

# Radio Communication



The Journal of the Radio Society of Great Britain

November 1994

Volume 70 No 11

THE VOICE OF AMATEUR RADIO FOR 81 YEARS

## MULTIBAND MINIS:

George Dobbs on the  
**5W QRP Plus**

Peter Hart on the  
**100W FT-900**



With This Edition: RSGB Annual Report & Accounts 93/94



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# Radio Communication



## NEWS AND REPORTS

### 4 THE RADCOM LEADER

by Peter Kirby, G0TWW, General Manager.

### 5 NEWS AND REPORTS - in colour

Two Gatherings of QRPers • Annual Report • 1995 Presidential Installation • Ron's Bird Scarer's an 'Owling Success • GB2RS Reserve Newsreaders Wanted • BBC Children In Need • Lodge Event Success • Full Licence - Age Requirement Reduced • Two new EMC Coordinators • AEA Appoint new UK Distributors • Propagation Studies Committee Vacancy • Britain to go 230V • RSGB HF Award Rules Revised • Novice RAE • R & D Electronics • Narrowboat Mobile • Scots Honoured • Peter Chadwick G3RZP, Resigns from Council.

### 80 RSGB HF NFD 1994 Results

## TECHNICAL FEATURES

### 13 SEVEN ANTENNAS ON ONE TOWER: Part One

Tony Preedy, A45ZZ, describes a radical design for a multi-band beam. A colour feature.

### 31 NOVICE NOTEBOOK

A 5/8  $\lambda$  vertical antenna for 70cm described by Ian Keyser, G3ROO.

### 32 RADIO EFFECTS OF COMET IMPACT

Dave Summer, G3PVH, describes his radio measurements made during the impact of the Shoemaker-Levy 9 comet with Jupiter in July 1994.

### 36 NICAD CHARGER

A charger that ensures your handheld battery is maintained in good condition, by E R Gaze, G8NKA. A colour feature.

### 45 STUB FILTERS

John Regnault, G4SWX, describes new circuit configurations of high performance filters using coax stubs.

### 52 EUROTEK: Ideas from Abroad

Erwin David, G4LQI, gives an edited translation of 'The Mousetrap', a keyer paddle with a difference, designed by Hans Widter, OE1WH and first published in *qsp* (Austria).

### 54 IN PRACTICE

Ian White, G3SEK, answers readers questions: Blowers For Power Amplifiers • Antennas Roundup.

### 60 TECHNICAL TOPICS

Stable LC Oscillators • The Multie Quarter-wave Folded Dipole • 1:1 baluns - Further Elucidation • Cleaning and Adjusting Semi-automatic ('Bug') Keys • Here and There.

### 68 GETTING STARTED ON MICROWAVE TV: Part Two

Dave Mc Que, G4NJU, concludes his ATV basics article with construction details of 10GHz equipment.

### 70 TOP BAND LOOP FOR LOW NOISE RECEPTION

A method of reducing the high noise level on 160m using a ferrite rod loop antenna is described by Richard Q Marris, G2BZQ.

**COVER PICTURE:**  
This month we look  
at two HF Multi-banders:  
FT-900: page 41.  
QRP plus: page 56.

## REGULARS

17 HF NEWS

20 VHF/UHF NEWS

24 SWL

25 CONTEST  
EXCHANGE

26 PROPAGATION

27 QSL NEWS

28 NOVICE NEWS

66 PRODUCT NEWS

72 DATASTREAM

74 EMERGENCY!

74 HELPLINES

75 SATELLITES

76 MICROWAVES

78 CONTEST  
CLASSIFIED

83 MEMBERS' ADS

85 CLUB NEWS

88 RALLIES AND  
EVENTS

89 SILENT KEYS

89 GB CALLS

91 AT YOUR SERVICE

93 THE LAST WORD

94 RSGB BOOK LIST

98 INDEX TO  
ADVERTISERS

## REVIEWS

### 41 THE PETER HART REVIEW

G3SJX examines the  
Yaesu FT-900 transceiver.  
In Colour.

### 56 USER REVIEW

George Dobbs checks out  
the new **Index QRP Plus**  
multi-band five-watter. In  
Colour.

# RADIO SOCIETY OF GREAT BRITAIN

THE NATIONAL SOCIETY WHICH REPRESENTS UK RADIO  
AMATEURS

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**UK associate member under 18: £16.00. Family member: £14.00**

**Corporate (Concessionary): £27.00** over 65 or full time student under  
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**Affiliated club or society/registered group (UK): £16.00** (including  
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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:**  
**01707-659015**

## The RadCom Leader

# End of an era . .

## . . But a Bright Future Ahead

IN THE SEPTEMBER *Leader* I informed you of the  
Science Museum's decision to close GB2SM after 40  
years of operation. This action not unnaturally prompted  
an adverse response from the amateur radio  
community, not only within the United Kingdom, but also  
world-wide. I am pleased to announce that following  
discussions with the Museum, they have agreed to enter  
into discussions with the Society with a view to providing  
the Museum with an innovative, state of the art, hands-  
on, amateur radio exhibit to replace the existing station,  
thus enabling GB2SM to remain on air from the Museum.

The existing station will close as planned on 7  
November; however, in the interim period it is hoped that  
we can devise a method of keeping the GB2SM callsign  
on air in some form until the new exhibit is in place.

I would like to take this opportunity to thank the  
Director of the Museum, Sir Neil Cossons, and his staff  
for their flexible approach in this matter and for allowing  
the Society to state its case for the retention of an  
amateur radio exhibit at the Museum. I will, of course,  
keep you informed through this column of the progress  
being made in the provision of the new exhibit in the  
coming months.

## Further Incentives For New And Existing Members

SINCE THE INTRODUCTION of the Direct Debit facility  
many new and existing members have opted to pay their  
subscription by this flexible and easy-to-use method of  
payment. The Society is keen to get as many members  
as possible over to Direct Debit as it eases the  
administrative burden on the Accounts Department and  
reduces costs.

As an incentive to change over to the use of Direct  
Debit from 1 January 1995, any new or existing members  
who opt to pay their subscriptions by Direct Debit will  
receive a £5 book voucher which can be exchanged  
against any publication that appears on the Society's  
Book List pages.

I hope as many of you as possible will take advantage  
of this offer which will run throughout 1995.

**Peter A Kirby, G0TWW**  
**General Manager**



● THE 1994 BRITISH Amateur radio Teledata Group Annual General Meeting will be held on 5 November 1994 at 1400. The location will be the same as last year: London House, Mecklenburgh Square, London. Further information from Andy, G3ZYP, tel: 01394 460441.

● THE NEW SECRETARY of the British Young Ladies Amateur radio Association (BYLARA) is: Mrs Maureen Ritson, G7FYV, 14 Dunsdale Rd, Holywell, Whitley Bay, Tyne and Wear NE25 0NG.

● ALL ON STATIONS may use the prefix OS until the end of the year to commemorate the liberation of Belgium in 1944. OS4CLM will be operational 28 October to 6 November in memory of the Canadian lives lost in the battle for Knokke. During the Canadian Liberation March on 1 November, ON6NF will operate on 80 and 40m CW from a 50-year-old army jeep with an "authentic transceiver".

## Annual Report

ENCLOSED WITH THIS edition of *RadCom* is the *RSGB Annual Report and Accounts* for the year ended 30 June 1994. It contains:

- Details of what the Society has done for its members over the last year.
- Audited Accounts for the year 1993/94.
- Agenda of the Annual Meeting.
- Full details of the changes proposed to the Articles at this year's Extraordinary General Meeting.
- Information on the candidates for election to the Council.
- Council election voting form.
- Proxy vote form.

Also enclosed is an envelope for the return of your Council vote.

If you have not received your *Annual Report*, please call HQ on 01707 659015 and ask for one to be sent to you straight away.

Low power operators assemble to compare notes

# Two Gatherings of QRPers

**E**NTHUSIASTS FOR low power operating seem to be more gregarious than amateurs in general. Whether they have more to talk about or are just friendlier people is a mystery, but QRP gatherings are popular and lively events.

The Rochdale Mini-Convention, courtesy of the Rev George Dobbs, G3RJV, takes place in October and we'll report on that next month. Two other events are the Yeovil QRP Convention in the Spring, and a smaller, but nonetheless enthusiastic, gathering of the faithful chez G4BUE, in the Summer.

## Sussex

IN 1984 CHRIS PAGE, G4BUE, was host to Ade Weiss, W0RSP, who wrote the QRP column in *CQ Magazine*. Chris invited his local G-QRP Club members to meet Ade and everyone had such a good time that they decided to do it again the following year. Since then the 'Summer QRP Party' has become a regular event.

QRPers meet to exchange ideas and talk about QRP and home-brewing whilst eating the

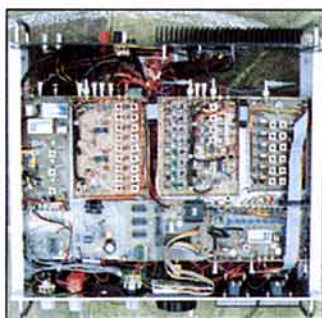


QRPers at Chris Page's 'Summer QRP Party' include, from left to right, OE6DUG, G4BUE, PA3BHK, G0BPS, PA3FPJ, AC8W and DL8RDS.

excellent food provided by Chris's wife, Pam, and many of the other wives. There is always an interesting assortment of homebrew rigs there that people have brought along to show off, to get working or to try out on Chris's antennas.

This year G4EUK brought along an all band CW/SSB transceiver that he has taken two years to build, which comprised a mixture of circuits from *Radcom* and *SPRAT*, the G-QRP Club's magazine (see photograph).

People have gone away from the Summer QRP Party fired up to build something, or to put up a better antenna or with more confidence to work DX. Such is the enthusiasm for QRP of those who attend the parties. Overseas QRPers regularly attend from DL, HB, JA, OE, OK, PA(9) and the USA (8) being among the 150+ amateurs who have attended over the years.



The layout of the all band CW/SSB transceiver built by Graham Adcock, G4EUK.

## Yeovil

THE 10TH YEOVIL QRP Convention was held this year on 8 May and it attracted over 300 low power operators from the UK and Europe; there was even a visitor from Australia.

Dick Biddulph, G8DPS, Chairman of the RSGB Technical and Publications Advisory Committee, opened the proceedings and the day began with a talk on 'Low angle propagation' by Rob Micklewright, G3MYM. After a short break, this was followed by Derek Alexander, G4GVM, a former Chairman of the Yeovil ARC, describing the conversion of his Marland transmitter to a transceiver.

The afternoon session commenced with a talk by Mike Grierson, G3TSO (no stranger to *RadCom* readers), on 'Practical VFO building'. The concluding lecture featured John Forward, G3HTA, and Dick Biddulph introducing 'The RSGB, your national society'.

The 'challenge' this year was to construct a receiver, using only ten components and a 6V power source, to produce the highest output from a 100mV 50Ω signal across a 10k load. The winner, was Dave Sumner, G3PVH, who used an ingenious combination of a valve, a transistor and eight other components producing 460mV at the test point.

## 1995 Presidential Installation

THE SOCIETY'S 1995 President Mr C N Trotman, GW4YKL, will be installed at an evening reception and dinner on Saturday 14 January 1995 (7.30 for 8.00pm). The venue is the Heronston Hotel Ltd, Ewenny, Bridgend, Mid-Glamorgan, CF35 5AW.

Tickets for this prestigious event are £20 per head. Members wishing to attend should apply by Friday 16 December to Fay Huxley at RSGB HQ, who can also arrange overnight accommodation if required. Please mention any special dietary requirements when applying for tickets.



# Ron's Bird Scarer's an 'Owling Success

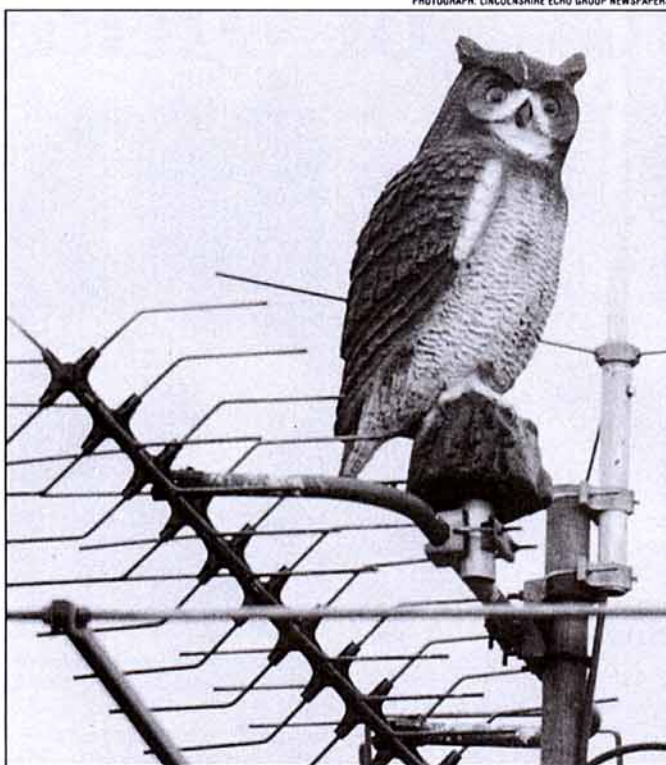
RON PLANT, G6HZV, caused quite a stir when he tried to protect his VHF aerial farm. It even made the *Lincolnshire Echo*. He writes: "Having been plagued for many years by starlings and pigeons landing and calling from the aerial array on the top of my 30ft mast, I decided that drastic action was called for."

He first tried applying silicon grease to the aerials but this only lasted a short time. He then found that G7MUB had deterred birds by using a plastic eagle owl, so he tried the same. [Members may recall a similar bird atop G3VOF's mast on our July 1992 cover-Ed].

Ron goes on: "Having placed the eagle owl in a position at the top of the mast, I waited to see what the results would be. After three minutes, two crows decided that this was an intruder into their air space and decided to dive-bomb him from various angles." But they soon flew off and no more birds landed that afternoon.

## It's Nailed to the Perch

"SATISFIED THAT I had cured the problem I settled down to my dinner, when the doorbell rang. On answering the door I was surprised to see a local Constable with a dead-pan expression on his face. 'We have had a report that there is an owl on your aerials.' Struggling to keep a straight face, I said: 'Oh yes, it's a plastic one. I keep it to scare off the starlings and pigeons.' He departed muttering . . . I then returned to the lounge where I col-



A mixed blessing: GB2RS Newsreader Ron Plant, G6HZV, found that Ernie the Eagle Owl fixed his bird problem but alarmed neighbours, the RSPCA, birdwatchers, the police and even a bus driver.

lapsed with laughter. I had already warned the neighbours what I was about to do but didn't think it would require notification to the police."

Since then, Ron's bird has caused great amusement: a bus driver stopped his journey to have a look, a bird-watcher trained his binoculars on it, the RSPCA came to rescue the 'stuck cat' and two elderly ladies swore blind the owl

had taken off one night only to return the next day in a different position (Ron had been on the air and had turned the mast through 90°!).

Anyone with hardy enough neighbours to be able to try this technique to protect their aerials will find these owls at Garden Centres, price £15.95 for the 2ft size, and £4.95 for the 9in version.

## GB2RS Reserve Newsreaders Wanted

THE GB2RS NEWS SERVICE has some 120 newsreaders making more than 80 broadcasts on HF, VHF and UHF (the schedule appears in the *RSGB Call Book*). However, some additional reserve newsreaders are required in certain areas. Volunteers are sought to fill the vacant posts shown in the table. Additionally, two newsreaders are required in the Aberdeen area so that the 6m and 2m FM services may be recommenced.

Aspiring newsreaders must be current members of the Society, and have the necessary technol-

ogy, site and dedication - being a newsreader is a heavy commitment. Anyone wishing to volunteer as a newsreader should con-

tact the GB2RS Manager, Ian Kyle, G18AYZ, 1 Portulla Drive, Lisburn, Co Antrim BT28 3JS, tel: 01846 665034.

Band/Mode	Area	Time	Main Reader
6m FM	SE England	1030	G8SC, Uckfield
	Midlands	1130	G4AFJ, Hinckley
	NW England	0930	G4LAA, Carlisle
	NW England	1030	G4LAA, Carlisle
	N Scotland	1000	GM4ILS, Elgin
2m FM	N Ireland	1130	G18AYZ, Belfast
	Midlands	1130	G4AFJ, Hinckley
	East Anglia	1030	G8HVV, Cambridge
	East Anglia	1800	G4RKK, Norwich
	Cent Scotland	1000	GM4HCO, Glasgow
	Cent Scotland	1030	GM3VTB, Glasgow N
	N Scotland	1000	GM4OPV, Fort William
2m SSB	N Scotland	1000	GM4ILS, Elgin
	N Scotland	1800	GM6TAN, Banff
	NW England	0930	G4LAA, Carlisle
70cm	NW England	1030	G4LAA, Carlisle
	SW England	0930	G0NZU, Bristol

Reserve GB2RS readers are needed for these areas.

## BBC Children In Need

THE CROWBOROUGH and District ARS is running GB2CIN as part of their fund-raising efforts for the BBC Children in Need Appeal. The venue is Jarvis Brook Social Club, Crowborough Hill, E Sussex, and the three-day event starts with a quiz night at 8pm on 24 November. The special event station will operate on the 25th and 26th using HF and VHF. Sponsorship will be based on the number of countries worked by GB2CIN. Details can be obtained from Mick Smith, G6UWO, on 01892 661807.

● Next year sees the centenary of Guglielmo Marconi's first wireless telegraph, and a number of events are planned to commemorate it. Marconi's widow died in July but their daughter Elettra will be continuing the preparations for the centenary.

## Lodge Event Success

IN JULY, THE University of Liverpool celebrated the centenary of the World's first public demonstration of wireless by Sir Oliver Lodge who was RSGB President in 1925. Liverpool and District Amateur Radio Society (LDARS) members used GB00L to work in excess of a thousand stations in over forty countries during the five day event.

120 people attended a Conference on the development of radio by Sir Oliver Lodge, and a further 500 visited the Exhibition of his notebooks, apparatus, photographs and other memorabilia. The amateur radio station was the focus of interest for many of the 250 schoolchildren who were present for the Oliver Lodge lectures and open days.



Jim Anderson, G0TDK, Chairman of the LDARS, presents Professor Twin, Head of Physics at Liverpool University (the modern counterpart of Sir Oliver Lodge), with the GB00L log books. The books, together with the QSLs received will be archived by the Department of Physics for use in future events.



# Full Licence - Age Requirement Reduced

THE MINIMUM AGE requirement of 14 for the Full Amateur Licence has always been frustrating to those who have passed the RAE below this age, and have then had to wait some years before being able to obtain their Licence. The Novice Licence was a big step forward, encouraging young people into amateur radio by making limited facilities available to them, but the anomaly still remained where those under 14 who had passed the exams for a Full Licence still only had access to the limited Novice facilities. We are pleased to report that recent discussions with the RA have resulted in the following announcement dated 13 September, which largely removes the anomaly by making the Full Licence facilities available to anyone over the age of 10 who has passed the Full Licence exams, provided they have also held a Novice Licence for at least one year.

**Amateur Radio Licence Age Requirement Reduced: Hold-**

## Two New EMC Coordinators

TWO NEW EMC COORDINATORS have been appointed: Mr R Gilchrist, G0TUE, tel 01229 718657; and Mr F G Sawyer, G3SLN, tel 0161 643 9014.

EMC Coordinators are available to advise members on their interference problems. A full list can be found on page 91 of February's *RadCom*.

ers of the Amateur Radio (Novice) Licence who are between the ages of 10 and 14 years will now have the opportunity to obtain a full Amateur Radio Licence provided they meet certain conditions, the Radiocommunications Agency announced today.

The conditions that will be applied are as follows. The person must be at least ten years of age and must have held an Amateur Radio (Novice) Licence Class (A) or an Amateur Radio (Novice) Licence Class (B) for at least one year. In addition, they must have passed the required examinations for the full Class (A) or Class (B) licence, including the 12WPM Morse test for Class (A).



Scarborough Special Events Group members operated GB30FYD in September to commemorate the 30th anniversary of RAF Fylingdales.

## AEA Appoint New UK Distributors

ADVANCE ELECTRONIC Applications Inc, the American manufacturers of data and antenna accessories, have appointed two companies to handle their products for the UK amateur market with immediate effect.

ICS Electronics Ltd have announced their withdrawal from marketing AEA over here in order to concentrate on their rapidly expanding interests in marine and commercial activities. However, they have confirmed to *RadCom* that they will honour all ICS warranties on equipment purchased in the last twelve months and have asked us to express their thanks for the support they have received from both the trade and

individual customers over the many years of their AEA association.

Siskin Electronics Ltd, of Hythe, Hants, are providing a full sales and repair service on all AEA 'data by radio' products and selected accessories, adding to their already dominant position in the field of amateur data and packet radio.

Martin Lynch at the Amateur Radio Exchange Centre in Ealing, is now marketing and supporting the full AEA range of amateur antennas and antenna analysers as well as the principal data and packet systems.

Siskin and Martin Lynch are no strangers to the AEA range. Both

have been leading stockists for many years and are very well equipped to sustain the high level of customer service and support expected by AEA users at home and abroad.

On Saturday 26 November, at the Martin Lynch 'Open Day', the two companies will cooperate in a special combined presentation of 'AEA in UK'. Members who attend can expect to participate in full hands-on demonstrations and have a chance to win appropriate AEA prizes in a one day competition.

Society members will recall and appreciate the invaluable pioneering work of ICS who, twelve years ago, were the first company in the world to introduce multi-mode terminal units for amateurs and were the first importers of packet radio TNCs for British radio amateurs. We all wish Alan and Marianne Clemmetsen well in their future activities.



Seen at the 1994 Annual Coleraine and District Amateur Radio Society (GI4NRQ) Rally on 28 August: (l to r) Ian Kyle, GI8AYZ, RSGB Council Member for Zone F; Ken McDermott, EI4DW, Vice-President of the Irish Radio Transmitters Society (IRTS); Ron Wilson, GI3CTU, President GI4NRQ Group; Maj Roy Graham, Vice-President GI4NRQ Group.

## Propagation Studies Committee Vacancy

THE RSGB PROPAGATION Studies Committee is looking for a volunteer secretary to assist the present one, with a view to taking over the job in due course. It is essential to have good word processing facilities, good secretarial skills and a telephone.

The committee meets about three times a year in Leicester and attendance is essential. A detailed knowledge of propagation matters is not necessary but would be an asset. Please send a CV to the Chairman, C Newton, G2FKZ, 83 Hollingthorpe Road, Hallgreen, Wakefield, West Yorkshire WF4 3NW.

## Britain to go 230V

FROM 1 JANUARY 1995, Great Britain will comply with a CENELEC standard and provide a mains electricity supply of nominally 230 volts, rather than the present 240V. Most European countries have 220V supplies at present, though Northern Ireland uses 230V already. The planned change should not cause any problems to consumers as most equipment will operate over a wide voltage range, for instance our 240V supply may vary now by as much as 15 volts.



## RSGB HF Award Rules Revised

A NUMBER OF THE RULES for RSGB HF awards have been revised as shown below. An information package for the RSGB Awards programme, including check lists and application forms, is available from the HF Awards Manager for £1.50, \$3 or 4 IRCs.

### Commonwealth Century Club Award

The following call areas have been added to the list of Commonwealth Call areas for the above award:

**South Africa:** ZS1, ZS2, ZS4, ZS5, ZS6 and ZS8 (Marion Island).

**Spratley Is:** 9M0 for operations using 9M0 calls only.

**Canada:** VE1, Maritime Provinces has been replaced by: VE1, Nova Scotia; VE9, New Brunswick and VY2, Prince Edward Island.

**Notes:** The start date for South African contacts is 1 June 1994, and contacts made before 1 June 1991 will also count. All contacts with 9M0 and the VE areas are valid.

The above areas will count for the CCC and 5-band CCC awards and WARC/160 metre endorsements from 1 September. Until 30 September applications for the CCC Supreme Award for contacting all Commonwealth call areas will be accepted under the 'old' list. No WARC or 160 metre endorsements have been issued so far for the 5 Band CCC Award - who will get number one?

## Novice RAE

THE CITY AND GUILDS report on the September NRAE has been published and shows a (provisional) 76.9% pass rate. A copy of the two-page report is available by sending a SASE to the Amateur Radio Department at RSGB HQ.

## R & D Electronics

OUR APOLOGIES to R & D Electronics for an error in their phone and fax numbers on page 70 of October's *RadCom*. The correct numbers are: phone 0843 866662; fax 0483 866663.

● 'WHAT'S NEW in Radiocommunications' is the title of a tutorial colloquium to be held at the Institution of Electrical Engineers (IEE), London on 12 December. For details call 071 344 5422.

## Narrowboat Mobile

THE STRATFORD ON AVON Canal Society held a gathering of narrowboats in July to celebrate the 30th anniversary of the re-opening of the Stratford Canal. The Stratford Radio Society ran HF and VHF stations from G0AJA's boat 'QE3'.

A 27ft mast was mounted on the boat and guyed to adjacent vessels. It supported a VHF collinear and a G5RV. Power came from a generator in the working boat next door.

About 100 stations were worked and there was a good flow of interested visitors. The team comprised G0AJA, G3MXH, G3OOQ and G8HJS.



### IARU Region One Award

The list of countries valid for this award has changed a great deal and at present there are 72 member countries of Region 1. The full list is available from the HF Awards Manager.

The achievement levels for this award were revised some time ago and are Class 3 for 30 member countries, Class 2 for 45, and Class 1 for all members.

This award can be endorsed for a single mode or band, including 6 metres.

The RSGB HF Awards Manager is G4BWP, and all applications should be sent to Fred Handscombe, Sandholm, Bridge End Road, Red Lodge, Bury St Edmunds, Suffolk IP28 8LQ.

## Scots Honoured

TWO RSGB TROPHIES have been donated specifically to recognise achievements by amateurs resident in Scotland. The **Jock Kyle Trophy** has been awarded this year to David Anderson, GM4JJJ, in recognition outstanding work over a number of years of operating. David has been the most consistent moonbounce operator in GM for many years and has achieved 'first' contacts between Scotland and countries around the world. He has worked quietly on the bands and never sought recognition for the work he has done. The Trophy was presented to David at the recent SARCOM convention in Aberdeen.

The **Jack Wylie Trophy** this year has been awarded to Tommy Hughes, GM3EDZ. Tommy has worked for the past twelve years as part of the Central Scotland FM Repeater Group, standing

down this year as Chairman. Over a number of years he has also been responsible for the organisation of Scottish Amateur Radio Conventions held at Cardonald College in Glasgow. Tommy was unable to attend SARCOM in Aberdeen to receive his trophy and the presentation to him will be made later in the year.

## Peter Chadwick G3RZP, Resigns from Council

IT IS WITH REGRET that the Radio Society of Great Britain announces the resignation from Council on 10 September 1994 of Immediate Past President Peter Chadwick, G3RZP.

Peter's resignation follows a decision by a majority of Council to propose certain minor changes in the *Articles of Association* to the membership of the Society at an Extraordinary General Meeting to be held in December 1994. The full proposals and explanatory commentary appear in the Society's Annual Report and Accounts circulated to members with this edition of *RadCom*.

If accepted, the changes allow Council a degree of flexibility in the future conduct of its business and correct certain anomalies that exist in the current wording of some Articles.

Peter felt that he could not support the changes at this time and, because Council is collectively responsible for sponsoring these amendments to the Society's constitution, decided he should resign his seat on Council.

Council will miss Peter's considerable technical expertise and good-humoured contributions to its work and wishes him well in the future.

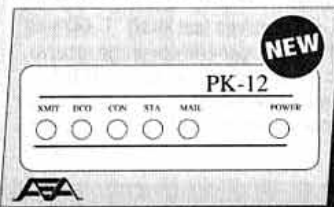
● THE 4TH CEPT Radio Conference takes place 21 - 23 November in Prague. Its theme is Mobility.



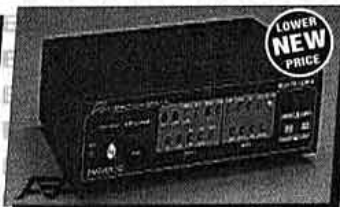
The Amateur Radio Village at September's LIVE '94 created plenty of interest.



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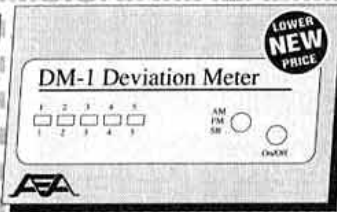
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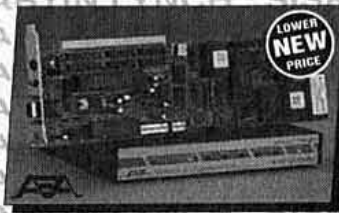


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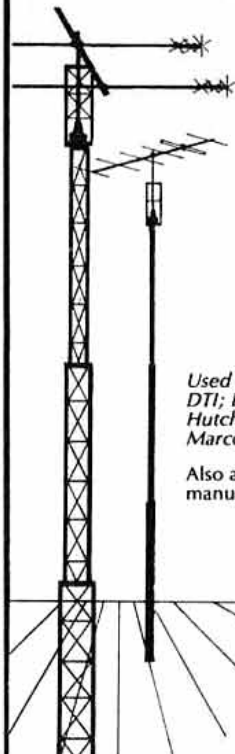
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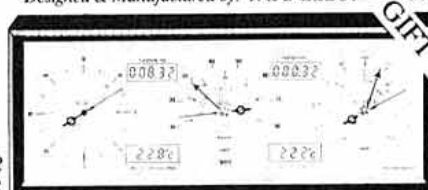
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## THIS MONTH'S LEADING PROJECT

# Seven Antennas On One Tower

The first of three parts by Tony Preedy C Eng MIEE, A45ZZ

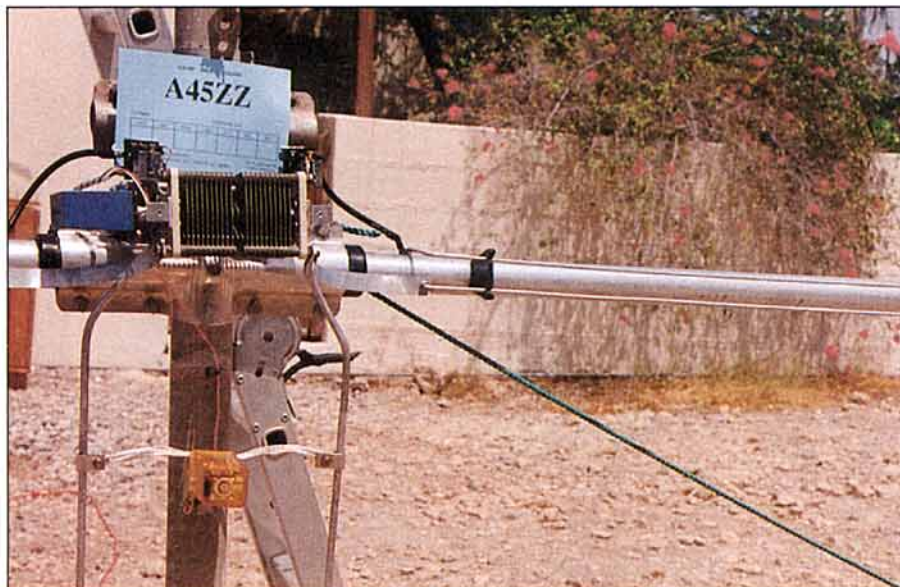
**T**HIS ANTENNA, COVERS all of the amateur bands from 7 to 28MHz, and is the result of my efforts to make a reproducible high performance multiband rotatable beam which does not use traps for tuning or matching.

Although traps have allowed compact two and three band rotary beam antennas to be built commercially, suitably weatherproofed types of appropriate precision are difficult for the home constructor to make. Commercial attempts to cover more than three bands using traps generally result in whole elements being redundant on some bands. Traps do in any case result in a compromise because they are inherently lossy, restrict antenna bandwidth, add windage and weight to the elements and worst of all, as with log-periodic and multiband quad antennas, they result in a high proportion of the exposed hardware being unused on most frequencies covered by the antenna.

The use of traps in a beam antenna for the seven HF bands is not practicable for home construction. A new approach was therefore necessary. Although my antenna operates down to the 7MHz band the boom is not much longer than a conventional tri-bander; although the elements are longer. As far as visual impact goes the longer elements are offset to some extent by the absence of traps (particularly if you were using traps in a seven-band design).

You need not be this ambitious if planning difficulties are anticipated. For example any monoband beam could be adapted on the same lines as my antenna by having the element centres insulated and made tuneable from the original band through each higher frequency one. My first attempt to prove the principle used a Hygain type 203 BA, 14MHz 3-element beam, with additional centre insulators, as used on the driven element, fitted at reflector and director. Relays were mounted inside the ends of the boom and connected across the insulators of the parasitic elements. The relays were closed for 14MHz and open on 18MHz, where the capacitance of the insulators conveniently provided the necessary tuning reactance. Initially the standard driven element was tuned midway between the two bands but later I replaced it with a folded dipole to give a better impedance match over both bands.

After this success I was inspired to add some more bands without adding extra elements or lengthening the boom the boom length being a limiting factor in my domestic situation.



A front element tuning assembly sitting on the locally made plastic cover. The housing can be kept to a reasonable size, about 160 x 100 x 75mm inside dimensions, if the servo is mounted outside on the end of the box and the 'O' ring seals supplied with it are used to keep out the weather. No attempt was made to seal the enclosure where conductors pass through the base because this provides a drainage route for the inevitable condensation.

### EXTENDED ELEMENTS

THE GAIN OF A DOUBLET varies with length as shown in Fig 1. The maximum gain of 3dB over a halfwave dipole (available when in extended double Zepp form in which each half is 5/8 wavelengths long) can be used to advantage in a beam antenna. For a given antenna height, this colinear gain is equally effective over any communication distance whilst gain obtained from either vertical stacking or additional parasitic elements is only effective over specific paths. The usable fre-

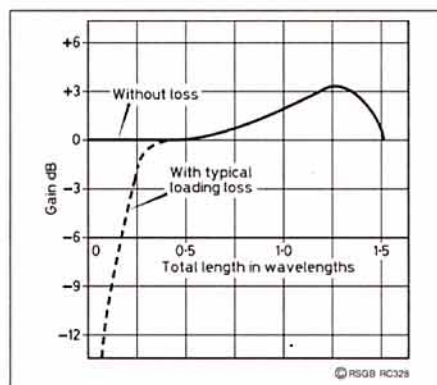


Fig 1: Broadside gain of a horizontal doublet compared to a half-wave dipole.

quency range of a doublet is typically that where the length lies between 1/3 and just over 2 x 5/8 wavelengths. That is over a frequency ratio of 3.8. The lower frequency is limited by losses in the loading inductor, typically as shown in the dotted curve of Fig 1, whereas the upper frequency is limited by side lobes taking power from the main broadside lobe of radiation.

A single nominally 14m element should therefore be expected to perform efficiently in a directional antenna throughout the amateur bands 7 to 28MHz if precautions are taken to minimise losses on the lower band. Transmission lines can make much more efficient loading inductors than coils and these were therefore chosen for the successful Hygain/Telex design which provides the basic mechanical structure for my antenna. The reactance necessary to tune an extended element of typical tubular form, to make it perform as a reflector, can be calculated approximately by treating the element as a section of transmission line of characteristic impedance 250Ω and using a frequency 5% lower than the working frequency. Similarly for a director a frequency 3% above the working frequency is used in the calculation.

To be more precise we should also consider element spacing and the effect of extra

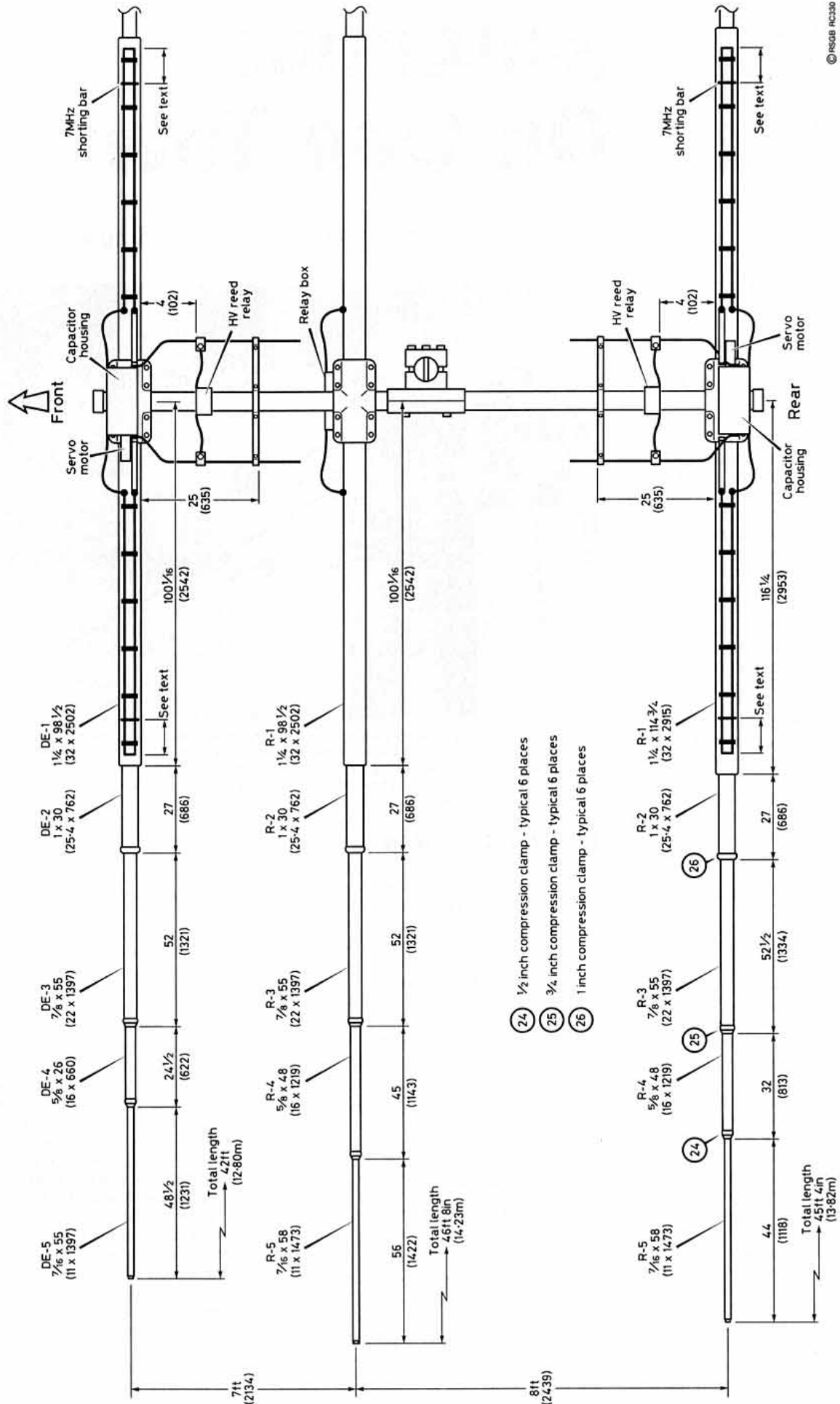


Fig 2: General view of the Hygain 402BA-S antenna modified for seven bands.



radiation resistance on the phase of the current in an extended element. However in this design it is not important to know exact measurements because with the exception of the reflector on 7MHz all tuning is optimised from the operating position. How many readers can be confident that the parasitic elements of their antennas are optimally tuned *after* they have fixed the antenna on to the tower? The required tuning reactance  $X$  is given by:

$$X = \frac{j \times 2 \times 250}{\tan(L)}$$

Where  $L$  is the electrical length of *half* the element in degrees (unless you're familiar with  $j$  notation ignore this symbol which provides the signs of the reactance).

For example, a  $2 \times 5/8$  wavelength doublet when used as a reflector at 28.5MHz must resonate in the  $1.5$  wavelength mode at say 27MHz where the electrical length  $L$  is  $5/8 \times (27/28.5) \times 360 = 213^\circ$ .

The tangent of  $213^\circ$  is  $+0.65$ . Therefore the reactance required is  $2 \times 250$  divided by  $0.65 = 769\Omega$  inductive. The formula will show that below the frequency where the element is a half wavelength, inductance is again required but between  $1/2$  and  $1$  wavelength, as on 14 and 18MHz in this case, the tuning reactance for resonance in the full wavelength mode will be provided by a capacitor.

The required range of reactance in this design was calculated to be obtainable from a section of transmission line (hairpin) shunted by a variable capacitor.

This arrangement incorporates capacitance attributable to the insulation at the centre of the element. The effect of centre capacitance is to increase circuit  $Q$  and hence the potential for dissipation by current circulating in the hairpin. This can be accommodated by making the hairpin from thick conductors. The hairpin also serves more conventionally to raise the otherwise very low feed resistance at the front, driven, element on the 7MHz band.

## MATERIALS

MOST OF THE HARD WORK and component sourcing usually associated with home construction has been eliminated from this project because the aluminium tubes, stainless steel parts, insulators and fixings are standard items from Telex/Hygain which I borrowed from their type 402BA-S, 40m two-element Yagi design. Even if you fail to make my antenna work you should still have a worthwhile asset!

Because of the relatively long elements this structure (shown in Fig 3) uses concentric heavy gauge tubing near the centre which is obviously necessary for both appearance and rated survival in severe weather. There is good reason to use a proven mechanical design for antennas of this size. This adaptation requires one standard antenna plus an additional set of parts, listed below, to form a third element.

It will no doubt be less expensive to obtain the standard fixings from a local source if you can. I managed to obtain all of the fixings and stainless steel clamps from a local marine chandler. The extra element is supported just to one side of the mast so that it imposes minimal additional loading on the boom.

Alternatively if the mast has a diameter of

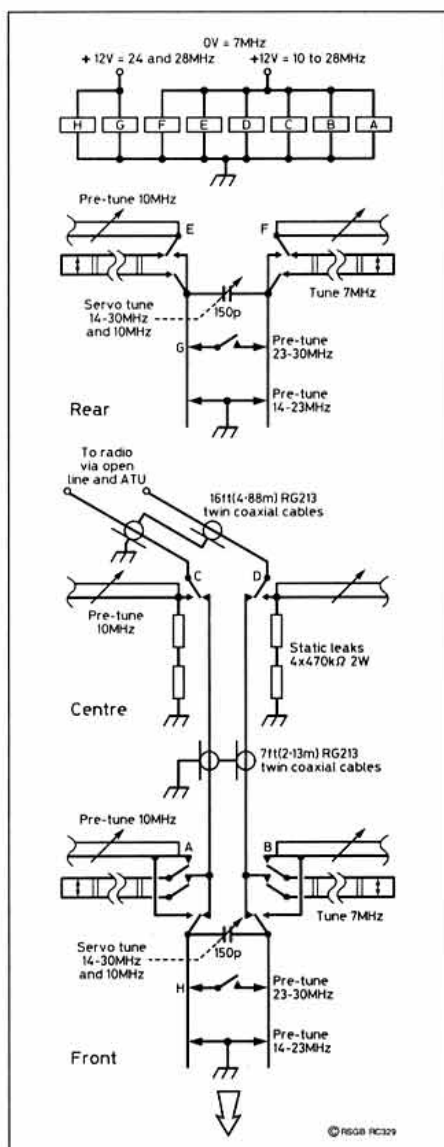


Fig 3: Concept and tuning of the 7-band antenna

exactly 2 in it may be more convenient to fix the centre element to the mast. Precautions will then be necessary to prevent any tendency for the centre insulator clamp to slip.

The only other mechanical items which need fabrication are a relay/junction box, some simple brackets, shorting bars, capacitor boxes and drive couplings. Precise assembly details are not given here because these will depend on what tuning capacitors you can obtain. The layout of the relay wiring will also have some influence on the final tuning. Always be aware of the need to minimise weight and windage at the ends of the boom or you may have to add some support for the sake of appearance. A simple remote band selector using a proven circuit based on 555 timer ICs and other standard components is described later.

## THE PARASITIC ELEMENTS

THE ELECTRICAL CONFIGURATION and tuning functions at the elements is shown in Fig 2. The front one is driven on 7MHz and becomes a director or pair of directors on bands 10 to 28MHz. Generally it is possible to tune each band without upsetting another. The mode of operation on 7MHz is conventional when the relays are not energised:

The element length is about  $1/3$  wavelength loaded to an electrical  $1/2$  wavelength by sections of transmission line supported on insulators along the element. A hairpin match (the original Beta match with 760mm removed from each leg for use at the reflector and for making shorting bars) results in a low driving impedance on this band. The element length plus hairpin provides resonance somewhat above 10.125MHz, resulting in a parasitic director.

The total length in metres is obtained from the formula  $138/f$ . Shorting bars on the linear loading are then used for tuning to the required 7MHz band sector. These each consist of two 35mm lengths of 6.3mm diameter aluminium rod (beta rod offcuts) drilled at their centre and clamped with a 2.5mm nut and bolt. The variable capacitor, which is ineffective on 7MHz, provides remote fine adjustment of director performance when the antenna is on 10MHz.

The 402BA antenna lends itself to easy conversion for 10MHz operation, where the element size is a half wavelength, simply by short-circuiting each half of the linear loading to the element at the centre. Unfortunately this places a doublet, formed by the loading lines, in parallel with the feed point of the elements.

Although it has little effect on 10MHz, this doublet is resonant in the 24 to 28MHz region, causing it to detune the extended element and to become the major radiator as the working frequency is increased. The benefits of the extended element would therefore be lost.

Effective elimination of the linear loading on the HF bands requires either that it be shorted to the element at both centre and outboard ends or that it be completely disconnected. The former is impractical and therefore the rather inelegant relay disconnection system of Fig 2 was adopted. Whilst the loading is disconnected each half of the element is  $5/8$  wavelength on 28MHz,  $1/2$  wavelength on 21MHz, etc, and thus the colinear gain mentioned earlier is realizable on the bands above 10MHz.

To tune as a director or reflector on 24 and 28MHz a centre loading inductor is provided by the shorter section of hairpin loop as selected by relays G and H, high voltage reed types obtained from RS Components (Electromail). Relays G and H have their own control circuit.

The necessary reactance to resonate the element at the right frequency for best director performance on the bands 14 to 28MHz is found under final working conditions by varying the tuning capacitance with the aid of a remote controlled servo motor.

Settings are stored at preset resistors for future rapid band selection. The choice of capacitance range was influenced by the relatively high capacitance of the centre insulators (about 37pF) and the need to keep the  $Q$  of the circuit low to maintain a wide bandwidth.

A tuning range of 14.2 to 31MHz, director or 13.4 to 27MHz, reflector was achieved in two bands with modified 500pF 2kV capacitors from the junk box (EF Johnson type 500E20).

... to be continued





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# HF NEWS

JOHN ALLAWAY G3FKM  
10 Knightlow Road, Birmingham  
B17 8QB

**C**RITICISM OF THE PRACTICE of giving only part of one's callsign when calling in DX pileups has been voiced by Ted Allen, G3DRN, (who will be recognised as having been in charge of the RSGB QSL Bureau for many years). Ted believes that the DX station should specify the countries which they will accept calls from or announce the numbers for which they intend to listen. There is no best way to avoid trouble but maybe one of the better techniques is not to operate transceive, say clearly and often where calls should be made and from which areas they will be accepted and under no circumstances answer any call from another area.

Apologies to G3WOS (JY8OS) and GJ4ICD (JY8IC) whose callsigns were not included in the list of UKSMG members who visited Jordan and were left out of QTH Corner in August HF News.

G3HB (QTHR) would like to hear from anyone who has received a 'Firecracker Award' from HARTS recently.

## URE HF NATIONAL CONGRESS

THIS TAKES PLACE from 3 to 6 December at Manises (Valencia) at the Hotel Sol Azafata (tel: +34 96 1546100, fax: +34 96 1532019). There will be many interesting features of interest to HF DXers. The Organiser is Angel Padin, EA1QF, who may be contacted via URE HQ, PO Box 220, 28080 Madrid, Spain. I can supply a copy of the programme.

## INTERNATIONAL QRP FREQUENCIES

MENTION IN THE September column of IOTA net frequencies brought a swift response from GM4XQJ who has pointed out that 7.030MHz is - by convention - one used for QRP operation! The agreed QRP frequencies are: (CW) 3.560, 7.030, 14.060, 21.060, and 28.060MHz and (SSB) 3.690, 7.090, 14.285, 21.385, and 28.885MHz.

## AZERBAIJAN

NATIG KASIMOV, 4J5T, was at HAMRADIO 94 and gave me an information sheet about the present state of amateur radio in Azerbaijan. He says that six years of war in the area have caused the number of amateurs to decrease from 220 to about 80, of whom most are in the older age groups. There are 11 club stations, and the Federation of Radiosport of Azerbaijan issues certificates - the 'Azerbaijan', 'Nizami 850', and 'General Azi Aslenov' awards. There is also AzAREN (the Azerbaijan Amateur Radio Emergency Network), which was active and saved lives after the earthquakes in Armenia, Iran, and Turkey as well as the one at Hodgejely. There is no commercial equipment available so most use home constructed gear and, as a result, RTTY and packet are not developed, and there are no VHF nets. QSL exchange is proving difficult because of the bad mail system in which IRCs are stolen. So most try to use foreign QSL managers. Not a happy picture but hopefully things will improve.

## DX NEWS

IT IS REPORTED that the DX Advisory Committee has rejected the proposal by fourteen-to-one that the Turkish Republic of Northern Cyprus be added to the DXCC list. It did not meet DXCC Criteria Point 1 - Government. It voted 8:7 to reject a proposed reinforcement of the rules against the unethical action of making a contact with a callsign other than that issued to the operator. It also decided (by an 11:4 vote) to recommend that there should be a minimum size for new DXCC countries by deciding that there should be a natural land mass of a size to support a reasonable amateur operation. In the case of islands the surface shall be dry at all times during high tide and the physical characteristics may not be changed or modified. This includes the use of man-made operating structures. Each case will be judged on its own merits. Implicit in the decision is that the operation from an island must take place from the surface of that island. This will now go to the Awards Committee for action. A further DXCC News Release dated 29 August said that ongoing investigations into the paperwork and photographs suggested that the P5RS7 operation may have taken place from another location than that claimed. The

## BAND REPORTS

Many thanks to all who contributed this month. They included G2AFV, G2HKU, G3GVV, G3YOL, G4CMZ, GW4KGR, G4OBK, G0MHC, and the UK Packet Cluster via G4PDQ. Reports cover the period mid-August to mid-September. As always callsigns printed in italics were of stations using CW:

<b>7MHz</b>	<i>CE8EIO, D2EGH, HS0ZAA, TA7/KU0J, ZP6XR, 6W6JK.</i>
<b>0000</b>	HH2PK, P40YL, VP8BKT, K1ZZ/VY2, Y11BGD, 5N0GC, 5U7Y.
<b>0300</b>	FR5DX, P40MX.
<b>0600</b>	FK8GJ, HH2PK, PZ1DV, V2HOW, V3ARF, VK9NS, VP2VI.
<b>1700</b>	JA, 9M2AX.
<b>1800</b>	JT1BR, S61IARU.
<b>2000</b>	A71AN, BV7GG, HL1IVA, HS1GOS, JT7FAA, VK4MZ, 7Q7CE.
<b>2100</b>	BV2A, C91AI, S61XQ, V21FC, V51BX.
<b>2200</b>	AP5AA, CU2BJ, YV1OB.
<b>10MHz</b>	
<b>0600</b>	FK8GJ, KL7XD, VY1JA, Z21HS.
<b>1700</b>	A71CW, VQ9KC, ZA1E, ZL3GQ, 8Q7AB, 9M8FC.
<b>1800</b>	JT7FAA, R1FJL, VQ9KC, 9J2SZ.
<b>2000</b>	C53HG, OX/DL1VU, 3B8/NK6F, 7P8SR, G3MRC/9Q5.
<b>2200</b>	CY9CWI, EA9AI, HK0ER, TT8/F5LGF, VP2MH, VP8GAV, VS6BG, ZG2FK.
<b>14MHz</b>	
<b>0600</b>	A35LT, BZ1BM, D2SA, FH5CB, FO5BI, KL7HF, T31BB, VK9NS, ZK3UC, 3D2CA, 3D2YH.
<b>0800</b>	AH8C, KH6CD, KH8BB, KL7DTH, PY0ZFB, V73/W8IDJ, 3X0DEX, 5W1GC.
<b>1000</b>	HS0ZAR, V73EX.
<b>1300</b>	A61AF, BA1CY, BV7GA, JU1HC, KH2/VP9BP, V85BG, VR2IF, XX9AS.
<b>1500</b>	BT3XLY, BV7GG, EP2MKN, ET3BA, JT1FAE, S21B, S61YC, TN8BR, VQ9TP, XW8KPL, Y11WMS, 9M8FC, 9V1WW.
<b>1600</b>	KL7XD, S21AM, VR2IH, 3XY0A, 4S7RO, 8Q7AB, 9M6ET, 9N1KY, 9U/F5FHI, 9X/F5PGP.
<b>1900</b>	HS0/G4UAV, KL7KJ, SU2MT, V85AM, ZD7WRG, 5N0GC.
<b>2100</b>	FS5PL, FY5KE, P40YL, PY0ZFB, V31JU, 9G1BJ.
<b>18MHz</b>	
<b>0900</b>	A35MW, KH8BB, V63JC.
<b>1000</b>	FT5ZF, TR8DF, VS6CT, G3MRC/9Q5.
<b>1200</b>	A22CT, BY1QH, D44BS, PJ8AD, 8Q7AB.
<b>1400</b>	A71CW, S61OK, T5AR, V31RO, 3DA0CA.
<b>1500</b>	S9VP, TA7/KU0J, VQ9QM, VU3RMS, ZD8OK, 3B8/NK6F.
<b>1600</b>	BZ1QL, C91AI, JT1CD, S61YJ, TT8/F5LGF, 7Q7JL, 8Q7AB.
<b>1800</b>	CN2VA, TU4EI, VP8GAV, YB6INU, 5N0GC, 9M8FC.
<b>21MHz</b>	
<b>0900</b>	OK1DOR/BY1BJ, BY5QW, HS0ZAR, S61IARU, VQ9AM, 3B8/NK6F.
<b>1200</b>	SU1SK.
<b>1400</b>	A61AF, D2EGH, FR5EL, ZD8EB, 5R8DS, W1WN/6O.
<b>1500</b>	ET3BT, FR5KH, ZD7WRG, 9N1HA, GM0FQV/9G1.
<b>1600</b>	D2SA, VP8BKT, 5H3JD, 5R8DN.
<b>1900</b>	CE0ZIS, FY5GJ, ZG2IB, 4U/F6FNL.

## QTH CORNER

<b>GD4UOL</b>	S Muster, Flat 4, 60 Genesta Rd, Westcliff on Sea, Essex SS0 8DB.
<b>GU/F5SHQ/P</b>	Both to PO Box 14, F-44521 Oudon, France.
<b>GU/F6FGN/P</b>	
<b>JU1HC</b>	Japan UNICEF Ham Club, PO Box 58, Moriguchi City, Osaka 570, Japan.
<b>JY8IC</b>	Geoff Brown, GJ4ICD, TV Shop, Belmont Rd, St. Helier, Jersey.
<b>JY8OS</b>	G3WOS, Chris Gare, 183 Sycamore Rd, Farnborough, Hants GU14 6RF.
<b>SU1KR</b>	Khaled Said Hassan, PO Box 78, Heliopolis, Cairo 11341 Egypt.
<b>V6SH</b>	Jim Hood, WV5S, 11623 Smoking Oaks Drive, Oklahoma City, OK 73150, USA.
<b>ZK2XN</b>	Radioamatorklubben P35, Postboks 5626 Mollenberg, N-7002 Trondheim, Norway.
<b>5X1XT</b>	P Rubinfeld, WF5T, PO Box 4909, Santa Fe, NM 87502, USA.
<b>GM0FQV/9G1</b>	G4XTA, 3 Knipe View, Bampton, Penrith, Cumbria CA10 2RF.

News Release went on to say that documentation did not establish that operating permission had been given by the appropriate authorities, nor did it establish that the operation took place from the territory of North Korea. The DXCC file has now been closed. On 1 September the number of unprocessed DXCC applications was 534. The DXCC desk had received 697 applications (54,764 QSLs) in August - the leading edge of the rush that occurs in September caused by those try-

## 28 MHZ COUNTRIES TABLE

G4OBK - 33	G0MCT - 12
G0AEV - 23	G0DNV - 9

ing to be included in the Annual Listings.

RSGB DX News Sheet says that Peter, ex-9G1PW/XT2BW, has now returned to the USA and that logs for his African operations are with WB2YQH who replies to direct requests for QSLs





# DX NEWS SHEET

A 'MUST' FOR ALL SERIOUS DX Operators, the *DX News Sheet* provides the most up-to-date details of special and rare station activities on the HF bands as well as key solar/geomagnetic data. Information for the *DX News Sheet* is collated and edited by top DXer Brendan McCartney, G4DYO. The *DX News Sheet* is produced 50 times per year and is sent to subscribers each Wednesday.

## SUBSCRIPTION RATES FOR RSGB MEMBERS

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**Zone 2:** Australasia, Pacific, Far East

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by return. John, GM0FQV/9G1, should be in **Ghana** for two years. A Central Arizona DX Association team will also be in Ghana from 24 October until 4 November and will operate in the CQ WW SSB test as 9G5TL. Outside the contest they will use individual callsigns - 9G5WH (KF7AY), 9G5VT (K5VT), 9G5RM (NZ7E), 9G5MB (AA7NO), 9G5JR (WA7LNU), and 9G5MT (WY7K). QSLs go to their home callsigns. Another team will be in Ghana for the CQ WW CW contest. Paul, WF5T, is expected to be in **Uganda** for the whole of November and he will operate as 5X1XT. Most activity will be on CW and RTTY. He will have an amplifier and expects to use 3.5, 7, and 10MHz as well as the HF bands. TT8/F5IXR has asked for the callsign TT8XR and should remain in **Tchad** until after Christmas. It seems that the information given in the September column concerning SU1KR was not correct. I have heard from my good friend SU1ER who emphasises that SU1KR is Khaled Said Hassan and is QTHR in the *Callbook*. Pavel, OK2FUN, operated as second operator at SU1KR during the SU1STARS activity and March/April contest period. He was not able to obtain an SU licence and OK2EC is QSL manager only for OK2FUN.

Tom Christian, VR6TC, has been in New Zealand for medical treatment but is now back on **Pitcairn Is.** Morten Antonsen, LA9GY, is hoping to operate from **Niue** as ZK2XN between 24 October and 27 November. He will be on all bands mostly using CW and will enter the CQ WW SSB Contest on 29 - 30 October. Jim, WV5S, and Coy, N5OK, of the Oklahoma DX Association will be returning to **KC6 (Belau)** this autumn and they will use their previ-

ous calls **KC6SS** and **KC6OK**. They will be there from 25 October to 2 November and will include the CQ WW DX SSB Contest. They will operate from V6 (Yapp) in the **E Caroline Is** from 2 to 7 November as V63SH and V63OH. Emphasis at both locations will be on CW, the WARC bands, 1.8 and 3.5MHz, and RTTY operation. ZL2HU is hoping to appear as ZK1KH from the **North Cook Is** between 12 December and 28 January.

RSGB *DX News Sheet* says that F6FER is in the **United Arab Emirates** for about one year and has operated from the club station A61AF. According to *RSGB DX News Sheet* OE6EEG is no longer acting as QSL manager for A71AL, HZ1MM, SU1AY, SU1ER, SU1RR, SU1SR, YI1DZ, or 7Z1IS.

W2GD will operate P40W from **Aruba** during the CQ WW SSB Contest and return in late November for the CW test when he will be accompanied by KR0Y who will operate P40L from P40V's QTH. PS7AB wishes to point out that he is *not* the QSL manager for the 1994 ZW0MI operation, and he is wondering if the operation was authorised. Amateurs in **Brazil** have been allowed to use 10MHz since 1 September. At present they are

## 1994 WARC BANDS TABLE

	10MHz	18MHz	24MHz	Total
G4OBK	131	198	123	452
EA5GQI	-	133	77	210
G0MHC	53	77	39	169
			(CW)	
GJ4GG	40	66	40	146
EA5DQE	-	92	49	141
G2AFV	57	56	12	125
G3ING	62	46	15	123
G3KKJ	17	53	39	109
G4CMZ	50	50	7	107
G0TMZ	25	32	11	68
G3IAR	33	16	2	51
G4FVK	18	20	11	49

Date	Prefix	DXCC Country	Remarks	Total
Jan 1987	3Y	Peter 1	Is added	317
Apr 1988	P4	Aruba	added wef 1.1.86	318
	S0	Western Sahara	restored	319
May 1989	4J1	M-V Island	added	320
	3D2	Rotuma Island	added	321
May 1990	3D2	Conway Reef	added	322
	T33	Banaba Is	added	323
	ZS9	Walvis Bay	added wef 1.9.77	324
Mar 1991	Y2	E Germany	deleted wef 2.10.90	323
	4W	North Yemen	deleted wef 21.5.94	322
	7O	South Yemen	deleted wef 21.5.94	321
	7O	Yemen added	wef 22.5.90	322
Sep 1991	ZS1	Penguin Is	added	323
Jan 1993	T9	Bosnia Hercegovina	added wef 15.10.91	324
	9A	Croatia added	wef 26.6.91	325
	S5	Slovenia added	wef 26.6.91	326
Jun 1993	Abu	Ail Is	deleted wef 31.3.91	325
	OK	Czechoslovakia	deleted wef 31.12.92	324
	OK	Czech Republic	added wef 1.1.93	325
	OM	Slovak Republic	added wef 1.1.93	326
	Z3	Macedonia	added wef 9.8.91	327
Jan 1994	E3	Eritrea	restored wef 24.5.91	328
Apr 1994	ZS1	Penguin Is	deleted wef 1.3.94	327
	ZS9	Walvis Bay	deleted wef 1.3.94	326

Table 1: The recent DXCC changes list prepared by KA6A for QRZ DX.





QSL from the Marquesas Islands activated by JA1BK this year.

restricted to the segment 10.138 - 10.150MHz but it is hoped to extend this soon. WB8GEX and WZ8D will be in St Kitts between 19 and 25 November. Their call signs will be V47NF and V47WZ and they will be on all bands 1.8 to 28MHz SSB. They will install a 50MHz beacon on 50.055MHz with the call sign V44K.

RSGB DX News Sheet says that SV2ASP/A located on Mt Athos is now using digital modes. It seems - according to Mario Ambrosi, I2MQP - that "the kingdom of Seborga exists only in the mind of someone that suffers from a high temperature, and this year in Italy it was very hot during August." He further reports that F8RU had checked with Philippe Capitaine, HB9RKG, the President of the IARC (4U1ITU) in Geneva, who confirmed that he had advised that the 0S1A call should not be used. Furthermore the ITU deals only with administrations and not individuals so no favourable or unfavourable reply could have been received!

## DXCC UPDATE

G4DYO HAS RECENTLY published in the RSGB DX News Sheet a summary of relatively recent DXCC changes prepared by KA6A and published in QRZ DX. See Table 1 for details.

## EXPEDITIONS

FOR THE SEVENTH time Steve, G4UOL/GD4UOL, will be visiting the Isle of Man this month. He expects to be QRV from 2100 on 18 November until 1800 on 2 December and is trying to get more countries towards his nine-band DXCC! He will be found about 10kHz up on each band (CW only), 10.102, 18.070MHz on the WARC bands and near 1.835kHz. QSOs will not be the chatty type as he is trying to make as many as possible.

F6FGN and F5SHQ will be active from Guernsey (EU-144) between 28 October and 6 November including the CQ WW SSB Contest. Their calls will be GU/F6FGN/P and GU/F5SHQ/P and they will be active on all bands

3.5 to 28MHz on CW and SSB. There are rumours of an expedition to the Andaman Is at the end of October but no other information is available.

## DXCC HONOR ROLL

THE FOLLOWING UK stations were shown in the list which appeared in the July 1994 issue of QST. The numbers given in brackets are the totals of 'all time' countries confirmed and the totals in bold lettering are the current countries available:

(Mixed) 328 = G3AAE (376), G3GIQ (358), G3KMA (360), G3LQP (351), G3NSY (347), G3RTE (334), G3SNN (336), G3TJW (348), G3UML (356), G3WPF (338), G4ADD (333), G4BWP (334), G4FEU (334), G4GIR (333), GM3BQA (355), GM3ITN (365), GW3AHN (376). 327 = G3JEC (354), G3KDB (348), G3MXJ (349), G3SJH (342), G3XTT (333), G4EDG (331), G4IUF (332), GW3ARS (336). 326 = G3KLL (347), G3RCA (336), G4BUE (339). 325 = G3TXF (341). 324 = G3ALI (346), G3ZAY (341), G4ZYQ (327), G0DQS (327), GM3CIX (355), GM3WIL (329). 322 = G3FXB (368), G3HCT (363), G3HTA (347), G3IFB (350), G3VXJ (325), GM3AWW (344), GM3YTS (326). 321 = G3COJ (344), G3FKM (367), G3TMA (329), G3VIE (340), G3YJI (333), G4DYO (332), GM4KLO (324). 320 = G3JAG (345), G3RUX (341), GW4BLE (330).

(Phone) 328 = G3KMA (350), G3NLY (357), G3SNN (334), G3TJW (348), G3UML (356), G4ADD (333), G4BWP (334), G4GED (331), G0CGL (330), GM3BQA (355), GW3AHN (373), GW3CDP (337). 327 = G3JEC (354), G3SJH (342). 326 = G3RCA (335), GW3ARS (335). 325 = G3KLL (358), G4LVQ (328). 324 = G4GIR (328). 323 =

G4PTJ (326), G4ZYQ (326), G0DQS (326). 322 = G3XTT (328), G3ZAY (339), G4WFFZ (324). 321 = G3VOF (328), G3ZBA (341), G4DYO (332), G0LOG (324). 320 = G3PJK (323), G3YJI (332), GM3CIX (343). 319 = G3FKM (361).

(CW) 328 = G3KMA (336). 327 = G3WPF (331), G4EDG (331), G4GIR (330). 325 = G4BWP (330). 323 = G3RTE (326). 321 = G3TXF (328), G3XTT (325). 319 = G3KDB (324), G3MXJ (324).

## CONTESTS

### HA-QRP CONTEST

0000 1 November - 2400 7 November

3.5 TO 3.6MHz CW only. Exchange call signs, reports, QTHs, and operators names. Each QSO with own country counts one point, with others two. Multiplier is the number of DXCC countries worked. Post logs before 21 November to: Radiotechnika szerkeeztosege Budapest, Pf 603, H-1374 Hungary. I can supply copies of the rules.

### OK DX CONTEST

1200 12 November - 1200 13 November

NO RULES RECEIVED to date. I have copies of the 1991 version.

### AGCW HOMEBREW AND OT CONTEST

1300 - 1700 20 November

1300 - 1500 7.010 - 7.040MHz, and 1500 - 1700 3.510 - 3.560MHz. CW only with input less than 100W. Class A: Transmitter and receiver homebuilt or more than 25 years old; Class B: transmitter or receiver home built or more than 25 years old, and Class C: QRP - Tx below 10W input home built or more than 25 years old. Send RST, serial number (start from 001 on each

band), and class. QSOs between As, As with Cs, and between Cs count three points, between Bs and As or Cs two, and between B's one point.

Logs must be postmarked no later than 15 December 1994 and sent to Dr Hartmut Weber, DJ7ST, Schlesierweg 13, D-38228 Salzgitter, Germany. Copies of rules available - SASE please.

### CQ WW DX CONTEST (CW SECTION)

0000 26 November - 2400 27 November

RULES AS GIVEN last month.

### WAEDC CONTEST (RTTY)

0000 12 November - 2400 13 November

3.5 TO 28MHz. In this section of the WAEDC there are no continental limitations and everybody works everybody else. QTC traffic is not allowed within one's own continent. Each DXCC/WAE country counts as a multiplier.

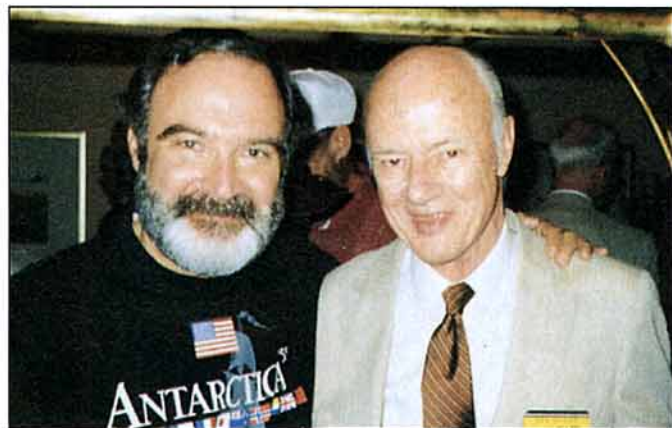
Mail logs to reach WAEDC Contest Committee, PO Box 1126, D-74370 Sersheim, Germany, by 15 December 1994. I can supply copies of the rules - and if you are intending to enter seriously I strongly recommend that you study them! SASE please.

## PROPAGATION

G8KG WRITES: "In the 'Dol-drums' is probably the best way of describing solar activity during the summer. The 27-day average of solar flux has barely risen above 80 sfu for the last 150 days and had sunk to 77 by the middle of September. "Only a brief peak in the daily figures into the 90s in the first week of September, coupled with the beginnings of the seasonal improvement in northern hemisphere MUFs, brought a little life back into the higher bands and it can at least be said that the level of geomagnetic activity seems to have reverted to that seen late last year, so HF band conditions have been more stable again recently."

## THANKS...

... GO TO ALL WHO supplied information and to the authors of the following news sources: the RSGB DX News Sheet (G4DYO), DXPRESS (PA3FQA), the Lynx DX Bulletin (EA2KL), the EA DX Bulletin (EA1QF), and the Long Island DX Bulletin (VP2ML). Please send everything for the January issue of Radcom to reach me no later than 17 November.



Left: Luis Chatarifsky, XEIL, key member of the February 1994 DXpedition to Peter II Island and Ken Miller, K6IR, of Maryland.



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# VHF UHF NEWS

## NORMAN FITCH G3FPK

40 Eskdale Gardens, Purley, Surrey CR8 1EZ

**F**URTHER Perseids information, a review of OH5IY's latest Meteor Scatter software and a report on the Swedish EME Conference are featured this month. There were no significant openings up to 22 September.

## PUBLICATIONS

ISSUE 3/1994 of *DUBUS Magazine* contains much bi-lingual technical information for the VHF and UHF operator. Articles include a cavity preamp for 144MHz using a power GaAs-FET by I8CVS and I5TDJ; a 50MHz monopole antenna array for MS work by K1POO and more on the DJ9BV noise figure meter project.

In the 'Hints and Kinks' section, DF5GX contributes 'Low cost autotracking for SAT and EME with ROTORSYS.' This is a Turbo Pascal program for IBM-compatible PCs with EGA or VGA graphics. DC6GB has a piece on 'Folded dipole construction for Yagis.' All *DUBUS* articles are superbly illustrated with high quality drawings, photographs and tables. Roger Blackwell, G4PMK, is the UK representative for *DUBUS* and he is QTHR (address in the *RSGB Call Book*).

## MOONBOUNCE

### CONFERENCE

The 6th EME Conference was held in the Swedish village of



The 25 metre dish antenna at the Onsala Radio Observatory in Sweden. L to R: SM7FWZ and K1RQG wishing they had one in their backyard.

Gottskars Kursgard on 26-28 August. Organized by SM6CKU and SM4IVE, it attracted 82 licensed amateurs from 18 countries, plus guests. The British contingent comprised G3SEK, G3WDG, G4CCH, G4KGC and G4RGK. The location was a conference centre 30km south of Gothenburg, the accommodation consisting of about 20 large cabins set in a forest.

A very full programme included a talk by VE3ASO about the Toronto VHF Society's experiments with the 46m radio telescope antenna at Algonquin Park. The FF1EME group explained their 23cm and 13cm operation using the antenna at the Nanay Radio Observatory; the reflector is 200m wide and 40m high set in mountains in the south of France.

G3WDG spoke about 3cm EME, SM0PYP explained the use of high-Q ceramic resonators in bandpass filters and F1FLN demonstrated his impressive Moon tracking software. On the Sunday morning, the whole group visited the Onsala Radio Observatory - see photo - and resident astronomers explained how they run the observatory, its activities and equipment.

A special session on EME issues and procedures was chaired by Joe, K1RQG, and Ian, G3SEK. It was agreed that: DL4EBY will be the exclusive skeds coordinator: KD4LT/K5JL will continue as 20m North American net control: K1RQG will control the European net from 1600UTC and relay information between the two continents: DL7APV will take over the EME directory: F5HRY, SM2CEW and G4CCH will act as the EME Contest Committee.

This report was compiled from a letter from Dave Dibley, G4RGK, and the September 432 and *Above EME News* published by Allen Katz, K2UYH. Everyone agrees that SM6CKU and SM4IVE did a superb job in organizing this event. The next one is scheduled for the Baltimore/Washington area of the USA in 1996.

## REPEATERS

THE SUMMER issue of *LENS*, the Leicester Repeater Group's Newsletter, features a contribution by Adam Moss, G0ORY, the engineering manager of the LRG's repeaters. The UHF one is GB3LE on RB4 and has had problems following its 'bath' when the bunker was flooded earlier this year. GB3CF, the VHF relay on R0, was put back on full power with "...unhindered receive capability." This attracted some



erate interference which is being dealt with. In mid-August the LRG had 45 members. If you'd like to swell the ranks, the Group's address is PO Box 180, Leicester.

## BEACON NEWS

AS REPORTED in the 4 September GB2RS news broadcast, beacon GB3CLE on 1296.910MHz will cease operation from its current site on Clee Hill (SPE) in March. Two alternative sites are on offer, one near Oswestry (SPE), the other near Newtown (PWS). The beacon is sponsored by the Salop ARS which invites users to indicate their site preference. Don Goddard, G3UQH, is the keeper and he is QTHR.

## CONTESTS

THE FINAL legs of the 432MHz Cumulative Contest are on 27 October, 11 and 28 November and 13 December, all 2030-2300UTC. The rules are on page 82 in the July *RadCom*. The last session of the 144MHz CW Cumulatives is on 31 October, 2030-2300UTC; use a 4422 summary sheet to show the scores for all the sessions and the best three will be chosen. Send logs and 427 cover sheet to adjudicator David Johnson, G4DHF, 65 West Street, Bourne, Lincs PE10 9PA.

The last three legs of the 1.3/2.3GHz Cumulatives are on 3 and 17 November and 5 December, 2030-2300UTC; see p82, July *RadCom* for the rules. For CW fans, the 144MHz Marconi Memorial and RSGB 24-hour contests start at 1400UTC on 5 November and you can enter both. For those who can't spare the time, there is a six-hour RSGB event from 0800 on the 6th. See p82 September *RadCom* for the rules.

## SOFTWARE

THERE ARE several computer programs in the public domain of use to meteor scatter operators. They range from very simple ones, which just display reflection efficiencies at regular intervals, to much more advanced efforts which almost make the operator superfluous. In this latter category is MSSOFT developed by Ilkka Yrjölä, OH5IY, the latest version of which I recently downloaded from the Internet.

Ilkka started developing this MS software in 1982 with a program for the Commodore VIC-20. The first PC version was 3.0 and v4.0 appeared in December 1992. Since then it has been steadily upgraded and expanded,

making considerable use of graphics for displaying shower activity, etc. The current version is v4.2e. The excellent manual runs to 20 pages and includes very comprehensive chapters on the theory of MS propagation and a description of the correct MS procedures.

Among the many features of this suite of programs are files dealing with the modification of transceivers for high speed CW keying, motor speed controller for tape recorders, MS sked and semi-automatic logging files. You can dispense with your CW keyer and use your PC and this software instead to create and send messages. The speed range is 100 to 9999 LPM (letters per minute). Circuits for simple and deluxe interfaces between the transceiver and COM1, COM2 or RS232 port on your PC are included in the manual.

There are so many useful features in MSSOFT that it would need a whole page to do justice to Ilkka's software. He has spent well over 500 hours developing it and it must be the definitive MS software. For those with access to the Internet, you can download it all from (ip 128.214.248.6) FTP.funet.fi with anonymous FTP at pub/ham/vhf-work/mssoft42.zip. Otherwise I can copy the ready-to-run collection to your formatted disk, either 3.5in or 5.25in. The suite takes up about 620k. Send your disk, with decent SASE or Jiffy bag, to the Purley QTH.

## METEOR SCATTER

### THE PERSEIDS

Alastair McBeath, Vice-president of the IMO (International Meteor Organization) sent an extract from the IMO's journal *WGN* about this year's Perseids shower. Observers in Honey Lake, California suggest there was an outburst of activity between 0830 and 1200UTC on 12 August. The peak ZHR (Zenithal Hourly Rate), based on 15min intervals, was 225, but 5min intervals indicate a peak ZHR near 400-500. The actual peak period was 1030-1100 at solar longitude (LS) 139.58°. European reports suggest the 'traditional' maximum was on 13 August with a ZHR of 100-120.

In his November *QST* 'World Above 50MHz' column, Emil Pocock, W3EP, reports that Shelby Ennis, W8WN (EM77), observed an intense flurry on the 12th, 1048-1118UTC. Peter Canlon of the IMO concludes that the 1994 shower had returned to

normal. It seems that the period 1350-1600UTC on the 13th provided good reflections.

Jukka Sirvi, OH6DD, reports that the first peak was at 1000UTC on the 12th, with good reflections 0900-1300. The second peak was at 0300UTC on the 13th, with good reflections 0100-1100. He states that the data for the shower, for use in MSSOFT v4.2e, are available on the Internet via FTP at ftp.funet.fi/pub/ham/vhf-work/msdata94.zip. Jukka's packet address is oh6dd@oh2rbi.fi.nu.

## NOVEMBER ACTIVITY

The Taurids meteor streams are associated with Comet P/Encke and are divided into Taurids North and Taurids South. The maxima are broad and flat, lasting for a week or more, with pretty constant ZHRs. According to the IMO's 1994 Meteor Shower Calendar, the Taurids N maximum should be on 3 November at LS 220.7°, while the Taurids S peak on the 13th at LS 230.7°. UTC times when reflection efficiencies exceed 50% are: NE/SW 2000-0130; E/W 2130-0330; NW/SE 0000-0530 and N/S 1900-2300 and 0200-0600.

The main November shower is the Leonids which is associated with Comet P/Tempel-Tuttle. The predicted peak - both IMO and OH5IY - is around 0100 on the 18th at LS 235.55°. Activity is expected to increase over the next few years as the comet returns to perihelion in the 1998-2000 period. Best times are: NE/SW 0130-0700 and around 1100; E/W 0400-0900; NW/SE around 0200 and 0600-1200 and N/S 0300-0500 and 0800-1300.

## ACTIVITY

No activity reports were received for this month. A reminder that the first leg of the ARRL EME Contest is on the 29/30 October weekend. See page 21 in the October *RadCom* for details. The second leg is on the 26/27 November weekend when the Moon's declination will average +1°, the Sun offset is -80° and the 144MHz sky temperature averages 230°K. The signal degradation is -0.6dB. VE3ONT will be QRV again transmitting on 144.100MHz and listening 144.100-144.110MHz. Their Moon times are: 26th 0538-1645; 27th 0646-1713.

## PROPAGATION

AUGUST WAS a very quiet month according to the Six and Ten Reporting Club's August Report edited by Ray Cracknell, G2AHU

(HWR). The K-index did not rise to 5 or above at any of the three British observatories - Eskdalemuir, Lerwick and Hartland. However, the planetary index, Kp, rose to 5 on the 13th and 14th. The Sunspot Index Data Centre (SIDC) in Brussels recorded the mean sunspot number (SSN) as 22.8. The adjusted mean solar flux at 2.8GHz was 78, according to the NOAA in Boulder, Colorado, USA.

The back cover of the Report shows an SESC regression model prediction of SSNs based on the July 1994 observed data. The source is the NOAA under reference SESC PRF 988, 9 August 1994. These data suggest a minimum in early 1996, with the first signs of the upswing to Cycle 23 by the year end. The predicted smoothed SSNs peak at 108 throughout the first four months of 2000, about two-thirds of the 1989 peak of this cycle.

50MHz is not regarded as a good band for tropospheric propagation. Until recently, the 20dBW ERP power maximum limited the longer ranges under flat band conditions. The current licence conditions now give a 400W/9dBd antenna station another 15dB gain, and this should help. The G4UPS/G3CCH tests at 0900 local time, started in November 1992, have produced very consistent results over a 350km path. This has prompted the RSGB Propagation Studies Committee (PSC) to undertake a study of tropo propagation at 50MHz.

Phase 1 is the setting up of a transmitting station at the QTH of Chris Deacon, G4IFX, in Darlington (DHM). He plans to run 50W to two 6-ele Yagis beaming south, thus covering the whole of the Midlands and most of southern England. A beacon licence is being applied for as this will be unattended operation. Obviously a network of listening stations will be essential. Anyone interested in this very worthwhile project should contact Ray Cracknell, G2AHU, for further information and comments. He is QTHR and his telephone number is 01568 780614.

In the August Report there are 50MHz activity reports from SM7AED (JO65 and JO66), SM3EQY (JP81), OZ3ZW (JO45), SV1DH, Z23JO and JA1VOK. British contributors are G2ADR, G2AHU, G2BDV, G3IMW, G4IGO, G4UPS and GM4DGT. Weak auroras were noticed by G4IFX (DHM) on 12 August, 1400-1906 and next day 1702-1707. For details of the Six and Ten Reporting Club contact Ian Brotherton, G2BDV, who is



QTHR. His packet route is G2BDV@GB7BNM.#45.GBR.EU.

## 50MHZ

### NEWS

Ted Collins, G4UPS (DVN), reports a new station QRV from Kazakhstan. UN7AX (ex-UL7AAX) in LN53PN was worked on 9 July by IK1EGC. The QSL address for SV9ANK (KM25NH) is: PO Box 1272, GR-71110 Iraklion, Crete, Greece. YL3AG (KO26AW) has been very active recently and his QRA is PO Box 111, LV-1069 Riga, Latvia. There is some confusion about YL2MB's (KO27) PO Box number which he is trying to resolve. Several Scandinavian operators told Ted that Leif Johansen, LA9ZV, died on 13 August; he was only 49.

### ACTIVITY

Robin Caine, G4IWS (BRK), started taking an interest in 6m and 4m earlier this year. He uses a home-brew transverter and HF225 RX with dipole antenna. At 2130 on 12 September he copied beacon CTOWW for 15-20min as it peaked to S9. Suggesting this is no great achievement, he comments: "...I hear so little activity that I would doubt the performance of my equipment were it not for the ability to resolve beacons." So he asks: "How about some tips on when to listen, and why the experts choose these times?"

This again highlights the 'licensed listener syndrome' - people with the RX tuned to the calling frequency waiting for someone else to call CQ. The problem of how to create VHF activity is a perennial agenda item in VHF Committee meetings but we have been unable to agree on any ideas for promoting it. Unless there is a really good opening, such as multi-hop Es over to North America or the Middle East, it seems that few are interested in coming on.

One suggestion is to try MS which yields good results on 6m using random meteors. This has been demonstrated by the morning skeds between G4UPS and SM7AED at about 0900 local time. Unfortunately the next showers are unfavourable for this path; the Taurids radiant is below the horizon at this time and it's just about the worst time for the Leonids. However, during the Geminids in the 12/13 December period, the geometry is just about ideal for a NE/SW path.

Jon Eastment, GW4LXO (GNS), wrote to update his table scores and mentioned 5T5JC,

JY7SIX and SV9ANK as new countries this year, bringing his tally to 129. On 3 September, YL3AG was a new square. Ron Adam's, GM4ILS (GRN), report covered June and July, so was mostly concerned with Es QSOs. On 2 July at 2350 he worked JX7DFA (IQ50OV) at S9 when beaming south. The true QTE is 355° but he was only S5 on that heading. A few minutes later, G3VMJ (ESX) called Ron, exchanging S9 reports. When GM4ILS turned his beam south, G3VMJ dropped right out. Ron asks: "Could this have been some form of auroral propagation or back scatter?"

G4UPS's report covers the period 20 August through 20 September. Es propagation occurred on 20 August to EH1; 24th to CT1, YU and 9H; 26th to OE2, S5, YU and 9A; 28th to ES, I3, OZ, SM, SP, S5 and YU; 31st to S5, SP, YU with SV9SIX copied for 10min from 1930. On 1 September to I1/2; 2nd to YU; 3rd to OK, OZ, SP, S5, YL, YU and 9A; 8th to DL, ES, SM and SP; 9th to ES, LA, SM and YL, plus CT in the evening; 10th to I3 and I8. Other modes were auroral on the 4 Sept evening and good inter-G tropo on the evening of the 9th.

Most of Ted's September activity occurred in the evenings from 1900, which seems to suggest that's when G4IWS should listen. However, something better than a dipole antenna is required. Even a small HB9CV type, rotatable by hand, could prove quite effective. In case anyone thinks that conditions in September in 1992 and 1993 were better, G4UPS sent copies of his reports. While there was a little

activity from South America in 1992, there were more days when nothing was heard or reported in both years than this September.

## 70MHZ

GW4LXO highlights QSOs with GJ4VXE/P, G4RKV/P (IN79) and crossband to 6m with S53VV. Jon says new stations on are G0PGT and G3JRL, both in the Weymouth area, while GW4NBY (GNM) has recently returned to the band.

## 144MHZ

IAN CORNES, G4OUT (SFD), operated in the 30 August leg of the CW Cumulatives and completed 29 QSOs.

Best DX was GI4OWA (IO64) at 424km. Other QSOs over 300km were with GI4KSO (IO64), EI6GF (IO62), GM0USI/P (IO76), GU4UJS/P (IN89) and GM4GUF (IO85). All G countries were worked except Jersey, but no continentals were heard at all in Stafford. By contrast, conditions were extremely flat in the 14 September session, best DX being GM0USI/P again.

Ela Martyr, G6HKM (ESX), took part in the six-hour section of the contest on 3 September but found conditions poor. Her best DX was about 400km less than in the low power event in July.

On the 18th conditions were quite good to the far north of Scotland and Shetland in the afternoon and evening. Ela started by answering GM8LFB's CQ call, then went on to work GM0ILB (IP90) and GM4IPK (IO99), both in Shetland.

Jim Rabbitts, GM8LFB (HLD), found September dull apart from the lift on the 18th. His best DX was G7RAU (IOW) at 856km. London stations worked were G6XLL, G1NTW/P and G1DMS, plus G4RRA (SRY). He heard GM0BQM (IO85) work into EA but didn't think propagation from Spain would reach as far as Lybster. However, he heard EB1EV/P (IN63LD) calling CQ but Jim's 10W couldn't break through the southern G QRM. The QRB is 1707km.

## 430MHZ UP

G4RGK is still suffering QRM in the 23cm band from the GB3HV TV relay. When he wrote, he was awaiting a visit from members of the Microwave Committee so they could hear the problem for themselves. His 16ft dish for EME is coming along well and probably won't be affected by the TV QRM since it won't be able to 'see' the eastern horizon.

## DEADLINE

THE DEADLINE for January copy is **24 November** and for February, **29 December**, but remember the Christmas post!

## INTERNET/MAILBOX

THE TELEPHONE answering and fax machine is on 0181 763 9457, my CompuServe ID is 70630.603 and the Internet address is 70630.603@compuserve.com.

The BT Gold mailbox is 87:CQQ083.

## ANNUAL VHF/UHF TABLE JANUARY TO DECEMBER 1994

Callsign	50MHz		70MHz		144MHz		430MHz		1.3GHz		Total Points
	Cty	Ctr	Cty	Ctr	Cty	Ctr	Cty	Ctr	Cty	Ctr	
G6HKM	28	52	-	-	67	20	24	6	4	5	206
G1SWH	2	24	22	4	61	18	29	10	2	2	174
G3FIJ	17	16	29	3	53	13	24	7	3	3	168
G0FIG	-	-	-	-	70	28	43	13	8	6	168
G3FDW	30	17	22	3	46	7	24	3	-	-	152
GW6VZW	55	60	-	-	-	-	-	-	-	-	115
G0HIK	1	1	2	1	71	14	16	8	-	-	114
G1AWF	6	11	-	-	74	19	2	2	-	-	114
G8XTJ	15	17	-	-	52	15	-	-	-	-	99
G4MUT	16	9	13	2	27	7	15	3	2	1	95
GW0PZT	-	-	-	-	59	24	-	-	-	-	83
G3UOL	18	4	-	-	47	11	-	-	-	-	80
G4DEZ	3	16	-	-	29	13	5	5	2	2	75
G4OUT	-	-	24	5	32	11	-	-	-	-	72
G1UGH	11	16	-	-	21	10	-	-	-	-	58
GI4OWA	1	15	-	-	26	12	-	-	-	-	54
G4OBK	17	30	-	-	1	1	-	-	-	-	49
GU4HUY	-	-	-	-	38	11	-	-	-	-	49
G3FFK	-	-	-	-	33	9	-	-	-	-	42
G7CLY	9	16	-	-	10	6	-	-	-	-	41
G3YHF	-	-	-	-	-	-	35	5	-	-	40
G6ODT	-	-	-	-	-	-	15	3	-	-	18

British counties are those listed on page 81 in the January 1994 *RadCom*; 77 in all. Up to three different stations allowed in each of the 12 GM regions. Do not include EI counties. Countries are the current DXCC ones plus IT9. Deadline for the January issue is **24 November**.



RADIO

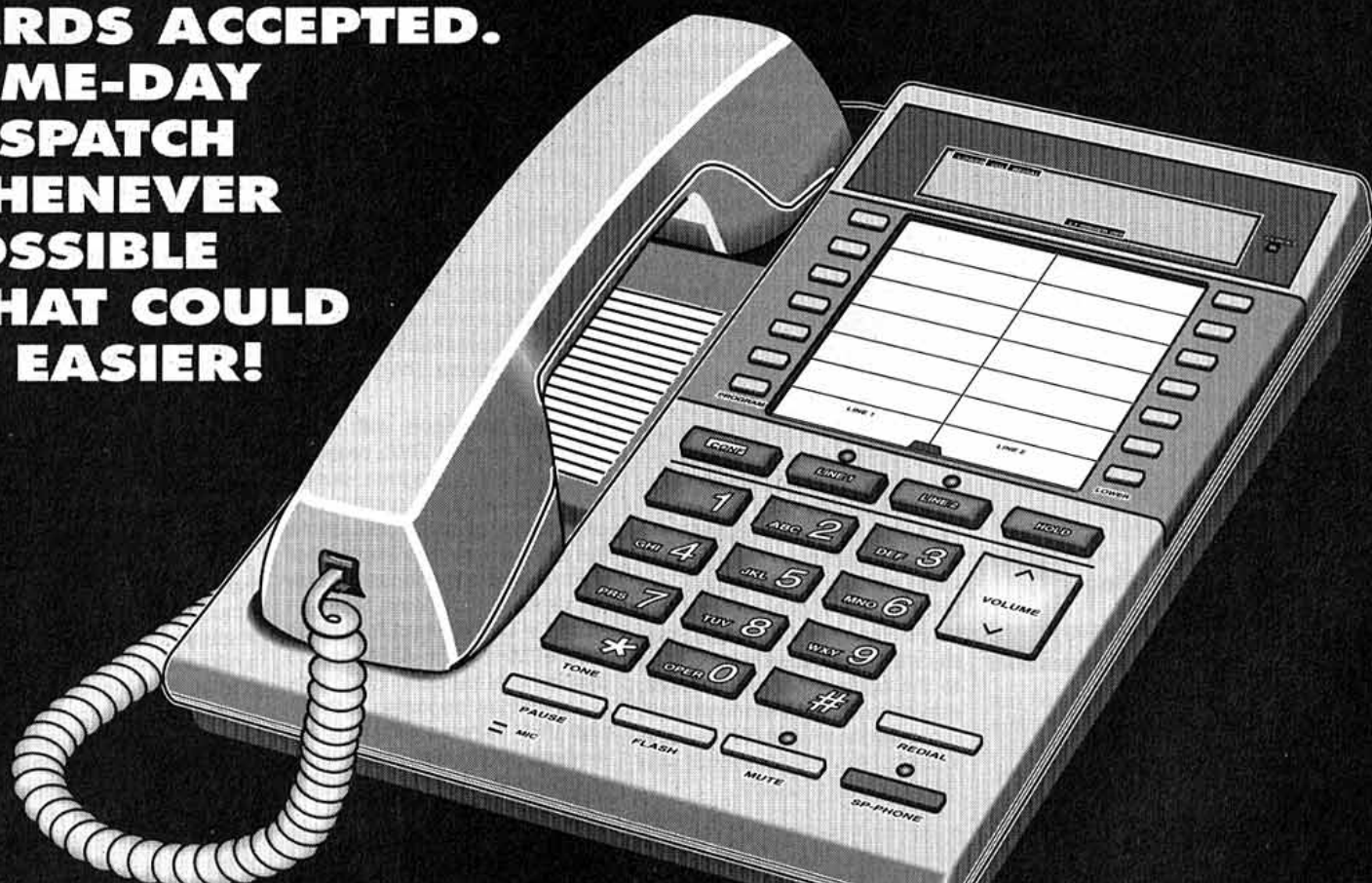
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# SWL NEWS

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

**A**S THIS ISSUE will be hitting doormats late in October, I have one final opportunity to remind you that the SWL Challenge takes place over the weekend of 29/30 October - to coincide with the CQ Worldwide SSB contest. The rules were reproduced on page 24 of last month's issue. I hope to see many entries and look forward to the interesting job of checking the logs.

## DX NEWS

JAN, G0OHV, PROVIDED details of the Whitton ARG DXpedition to The Gambia (C56) between 23 October and 7 November. The special event callsign C56DX has been issued for the CQWW contest, but outside the contest the call will be C56/G0MRF. I am currently trying to arrange to act as SWL QSL Manager.

I have been asked for QSL information for the following stations active in 1980 and 1981 - FO8AK, H44WH, H44BH, H44PT, H44JE, FW8SC, VP8AHS, VK0KH, FO8FW, H44CB, 3D2WR and G3MUV/CE0. Can anyone help?

## LISTENERS' QSLs

THE PHOTOGRAPH is of our long-serving QSL Manager, Dave Borne, G4CYW. As you will see, the 'office' doubles up as the dining room. Dave took over the bureau in 1974 and during the 20 years of his 'reign', he has received envelopes from 1,020 SWLs. Of these only 193 - as far as Dave knows - have gone on to get a G call. At present, there are 177 SWLs using the bureau. He has handled cards for eight listeners for 20 years; they are - BRSs 8841, 25429, 30144, 32525, 33320, 35285, 36554 and 36673. Can 30144, 33320, 35285 and 36673 get in touch with me - I am not aware that they have ever written to SWL NEWS.

Cards are held at the bureau for BRSs 30389, 31976, 87563, 88224, 92631, 92637, 93340, 93731 and 94535, but unfortun-

nately Dave has no envelopes for them. Although some of these listeners have never deposited cards at the bureau, it is suggested that even if only QSLing direct, it does pay to keep an envelope at the bureau marked 'ATC' (as they come) in the top left hand corner. For those who do not know, the SWL QSL bureau address is: Mr D Borne, Roughways, Chub Tor, Yelverton, Devon PL20 6HY.

## JUNE WARC BANDS

YOU WILL RECALL that I suggested an event aimed at increasing SWL awareness of 18 and 24MHz during June. Unfortunately, only two logs (and my own) were received. Conditions were not very good and this may have accounted for the poor entry. Thanks to G6FVH and BRS52543 for their interest. I shall run more such activity periods in 1995 but, for the record, G6FVH heard 57 countries, while BRS52543 heard 53 on 18MHz. Both heard 13 countries on 24MHz, and both attained 14,000 points, with G6FVH scoring 456 more than BRS52543.

## WRARS RESULTS

TWENTY-TWO ENTRIES were received from eight countries. There were five logs from British listeners, and four CW logs (none from G). The event was arranged to gauge band activity and propagation at the bottom of the current sunspot cycle. Conditions were described as 'ordinary', but there was some Sporadic E activity on the higher bands. The White Rose Amateur Radio Society was pleased with the entries to the contest and, as a result, may be making it an annual event. Although there were only five British logs, the overall winner was Arthur Miller, G-5218.



SWL QSL Manager, Dave Borne, G4CYW, sorting out a recent batch of cards.

## SOFTWARE UPDATE

### HOME BREW

THE 'HOME BREW' section of *Software Update* in September's column certainly provoked much interest. My thanks to BRS93127, G3DVL, G13EVU, G3MPO, G3SZS, G4CLF, G4EQC, GM4FGS, G4GLM, G4RGA (ex-BRS30694), G17SEI, G8DHU and G8WRB who each provided helpful comments about Mick Toms's, BRS31976, problems of converting a Spectrum program to a PC due to the lack of an ARC Cosine function in Microsoft QBASIC. It seems that this need not be a serious problem as ARC Cosine can be calculated by use of a square root and ARC tangent functions. Both are provided in QBASIC as the Sqr (square root) and the ATN (ARC tangent). Some wonderful formulae were provided which proved that others were more into maths than I am! All letters have been forwarded to Mick and I await his comments with interest.

### EASISWL

This program, outlined in my September column, is now available to listeners. As far as I know, it is the only commercially available general purpose SWL logging program.

I have arranged with Don, G0MDO, that any SWL ordering a copy of the program during November need only pay the special introductory price of £4. Since the comments in the September column, and in response to comments from Mick Toms, Don has added a DXCC chart for bands from 50MHz up to 432MHz. So this general purpose SWL program will now appeal to both HF and VHF listeners. To take advantage of this offer, please write to Don Ward, G0MDO, at 9 Little

Lane, East Morton, Keighley, West Yorkshire BD20 5UQ enclosing your cheque/postal order for £4 plus return postage. At such a reasonable price, it makes sense to order your copy now.

## SUPER-DUPER

PAUL, EI5DI, HAS confirmed that due to pressure of work he is unable to amend SDL - the listener equivalent of Super-Duper - to provide listeners with logging facilities in all RSGB and most international contests. However, version 6.02 which was current for this year's IOTA contest is available free to any SWL who sends Paul a blank formatted 3.5" disk, two IRCs (UK stamps are no good for postage from Ireland) and an SAE. Paul will update SDL ready for the 1995 IOTA contest in due course.

## 4S7 QSLs

I AM STILL receiving cards for the 4S0DX expedition in October 1992. The latest batch had been passed to me by David, G0MRF, in late March. No doubt SWL cards will continue to be received for a number of months yet. If any SWL looks through his logs and finds that he still needs a card from 4S7, I still have a small supply left.

Two of the Whitton ARC members intend a further DXpedition this October. Look through your records now to see if you need a QSL from D44 - their intended destination. I may be handling the SWL QSLs for that trip, too, but more information later.

G0MRF and G0ONA operated from C56 in December. One amusing story with two valuable lessons was that in trying to fulfil a 'sked' on 14MHz, a UK station offered to telephone their friend to get him on to 14MHz. The telephone number was passed over the air and while the ensuing QSO was taking place, eleven people called the number and spoke to the English station's XYL!

The lessons? Do not give out telephone numbers over the air and never assume that a frequency is as unoccupied as it may appear. There is always someone listening!

## FINALE

NEXT MONTH'S column will include details of how to build a receive packet interface, details of a new award for listeners hearing international beacons in 1995, and rules for the White Rose ARS LF contest. The deadline for January is 20 November.





## Contest Exchange

ANDY COOK, G4PIQ

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**I**N THE PAST, I have mused over the question of what is the real difference in effectiveness between multi-operator and single-operator stations. After all, 24 hours is not a real challenge for one person to stay alert for (given enough sleep before the contest and caffeine and adrenalin during the event), and even though 48 hours is more difficult, it is still achievable if you are properly prepared. Computers make it possible for one person to handle all the operating and logging, and setting up the equipment can simply be spread out over a longer period if there is just you to do it.

However, I think that the 2m trophy in September reminded me very effectively of where the big difference lies - it's when something goes wrong! If you are single operator, there is only you to sort it out while, if you are a multi-op, you can often take the broken piece of equipment out of line and have one person carry on operating, albeit at reduced effectiveness, while someone else gets their head inside the smoking beast!

As usual, I entered the single operator section of this September contest and, after losing five hours of prime operating time (these things never happen overnight - always at the busy times!) through three linear amplifier failures, one rig failure and a 25ft stub mast in the tower bent over at 30° three hours before the start, I've decided I need to take a closer look at some aspects of my station and to plan my preparation time better!

### IOTA CONTEST

THE SECOND IOTA contest ran back in July this year and once again attracted a lot of interest. The HFCC are just about to begin reviewing the rules for the 1995 event and are looking for input from you to help them. There were some significant changes made this year, such as the addition of CW, but not all seem to have attracted as much interest as had been hoped. There is also the perennial issue of there being very many stations on the air who

amassed quite respectable scores, but who did not submit entries - what do we need to do to encourage you to enter? The paperwork really is very much less difficult and time consuming these days, with logging software available (free for the IOTA event), and old but usable XT PCs available for very little money. Any comments which you can contribute to this debate should be aimed at the HFCC Chairman, Chris Burbanks, G3SJJ, or any member of the committee.

### WRTC

BACK IN 1990, the first World RadioSport Team Championship was held. This was an event run in Seattle, USA in which 22 teams of two people from different countries competed from nominally 'equal' stations in a special contest. Dave, G4BUO, and Steve, G3YDV, represented the UK and achieved an excellent seventh place from a somewhat less than equal station! Being the first event of its kind in the west, the 1990 event identified a number of difficulties, such as there being no way to make stations separated by several tens of miles truly equal. However, the lessons learnt during that event are being used to set the rules for a second WRTC to be held around Washington DC during the 1995 IARU RadioSport contest.

The exact rules and selection procedures for the teams are still being determined - there is some debate as to whether the teams will be national, or multi-national across the IARU region (in the case of the UK, including France, Belgium and the Netherlands), and it is still unclear whether selection will be carried out by national societies, or from a ratings system based on the operators' performances in previous contests. Hopefully all will become clear soon, since the closing date for entries is expected to be the

end of February, and I hope to be able to bring you more information next month. But, if you are a hot SSB and CW operator, why not think about whether you can manage a trip (which you will have to fund, unfortunately!) to DC in July.

### VHF SOFTWARE

LAST MONTH I looked at what the main options were for logging in HF contests, and this month is the turn of the upper part of the spectrum. However, before moving onto exclusively VHF matters, I should say that I've received V6.04 of the Super Duper set of programs, and these now properly support operation inside a DOS window in Microsoft Windows which I said last month was not guaranteed in earlier releases.

The two main options for VHF contests are - LOG by G3WGV which was mentioned last month, and SDV by EI5DI, which is the VHF variant of Paul's Super Duper HF contest logging program. Both programs behave in much the same way as they do at HF, but EI5DI's is easier to use, with LOG having a few more features - the automatic display of bearing and distance in LOG is particularly useful with the narrow antenna systems in use at VHF/UHF.

Some VHF contests now use a multiplier scheme which consists of locator squares, counties and countries, and the new version of SDV has the option to cope with all of these variants while LOG is only able to cope with county and country multipliers. This means that with LOG, for those contests which use them as multipliers, you cannot keep track of the locators worked during the event. After the event you will have to edit the LOG file to show these additional multipliers. Some of the VHF contests which are co-ordinated with Europe (the 2m Trophy and the 70cm section of the October UHF event) require

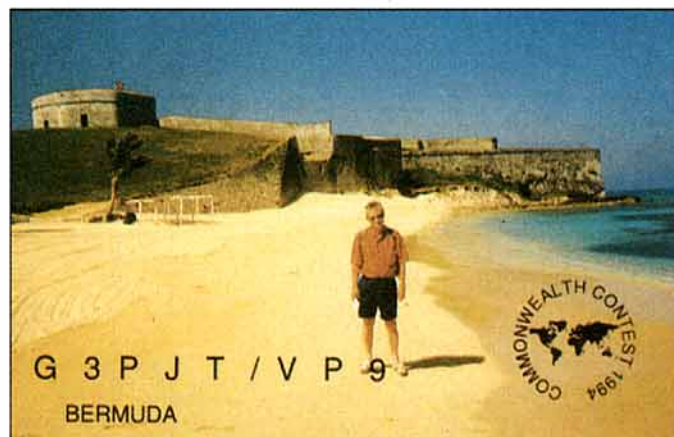
scoring in both radial rings and at 1 pt/km if you are going to enter both the IARU event and the RSGB one. SDV supports this well, with both kilometres and radial rings on the log, but LOG either requires two sets of logs to be printed out, or I use a BASIC program to write a km score into the comments field of each contact.

Unlike the HF Contests Committee, the VHF Contest Committee still requires a paper copy of logs along with any disk submission. Within this paperwork there needs to be included a summary list of multipliers worked (see November 1993 *Contest Exchange*). LOG automatically creates such a list (although excluding locators), while you will have to do this manually with the present release of SDV. If you have a large log of which has to be done by hand, this can be a bit arduous. However, my solution would be to use a spreadsheet/database program such as Microsoft Excel to make light work of the job - another alternative would be to write a BASIC or other language program to do the job.

### NOVEMBER

BY THIS TIME of year we are well embroiled in the contest season. There are two RSGB HF events - both on 160m. The first is the Club Calls contest which is a 4-hour mixed-mode event, but with a lot of SSB activity, and with a scoring system aimed at encouraging club stations and callsigns onto the band. This is a great opportunity to give Class B operators exposure to HF, and many clubs get several stations on the band. One week later is the 2nd 1.8MHz CW contest - this will run in the same four-hour format as in previous years in spite of the longer pan-European event surrounding it, and feedback from this year's contestants will be used to shape the rules for 1995. Finally on HF is the big CW contest of the year - CQWW on the last weekend of the month. Again, a superb opportunity to work DX even if you are just using a transmitter powered by a lemon juice battery with a piece of wet sea-weed as an antenna.

At VHF, the Cumulatives Season is in full swing with 2m, 70cm, 23cm and 13cm events all during the month, and also at the start of the month is the IARU Region 1 Marconi CW contest on 144MHz. There is not only the full 24-hour section, but also 6-hour sections on the Sunday for those with less spare time.



Bob Whelan, G3PJT, in the 1994 Commonwealth Contest.



# HF F-LAYER PROPAGATION PREDICTIONS FOR NOVEMBER 1994

The time is represented vertically at two-hour intervals UTC 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 .....1111122 .2468.2468.2	24MHz .....1111122 .2468.2468.2	21MHz .....1111122 .2468.2468.2	18MHz .....1111122 .2468.2468.2	14MHz .....1111122 .2468.2468.2	10MHz .....1111122 .2468.2468.2	7MHz .....1111122 .2468.2468.2	3.5MHz .....1111122 .2468.2468.2
** EUROPE								
MOSCOW	..22.	..2442	..5775	..7888	..3888	22.766678522	885543346888	++42...3+++
MALTA	..1211	..2433	..5763	..8888	..3888	452765568842	998643346898	+++3...3+++
GIBRALTAR	.....	..221	..15543	..4777	..8888	131376667841	898854335897	++++2...25++
ICELAND	.....	..11	..1431	..4763	..2888	..7777872	562165456885	++++32.245++
** ASIA								
OSAKA	.....	.....	..2	..5	..7311	..25433421	..131124662	.....45
HONGKONG	..12.	..34	..672	..1785	..2666	..133344311	..11124775	.....24+3
BANGKOK	..232	..465	..1787	..2788	..2566	..23346421	..1124776	.....4+4
SINGAPORE	..333	..5552	..17875	..26887	..24667	..13347422	..1124776	.....4+3
NEW DELHI	..332	..554	..17771	..36873	..34666	321113345323	73...124788	4...4++
TEHERAN	..3331	..5553	..37776	..57787	..54567	643312347534	873...124788	+4...4++
COLOMBO	..3331	..5553	..26776	..35788	..22567	22...2347534	51...124788	2...4++
BAHRAIN	..4331	..16553	..37776	..56888	1..5336761	7532.1347645	972...114788	+4...4++
CYPRUS	..4543	..77661	..38884	..68889	221766788411	886543457866	996311135899	+43...25++
ADEN	..4333	..16555	..36678	..55578	2.14225783	8231..246866	962...14788	+4...4++
** OCEANIA								
SUVA/S	.....	.....	..21	..243	..1566	..543463	..311242	.....
SUVA/L	..1	..21	..542	..7642	121376543631	..255333552	..221.132	.....
WELLINGTON/S	.....	..1	..231	..2553	..5666	..643561	..1311242	.....
WELLINGTON/L	.....	.....	..1	..31	..12164111531	..235323542	..121.132	.....
SYDNEY/S	..121	..3431	..7763	..18876	..376674	..2533463	..2112461	.....23
SYDNEY/L	.....	.....	..11	..241	..6632.34	..153334741	..31.1351	.....2
PERTH	..343	..5652	..27875	..47887	..35667	1..23347532	..1124762	.....44
HONOLULU	.....	.....	.....	.....	..1.32	..3232641	..12.311241	.....24
** AFRICA								
SEYCHELLES	..2333	..14556	..36678	..45578	2..22257831	732...246866	84...14789	+...4++
MAURITIUS	..4434	..16666	..26678	..45578	22.222568411	752...246866	73...14789	4...4++
NAIROBI	..54451	..66673	..27686	..45568	22.422368511	8731...36877	972...14788	+4...4++
HARARE	..23562	..35684	..15678	..35557	241422258732	8832...26888	972...3789	+4...4++
CAPETOWN	..2564	..24786	..46788	..25568	331432246843	8842...13788	873...1588	+4...25+
LAGOS	..46675	..67787	..87782	1.17556851	35.552236853	89652...13798	8883...1588	5+5...2++
ASCENSION IS	..25446	..47667	..77668	1..76557	253163224763	89853...1488	88851...269	+++2...4+
DAKAR	..16656	..37777	..68778	..77557	244174225763	789651...2588	88862...279	55+3...4+
LAS PALMAS	..4444	..27666	..58882	..78888	132187667841	788774435797	999842112589	+++5...2++
** S. AMERICA								
StH SHETLAND	.....1122	.....12345	..45667	..67766	143176544532	567553211234	345421...1	..22
FALKLAND Is	..2245	..43671	..37673	..58666	134.76433332	6885531...124	577631...2	2443
R DE JANEIRO	..2112	..42241	..75464	133.66322442	133.66322442	789553...146	98973...15	+++4...2
BUENOS AIRES	..1114	..33361	..26563	..57655	123.76422331	6884531...24	789731...3	4++4
LIMA	..333	..6551	..8663	..16322	..1.163222	4561133...13	6886311...1	3++4
BOGOTA	..332	..5541	..8663	..86541	..1363223	3451443...23	7876311...3	5+54
** N. AMERICA								
BARBADOS	..333	..16551	..38663	..67555	..1.1652234	4561442...135	887631...15	++54...2
JAMAICA	..122	..3441	..6663	..76541	.....164223	333.4331...23	7874311...3	5+54
BERMUDA	..122	..3441	..6763	..27765	.....565454	333.34321244	8884311...16	+++4...3
NEW YORK	..21	..143	..3662	..6774	.....266553	221.13332343	7773311...15	+++4...2
MEXICO	..21	..43	..752	..863	.....36421	121.41341.11	4773311...1	+++4
MONTREAL	..11	..133	..3662	..5774	.....266663	221.13333343	7772311...125	+++4...2
DENVER	.....	..2	..141	..363	.....6642	12...1.143221	4761311...1	2++4
LOS ANGELES	.....	..1	..3	..62	.....3641	11...2.44211	2651311...1	4+4
VANCOUVER	.....	.....	.....	..11	.....541	11...35421	36513113111	4+4
FAIRBANKS	.....	.....	.....	.....	.....22	11...33236531	342.31124322	..234

The provisional mean sunspot number for September 1994 issued by the Sunspot Data Centre, Brussels was 26.7. The maximum daily sunspot number was 65 on 5 September and the minimum was 8 on 15, 16 September. The predicted smoothed sunspot numbers for November, December and January are respectively: (classical method) 23, 22, 21 ( $\pm 5$ ); (SIDC adjusted values) 17, 15 and 13 ( $\pm 4$ ).





**JOHN HALL, G3KVA**  
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**S** SEVERAL LETTERS have been received about charging free-oaders for the incoming QSL service and I am grateful for all your comments. There are some strong feelings on the subject and it would be remiss of me to ignore them. It is equally clear that any system will depend on the cooperation of the Sub Managers and their ability to know who the non-members are. Once the newly commissioned HQ computer is up and running in the New Year I will ask two or three willing Sub Managers to run a trial system before committing the Society to something that might turn out to be time consuming and ineffective. Like decorating, it's all in the preparation!

## QSL CARDS

ROGER PIPER, G3MEH, is currently collecting QSL cards towards obtaining senior transmitting awards on 70cm and 23cm. As most readers will know, these awards are largely based on confirmed contacts with UK Counties. Roger says he is finding it increasingly apparent that many UK QSL cards omit the county details - presumably because the county is now no longer essential thanks to postal codes. Roger makes the plea that county information, together with the locator and WAB information, is shown on the QSL card somewhere. QSL card printers please note.

D W Mephram, G4ERA, says that he feels the printers of QSL cards should mark examples of their work they send to potential customers with the word 'sample' or some other method to show they are not for use by others. The reason he feels strongly about this is because he has been a victim of the omission and he's not very happy about it. I can quite understand why.

## QSL MANAGERS

I WROTE RECENTLY about the growing habit among the newly licensed of writing the QSL Sub Manager's callsign on the QSL card and the havoc that creates with the sorters. I now realise what led to that silliness. In the QSL notes for guidance I had naively included a note to the effect that it was important to show the call of any 'QSL Manager' when routing a card. Of course, old hands will know the difference between a QSL Manager and a QSL Sub Manager. It is painfully apparent that some people are still getting confused and, for those that don't appreciate the distinction, let me explain.

**QSL Manager:** This is someone who acts on behalf of another amateur who is more than likely using a DX call. The manager undertakes to receive all incoming cards for the call and to send out cards on his behalf. That leaves the DXer free to just 'work em' and forget about the admin side of the operation. He will supply logsheets to his QSL Manager at frequent intervals in order that the latter can check the QSOs. It follows that it is *most* important for the QSL Manager's call to be shown on the QSL card with the words 'via' in front of it because very often the Central QSL Bureau has no idea who has been asked to carry out the task. It could, for instance, be a G call acting on behalf of an American

ham who is operating in the South Pacific. It is common for a QSL Manager to act for a number of separate DX calls.

**QSL Sub-Manager:** This is quite a different person and is responsible for sub-sorting all the incoming cards relative to the call series for which he or she is responsible and which have been forwarded on by the central bureau. It only confuses matters if that person's call is put on the cards because the Central Bureau know exactly who they are because they appointed them! Sorry if it all sounds a little confusing but I didn't invent the terms. What I have done is remove the reference to QSL Managers from the notes for guidance on the assumption that the people who take advantage of the valuable service they provide will know exactly what their function is!

## AWARDS

LEN CUTTING, G3KAA, has sent some photographs of interesting certificates. He has the Commonwealth DX Award, the Worked All Pacific and is on the DXCC Honor Roll. All, he says, with 100W and a G5RV; no linears, no beams, no bells and whistles!

The first of Len's photographs is the Arabian Knights Award personally signed by HM King Hussein, JY1. Len says the certificate measures about 20 x 17 inches which I reckon is about flying carpet size! One can still get the award by working at least 10 Arab countries and one contact must be with either JY1 or JY2. It costs 10 IRCs from PO



The very collectable Helvetia Award.

Box 1055, Amman, Jordan.

Another one signed by JY1 is the Royal Jordanian Silver Award and this one is still available for working six different JY stations.

Shown above is the Helvetia Award. You have to work all 26 Swiss cantons and half cantons for this. Beautifully produced certificate is of a standard similar to many HB QSL cards we see going through the Bureau.

Fred Handscombe, G4BWP, the RSGB HF Awards Manager, writes about a number of points. Fred says that when applying for an award make sure that you are in possession of the current rules and correct details of the awards manager! Awards books go out of date quickly but the best I know of is the *K1BV DX Awards Directory* which is updated annually and contains details of over 2200 Amateur Radio Awards from 124 DXCC Countries.

Fred goes on to say that delay in receiving awards from overseas is commonplace. For instance, the ZB2 award takes ages to arrive. If you have applied for one of these don't expect it for at least a year. That's my experience anyway. I have no idea why that is, but perhaps a ZB2 reader can enlighten us all.

Fred then makes the general point that awards managers are all volunteers. They put in many hours organising and administering their particular area of responsibility, and receive telephone calls at all hours - sometimes at work. I know of one such volunteer who works in excess of 40 hours a week dealing with awards. All they ask for is a little understanding from the 'punters'. That doesn't seem unreasonable.

While idly listening out on 20 metres (the CW bit of course) the other day I came across my pet hate - that of calling CQ incessantly without a callsign. This particular character got up to 22 consecutive CQ's without identifying himself until I got totally bored and moved on. I still don't know who it was. Why do some people do that?



The Arabian Knight Award achieved by working 10 Arab countries, one of which is JY1 or JY2.



The Royal Jordanian Silver Award achieved by working six JY stations.



# NOVICE NEWS

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Four 'Boy Scouts of America Belts', which are rarely awarded in the UK, were presented to British youngsters - three Scout Novices and one SWL. Denys, GD4OEL, visited Milton Keynes to hand over on behalf of the America Scouts and was most impressed with the youngsters he met. The awards are very highly prized and are not easy to earn, so I offer this column's congratulations to the recipients.

They were awarded for outstanding effort. Amy, 2E1BJM; Ben, 2E1BJN and Colin, 2E1DAK, received their belts for achieving their Novice licences, for their efforts to keep GOSMK (Milton Keynes District Campsite) on the air, helping with the badge courses for the Communicator and Computer Badges for that group and working for their own Scout troops as well. The SWL, Ricky, was chosen for his continued service in Cubs and Scouts, helping to run the Cub pack and, at thirteen, being the senior patrol leader of Saffron Scouts. He works in the Scout allotment and has been chosen to represent Milton Keynes at the World Scout Jamboree in Holland in 1995, for which he is busy trying to raise £900 for his expenses. He is not yet licensed - but I hope he finds time among his other activities to take the plunge, he is keen to try.

The belts were sent to Denys by Alan Schwartz, KA1CFA, who is an amateur radio operator for the American Scout movement and presented by John Salmon, the Chairman of Milton Keynes Scout Amateur Radio Group.

## AS PROMISED

ANDREW, G7MXS, PROMISED a radio to all the members of his family who passed the June NRAE. That has cost him three Kenwood TH42E transceivers. Mum - Gillian - Christopher and Kimberley all sat and passed the exam along with James, a friend of Christopher's. James gets a handheld radio from his dad Martyn, G7RRT. Now for the information that makes this item very special for me.

At a local rally where I was 'on duty', the family came to have a word with me clutching their copy of *Revision Questions for the Novice RAE*. They were a little concerned that the questions may be too difficult for Kimberley to understand as she is very young - nine years old. I asked Kimberley to tell me the results of their NRAE when they got them. She kept her promise and, not only told me of the 100% success, but added her praise for Instructors Tony, G1TKX, and Bill, G1YED, saying how patient they had been in their explanations.

She added that she hoped that reading of her success will encourage other youngsters to follow her example and take the Novice course and exam - saying "It's never too young to learn about amateur radio". Words of wisdom indeed.

Four family members - four amateurs. If you live near Sheffield listen for: Gillian, 2E1DGP; Chris, 2E1DFU and Kimberley, 2E1DFV. As well as Martyn, G7RRT, of course.

## DETERMINATION

GRANDAD AND GRANDSON (Jack and Justin) enrolled on a Novice course at FRARS (Flight Refueling Amateur Radio Society) in 1990. Jack had already started an RAE course but was playing safe by having two strings to his bow. Halfway through the Novice course, he took and passed the RAE gaining the callsign G7JTU, but continued to attend with Justin.

Both passed the NRAE in September '91 with Justin becoming 2E1AGI and Jack becoming 2E1AGU, although he was more inclined to use the G7 callsign, with a VK station as one of his first six metre contacts. They both agreed that the next step was to

pass the Morse test - which gave them consecutive callsigns. 2E0ABR for Jack and 2E0ABS for Justin. Justin used it on the air and found it very satisfying but Jack did not - preferring to use his voice. A test at 12WPM was the next aim - Justin passed at his second attempt which led to a curious situation. Justin was a Class A Novice licence holder - with a Morse pass at 12WPM and Grandad was a G7 trying to obtain a 12WPM pass. However, the intrepid pair were undeterred.

At his first RAE attempt, Justin was successful in passing the second paper while Jack was once more attempting - but not passing - the Morse test. One more try later for both and success was assured. Jack is now G0SRX and Justin is G0VBV.

I think the pair showed remarkable determination and deserve their success - I am sure that the pleasure they will now gain makes their effort worthwhile. I also thank Justin for his willingness to share the story - which has shown that if you want something badly enough, and are prepared to work hard, there is nothing that is impossible. It is not easy to admit to failures the way Justin did and I hope that others reading this use him as an example. It took four years to achieve their goal, but I am sure that neither of them consider the time wasted!

## A LINK WITH HOME

I AM ALWAYS pleased when one item of news generates another. Such was the case when the report on Mike, GM6TAN, (Novice QSL Bureau Manager) appeared.

Mike trained a group of Novices who took the exam last December. Three passed, one of whom was Keith, now 2M0ACT. Keith is twelve and took the 12WPM test. He can be found

most evenings calling CQ on 3.570MHz and, although he has made contacts throughout Europe on the Novice frequencies, he has only found one other Novice, 2E0ABI, so far.

However, Banff and District ARC meets on alternate Fridays at Banff Castle and is running a fully attended Novice class there. Members will be happy to give more information to anyone in the area. The course is being directed by George, GM3GG, who has a great deal to offer the newcomer to the hobby. I have George's permission to tell you that he is a white-stick operator - which proves that disability is no barrier to helping others.

This information comes from Stuart, GM0CAQ, who as Keith's dad, has found an extra bonus in having a licensed son. A QRP enthusiast, Stuart can keep in touch with home from his place of work - an oil production platform east of the Shetlands.

## URGENT

SUE IS DESPERATE - can you help? She is a teacher at Lyndhurst Middle School in Borehamwood, Hertfordshire, and has a group of fifteen eager youngsters, aged between nine and fourteen, who would dearly like to join the amateur throng but cannot find anyone to run a Novice training course.

She is not licensed although her father was, holding the callsign G3LCM, but intends to join the first class to gain her own callsign.

There is a possibility that a course for the youngsters would be followed by a later class for parents, who have also shown interest. Class times will be arranged to accommodate everyone. If you think you would like to help - and more than one pair of hands will be needed - please contact Sue Curllis on 081 953 7748.

## AND FINALLY...

PLEASE KEEP the news coming. Apart from the pleasure I get from receiving your letters, this is your column and can only be filled with your help. If you have written to me in the past and your item has not been included, it may be that space was not available.

As with other columns, news sometimes goes out of date before it can appear - there are other pressures on space. But if you have something which could be of special interest to others, please write again and I'll do what I can.



Members of the Milton Keynes Scout Amateur Radio Group. Clockwise from left: Amy, 2E1BJM; Eric, 2E1CKQ; Ben, 2E1BJN; Mike, G0RXJ; Ricky, SWL; Colin, 2E1CLH; John Salmon; Phil, G0EYZ.



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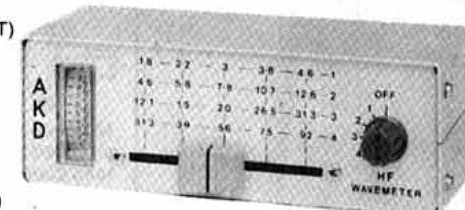
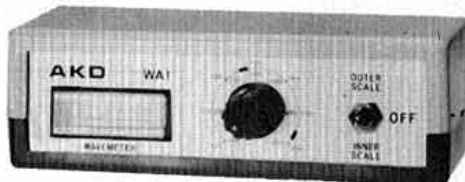
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73 from Dave G4KQH, Technical Manager.



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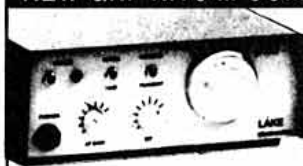


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# Novice Note Book

IAN KEYSER, G3ROO

Rosemount, Church Whitfield, Dover,  
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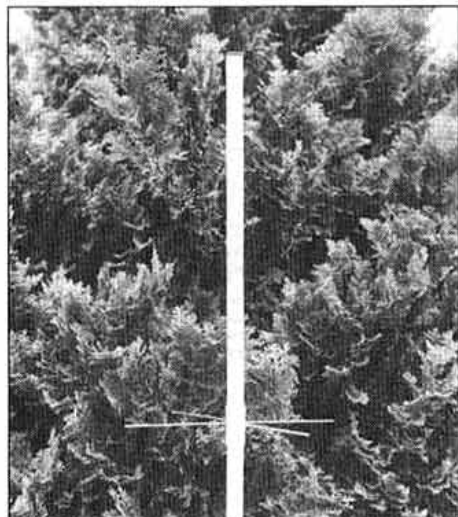
**N**OW THAT MARGARET my wife has obtained her Novice Licence (2E1DFH) serious consideration was given to getting onto 70cm from the house. It was decided that another handheld to complement my old KT44 would be the ideal solution.

The problem was what antenna to use? I tried building a Slim Jim, but did not like it because of the unbalanced feed point; I then converted it to a J-pole which seemed to work well until I knocked together a simple ground plane antenna. I realised that the construction was far more simple and there seemed to be little difference between the two. After further thought on the subject I realised that it would be nice to have some gain to overcome the losses in the feeder. After all, at these exalted frequencies, the like of which I have not known for many a year, even short lengths of very good feeder can have high losses.

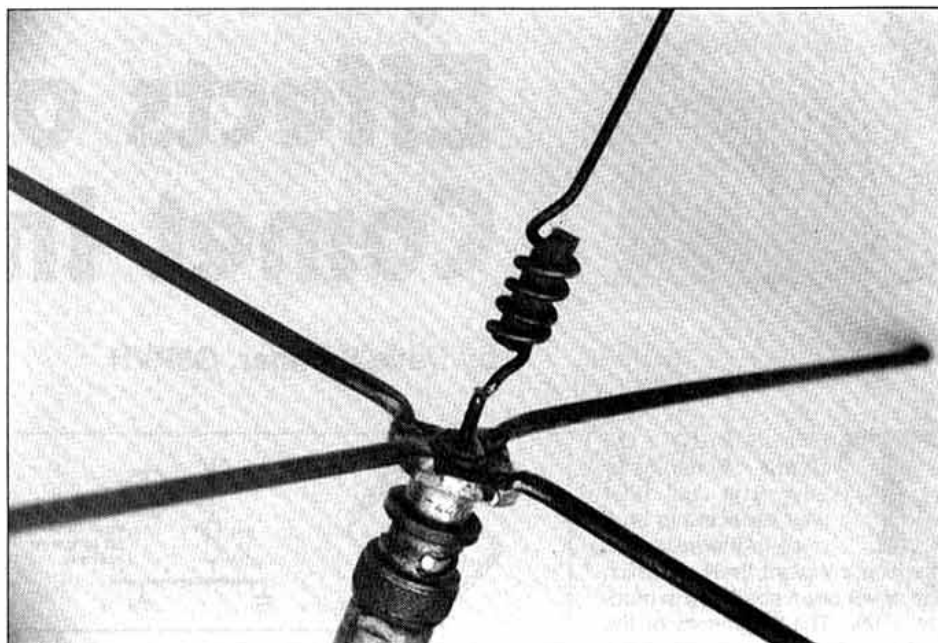
## A 5/8 $\lambda$ VERTICAL ANTENNA

A 5/8-WAVE ANTENNA with a base loading coil to make it look like a 3/4 wave to the feeder might be the answer. I used a length of 1.5mm welding rod, marked off a little over 5/8 wavelength and then wound five turns on a 4mm drill shank. The end was then filed down to a tapered point and this was soldered into the centre conductor of a BNC socket (I always use BNC sockets with PTFE insulation as I always manage to damage the insulation of the cheaper sockets).

The coil in the base made the antenna very 'whippy'; this was overcome by cutting a short length of plastic knitting needle, 5mm in diameter, and forcing it into the coil. The structure is shown in Fig 1. Four lengths of 3mm welding rod had already been cut, bent and



The completed antenna in its plastic tube.



The 70cm, 5/8-wavelength, vertical antenna showing construction details.

soldered into the four mounting holes of the socket and then cut to length to form a radial system when I was experimenting with the 1/4-wave ground plane.

On testing, the standing wave ratio was found to be 1.6:1, which was very good as I had only guessed the base coil! I then trimmed off 3mm at a time from the tip of the aerial until the SWR dropped to 1:1.

I had already cannibalised the ground plain antenna to make this 5/8-wave version and so could not do comparative tests, but I still had the J-pole complete. Against this there was a distinct advantage when using the 5/8 wave antenna.

The next job was to make the structure waterproof. For this I used 22mm PVC waste water pipe of the 'weldable' variety, which is easily available at plumbers' merchants, and can usually be purchased by the metre. A coupler was slotted to take the radials, and the BNC socket filed as required so that it would slide down the inside of the coupler, with the radials poking out of the slots.

A length of tubing was cut 30mm longer than the antenna and this was pushed into the plastic tube coupler. A plastic bung was used to close up and waterproof the top end; a plastic screw-top may be used instead. Plastic welding solution was then applied to the joins and the antenna was then finally sealed in the plastic tubing and allowed to set. A hint at this point is that as the coupler has been slotted to accept the radials, it is worthwhile taping this weakened joint firmly with PVC tape until the welding solution sets.

So that the antenna can be erected I used an off cut of tube pushed into the bottom end of the coupler and held with a self tapping screw. This made an ideal mount and my new 70cm antenna was then positioned above my TV aerial using nylon cable ties to hold it in place.

## HINT FOR THE MONTH

PLASTIC KNITTING NEEDLES can be used in various ways such as coil formers, stand-off insulators under PCBs and spreaders in a home-made twin feeder.

## COMPONENTS LIST

- 1 four-hole mounting BNC socket
- 1m length of 3mm brazing rod
- 1m length of 1.5mm brazing rod
- 1m length of 22mm waste water pipe
- 1 22m Straight coupler
- Plastic welding solution
- Brazing rod (may be available from a small local garage)

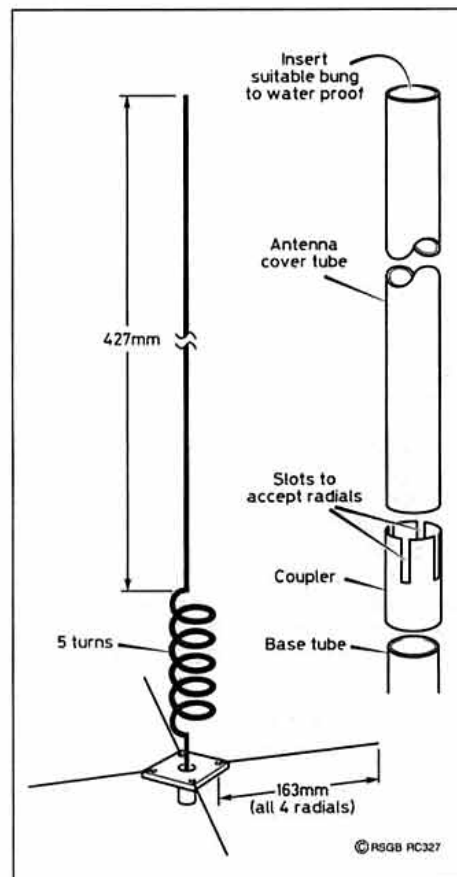


Fig 1: Construction of the 70cm vertical antenna.



# Radio Effects of Comet Impact

by Dave Sumner, G3PVB

**T**HE IMPACT OF Comet Shoemaker-Levy 9 in July 1994 was expected to be a once-in-the-millennium astronomical event, the like of which had never been observed in modern times. The fragments of the comet, in the order of 1km across, would collide with Jupiter at extremely high velocity, 200,000km/hr, causing the explosive release of energy, equating to millions of Megatons of TNT [1].

Published computer simulations [2] of the impact showed the ejection of a plume of material to an altitude of 200km, followed by the outward spread of shock-waves in the planet's atmosphere. However, no-one knew exactly what would happen, and the radio effects in particular were a matter of conjecture.

In view of the very large energy which would be released it seemed possible that radio effects might be observed and I therefore decided to take measurements during the impacts.

## RADIO EMISSIONS FROM JUPITER

RADIO EMISSION WAS OBSERVED in the VHF range and also in the 20 to 30MHz region, the latter being intense and variable and influenced by the satellite Io. This was the range chosen for radio noise measurements, and a frequency of 20.995MHz was used for most of the time as a result of equipment availability and avoidance of terrestrial interference.

In addition to noise measurements a last-minute decision was made to monitor D-layer ionisation by measuring the strength of distant LF and VLF transmitters. This technique has been used by others to observe solar flares and is very sensitive [3]. It was speculated that X-ray or UV radiation from the impacts could influence the D-layer, and the measurements were simple to make.

## 21MHZ NOISE MEASUREMENTS

THE ELEVATION ANGLE of Jupiter would be 25 degrees for the first and several later impacts and the antenna was placed at about half a wavelength above ground to obtain maximum ground reflection gain at this angle.

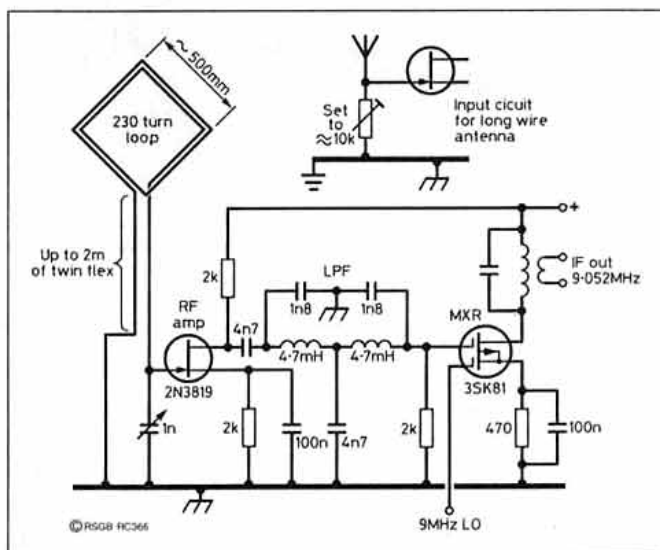


Fig 1: VLF receiver front end

To reduce local interference, a parasitic director was employed, although this would not improve the gain towards Jupiter as it reduces the ground reflection. Due to local environmental considerations it was not possible to use full size half-wave elements and therefore the two antenna elements were helically wound using a four-star winding to reduce skin effect. It was calculated that the gain reduction caused by the size reduction would be 1dB.

The receiver was a KW2000 transceiver and the input could be switched to the antenna or a zener diode noise source for calibration. It was found that the antenna noise temperature was well above the receiver noise floor and it was also possible to observe the noise from a 50Ω resistor when

heated by a soldering iron when using a sensitive audio detector. Whilst a Dicke, or other type of switching arrangement, was considered, the noise being observed was great enough to make it unnecessary. The main interest was in short term effects not requiring exceptional hour-long gain stability.

The audio output of the receiver was detected by a diode working into a low impedance obtained by using an Op-Amp as a current-to-voltage converter. In this way the diode was operated as a square law detector, giving an output proportional to power, irrespective of waveform. The diode was used with a resistive load rather than a capacitive load to obtain mean rather than peak reading. This ensures that the output corresponds

to power irrespective of the waveform of the applied noise, which could be important if spikes due to static are prevalent. The output of the current-to-voltage converter was applied to a CR combination having a charge and discharge time constant of about 10 seconds. The long time constant was particularly useful in avoiding a large response to single spikes of noise, which a peak reading instrument would have fully responded to. It was intended to use the indicating meter with a suppressed zero to expand the readings, but experience showed that the natural noise fluctuations were easily seen without this.

In the case of a square law detector, the detection sensitivity is increased by using the long time constant by a factor equal to the ratio of the receiver noise bandwidth and the

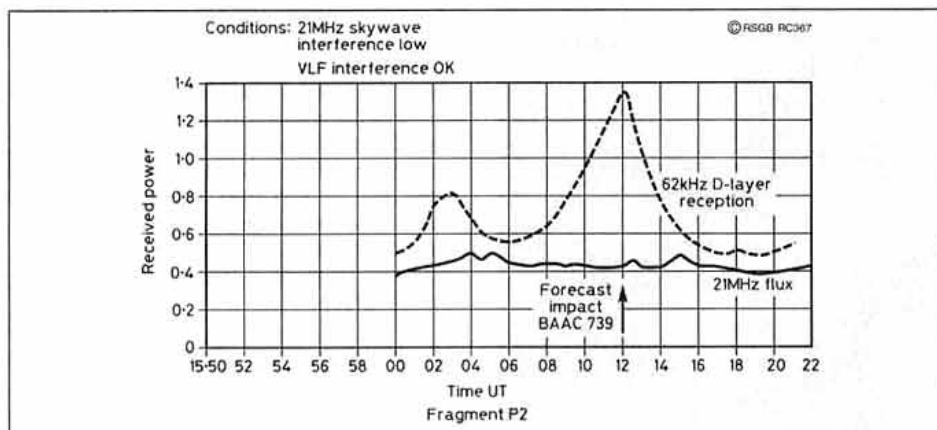


Fig 2: 21MHz flux and 62kHz reception during fragment P2 impact.



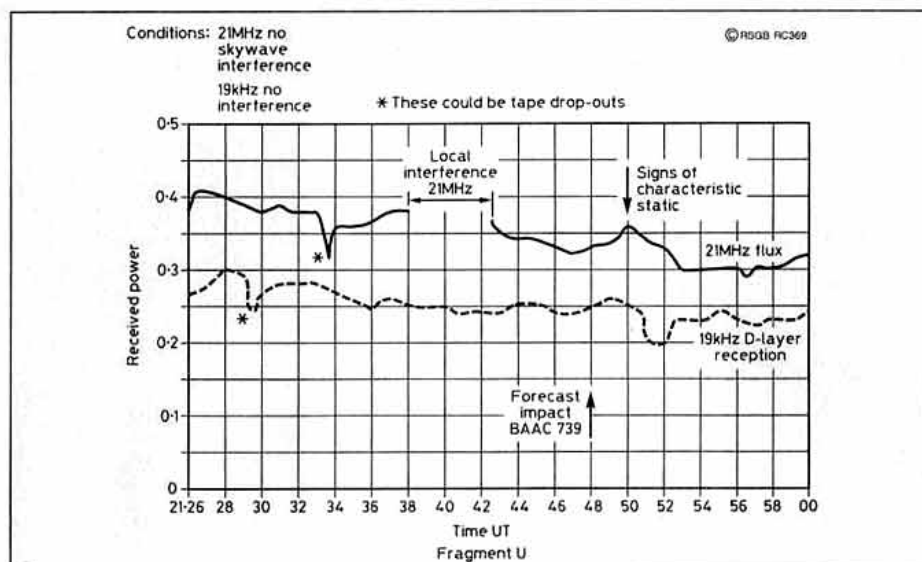


Fig 3: Fragment Q2 impact.

post detection bandwidth. As an example, if the receiver noise temperature is 1000K and its noise bandwidth is 3kHz, and the time-constant 15 seconds, the minimum detectable signal is:

$$P_n = \frac{1000}{3000 \times 15} = 0.02K$$

This is far more than needed for observing Jupiter but the very steady meter indication makes for accurate manual readings.

## D-LAYER MEASUREMENTS

THESE MEASUREMENTS WERE made by receiving distant LF and VLF transmitters received by D-layer reflection (or, more precisely, via the Earth/D-layer waveguide). Frequencies used were 19KHz, 52KHz and 62KHz. The antenna was a multi-turn frame (or loop) having a size of about 500mm square, resonated by a variable capacitor. This provided pick-up as good as a large inverted 'L' and reduced interference considerably due to its sharp tuning and directivity.

The receiver is shown in Fig 1. Up-conversion to 9MHz was employed mainly to reduce development risk in the short time-scale. It is necessary to use front end selectivity to remove the image frequency and also 50Hz mains hum. As the antenna has a very high

and variable impedance, an RF amplifier was used, after the manner of an active antenna, to achieve a constant impedance of 2kΩ for the filter.

The audio output was recorded and then played back into the same audio detector as for the 21MHz measurements. Severe interference from TV time bases and computers was encountered but this was virtually eliminated by locating the equipment away from the house in a shed. Unfortunately, the audio cable leading into the house for recording purposes re-introduced the interference and time ran out before a solution could be devised. Nevertheless, some good results were obtained.

## RESULTS

MEASUREMENTS WERE ATTEMPTED on fragments A,E,H,L,P2,Q2,Q1,S,T and U. None of the results is conclusive evidence of detection but a number are of interest.

Generally, a noise increase at 21MHz was seen at about the right time. There is some difficulty ascertaining at which moment a radio burst might be expected because the visual observations only see the resulting plume. In addition, it has become evident that the fragments were different in composition [4], making it possible for different times for a plume to develop.

The noise increases were in the range 10

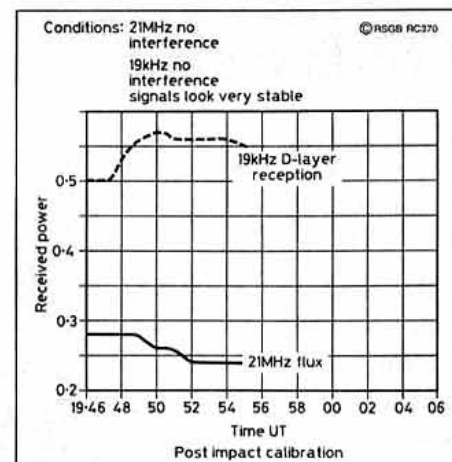


Fig 5: Control measurements at 19kHz and 21MHz.

to 25%, and detection by ear would therefore be very unlikely. Positive identification is not possible because other noise bursts occurred at various times, and may or may not have also been originating from Jupiter. These results are shown in Figs 2, 3 and 4.

In three cases, a long audible crash was recorded before the increase in white noise. It may be conjectured that this crash was the re-entry and the subsequent white noise the plume.

The D-layer results show fluctuations within about one minute of the 21MHz noise. The long range stations increased in strength whilst the 19kHz station at 230km showed a sudden decrease. Again D-layer fluctuations occurred at other times making positive identification impossible. A recording of results (control) is shown in Fig 5.

## DISCUSSION

ENQUIRIES WERE MADE as to whether X-ray bursts had occurred during the impacts, and it was ascertained that two satellites were monitoring the Sun and Jupiter and nothing had been recorded. Therefore, the D-layer results cannot be explained at the moment except as experimental error or random events.

It is hoped to analyse the recordings further to extract more information and to perform a computer correlation study between the D-layer and 21MHz results.

The experiment was extremely exciting and interesting and above all has illustrated to me the difficulty of obtaining scientific proof. How long before the next collision?

## ACKNOWLEDGMENT

I WOULD LIKE TO THANK Geoffrey Grayer for drawing the attention of Radio experimenters to the comet collision in his article in *RadCom* [1] and for his scientific discussions and advice.

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- [1] Grayer G, 'Jupiter's Big Bang'. *Radio Communication*, June 1994, p39
- [2] Ratcliffe M, 'The Night Sky July'. *Astronomy Now*, Vol 8, No 7, July 1994.
- [3] Taylor P O, *Observing the Sun*. Cambridge University Press, 1991
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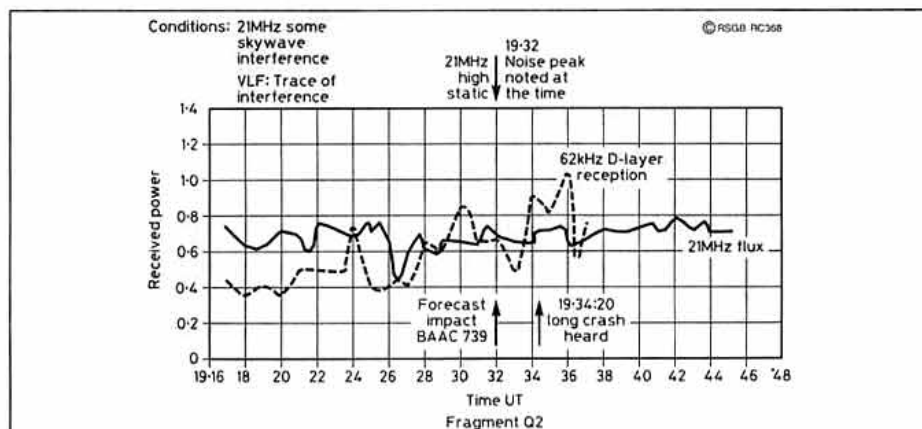


Fig 4: 21MHz flux and 62kHz reception during fragment U impact.

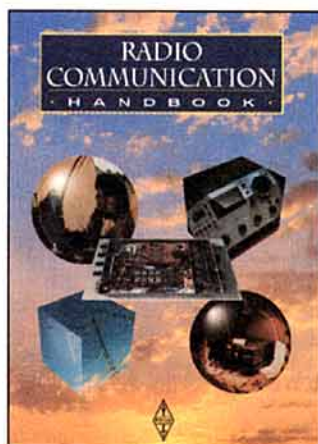


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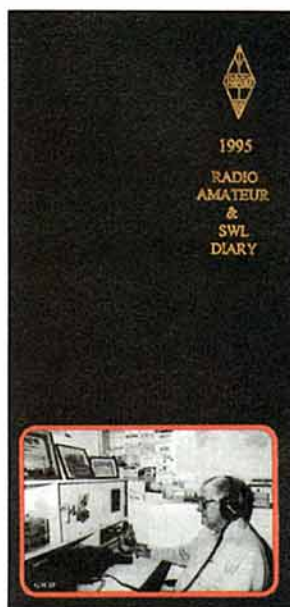
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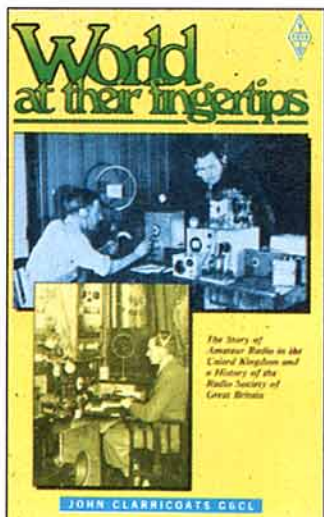
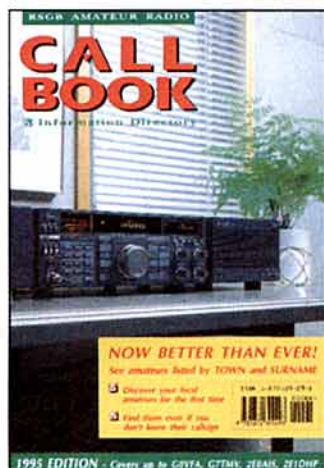
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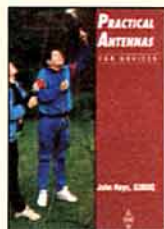
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# An Automatic Nicad Charger

by E R Gaze, G8NKA.

**O**NE OF MY FAVOURITE bits of kit is a handheld transceiver. If like me, you were startled at the cost of manufacturers' battery packs, you probably opted for an empty case and at the next rally bought yourself enough batteries to fill it. The most common pack holds six 1.2V batteries giving a terminal voltage of 7.2V at capacities ranging from 500 - 900mA/hr. The commonest is 700mA/hrs and all reference to batteries in this article refer to this variety.

The calculations are simple and easily altered to whatever type you have. To keep batteries in top condition it is necessary to discharge them fully before recharging. This charge / discharge facility along with a built in one or 12 hour timer is the essence of this project.

Most nicads have their capacity written on them in the form current (mA) / time (hours). In a perfect world, if we take a fully charged battery and place a variable load across it, then adjust the load so we get a current of 800mA flowing, the battery would sit there supplying its 800mA at 7.2V for one hour. The voltage and current would fall to zero, leaving the battery completely discharged.

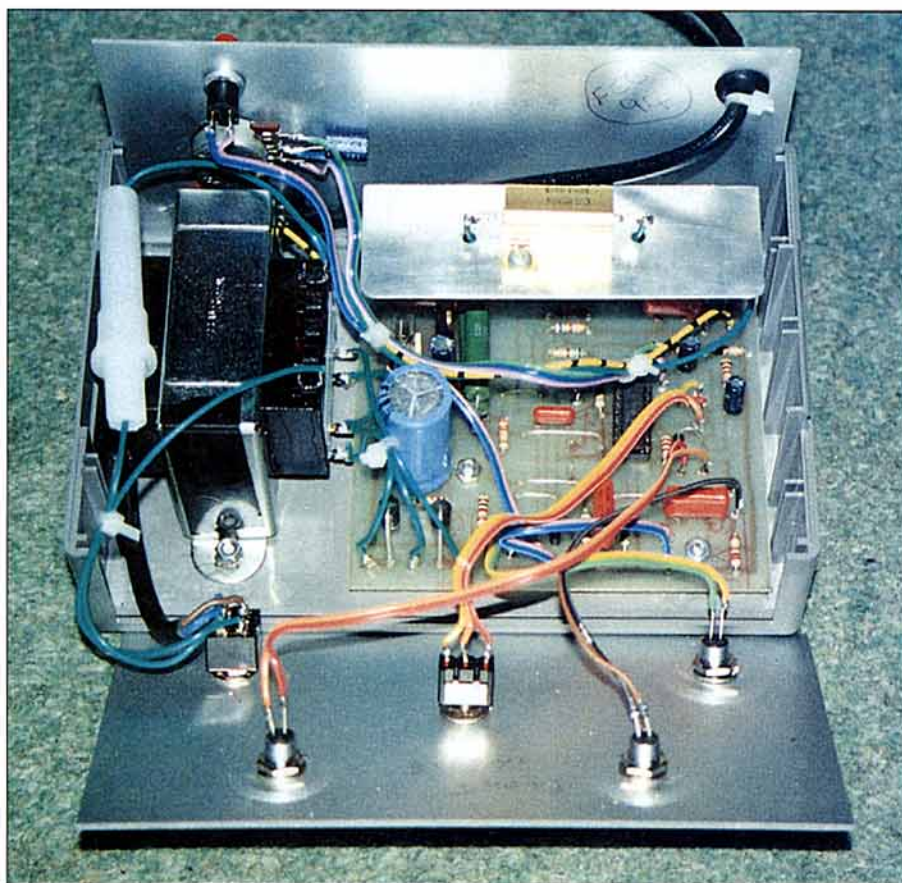
If we then remove the load and connect the battery to a constant current source of 800mA for one hour, the battery would be 'full'. In fact it's a bit more complicated. Batteries exhibit a characteristic called 'memory'. If, for example, our standard battery is repeatedly discharged to say, half its capacity, the battery remembers and over time the effective capacity falls to 400mA/hrs.

Most handhelds do not discharge the battery fully or they are recharged before they are completely discharged. The practical outcome is a gradual reduction in the working life of the battery pack.

To overcome this problem, the battery should be discharged to about 0.9V per cell before recharging commences. After several cycles this reforms the battery to its rated capacity. It is also standard practice to overcharge the battery by about 10%, ie 770mA for one hour. This is OK, but it is usually better to take a bit longer and do the job properly.

Charging the battery at 10% of its amp/hour rate plus 10% (77mA) for 10 to 12 hours is better, as the charge is low enough not to generate internal heat. Also it can be kept topped up by trickle charging, ie reducing the current to approximately 3% of its Amp/hour rating (21mA). This can be maintained safely for a week or so.

So now we have our charger requirements as follows:



- Discharge the batteries.
- Charge the batteries for one hour at their mA/hr rating or 12 hours at 10% of their mA/hr rating (plus 10%).
- Trickle charge the batteries (several days) at 3% of the mA/hr rating.

## HOW IT WORKS

WE NOW KNOW WHAT is required, so how is it done? Referring to Fig 1 and ignoring the IC and surrounding components, look at the

two transistors and presume they are both off. Insert the battery pack, nothing happens! Connect the base of TR1 to a positive supply and it will 'turn on'.

Think of it simply as a switch. When TR1 is switched on it effectively puts R17 (8R2) across the batteries. Assuming the batteries are fully charged and have a terminal voltage of 8.2V (to keep the figures simple) there will be a discharge current of 1amp, ( $I = V/R$ ) discharging the battery in about one hour. In practice it will take about 50 minutes for a 'full' battery and about 10 to 15 minutes when my handheld 'blanks out'.

We then remove the positive voltage to the base of TR1, turning it off. Applying a negative voltage to the base of TR2 (as it is a PNP device) turns it on. The Darlington transistor and associated components form a simple constant current source (no originality claimed), the current being limited by R16. Its value was chosen to give a maximum current of about 1300mA (this is about the limit of the transformer (Fig 2) and should be adequate

## SPECIFICATION

Battery	6 x 1.2V cells 7.2V pack
Charge Range	0 - 1300mA
Min battery voltage	2.5V
Discharged voltage	5.4V
Discharge time(empty)	12 min
Discharge time (full)	50 min
Charge time	1 hour (12 hrs on trickle)



for any increase in battery capacities).

That is really the heart of the charger. All we need to do is build some circuitry that will monitor the voltage of the discharging battery, switch it to charge, adjust the charge current to suit a range of batteries, build a timer for one or 12 hours, then arrange for the batteries to be trickle charged until we require them. Panic not! The IC does all these jobs.

Anyone interested in the full workings of the U2400B should obtain the manufacturer's data sheet. I have not used all the functions available, trimming them to my specific requirements.

The IC has three voltage comparators which, with suitable voltage divider resistors, monitor the state of the battery. Pin 5 of the IC would normally go to a positive temperature coefficient resistor in close proximity to the battery, so if it became hot this would be detected and the IC would switch off the charging current. I dispensed with this because I did not want to keep removing the batteries from the case and did not intend to use the rather brutal half hour charge range. A simple potential divider R2, R3 takes care of this.

Pin 6 via divider R13, R10 monitors the falling battery voltage on discharge. When the battery voltage falls to about 5.4V (0.9V x 6 cells) pin 10 goes low, turning off TR1. Pin 12 also goes low, turning on TR2 and charging starts. SW2 is used to 'trick' the IC into thinking the battery is discharged, putting it into the charge mode, irrespective of the battery state.

Pin 4 has two functions:

- 1) It informs the IC that a battery is connected - provided its terminal voltage is above 2.5V.
- 2) It turns off the charging if it senses the battery voltage is becoming too high. This function caused me some problems. The manufacturers consider the battery overcharging if its nominal 1.2V cells reach 1.6V (in a

pack of six cells, this would be 9.6V). Now, perhaps because I used 'surplus' batteries, all of the packs I charged on a stable bench power supply, whether for one hour or twelve, reached a terminal voltage of about 10.2V. After lots of head scratching, I decided there was not much I could do about this and elected to disable the over-voltage facility.

D1 clamps the voltage at the end of R9 to 0.6V. R5, R7, form a potential divider reducing this to 0.3V. This enables the IC to 'see' when a battery is connected, but disables the over-voltage facility.

Now for the charger part. S1 is set to one hour and the battery has been discharged. Now if pin 12 goes low maximum current flow, set by R16 of 1300mA occurs - too much for most batteries. Fortunately there is more to it than this. A 200Hz oscillator is running in the IC and this via pulse-width modulation, is used to control the current flow. If we imagine TR2 as a switch that can be turned on and off rapidly, that gives an idea of how it works. If the switch is turned 'on' for the same length of time as it is turned 'off', and this is done 200 times a second the battery would appear to integrate the pulses and we would see an average current flow - half of 1300mA. Now, if the switch turned 'off' for twice as long as it is turned 'on', we would get an apparent steady current flow of approximately 440mA - one third of 1300mA.

When RV1 is adjusted, the pulse-width of

the 200Hz waveform is altered, the wider the pulse width the greater the 'on' time, the narrower the pulse width the greater the 'off' time. The result of this is, as RV1 is altered, an apparent smooth current flow, adjustable from 0 to 1300mA. Setting this for our standard battery (770mA), we switch to the 12-hour range (remembering the current requirement of approximately 10% of the battery capacity plus 10% - 77mA). The IC does this by pulsing the battery at the previous preset current for 200 milliseconds every 1.2 seconds (you do the maths, I believe the manufacturers.) After charging for one or 12 hours the IC switches to its 'trickle charge' mode, by again pulsing the battery at the preset current (770mA) for 200 milliseconds, only now the frequency drops to once every 16.8 seconds. Once the one hour charge rate is set, the IC looks after everything else. The charging times and clock frequency are default values and cannot be altered.

The sharp eyed among you may be wondering why we require D5 and C9. The discharge 'high' at pin 10 is not steady, it is also clocked at 200Hz, and varied by RV1. This results in erratic discharge times. D5 rectifies the pulses and C9 smoothes them, the time constant being long enough to turn TR1 hard on for any practical setting of RV1. Last but not least U1 (LM7812) supplies the regulated 12 volt rail.

## CONSTRUCTION.

CONSTRUCTION IS QUITE straightforward, especially if using the PCB and layout shown in Figs 3 and 4. The front and rear panel layouts are not critical, but the prototype is quite pleasing to the eye. The 'S' shaped heatsink is really the only bit of metalwork involved in the charger (see Fig 5 for dimensions). TR1 and TR2 both require mica washers etc to insulate them from the heatsink and

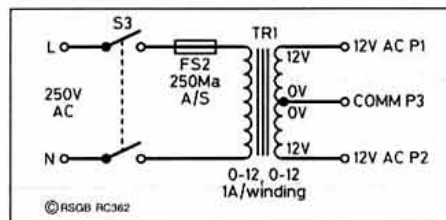


Fig 2: Transformer wiring diagram

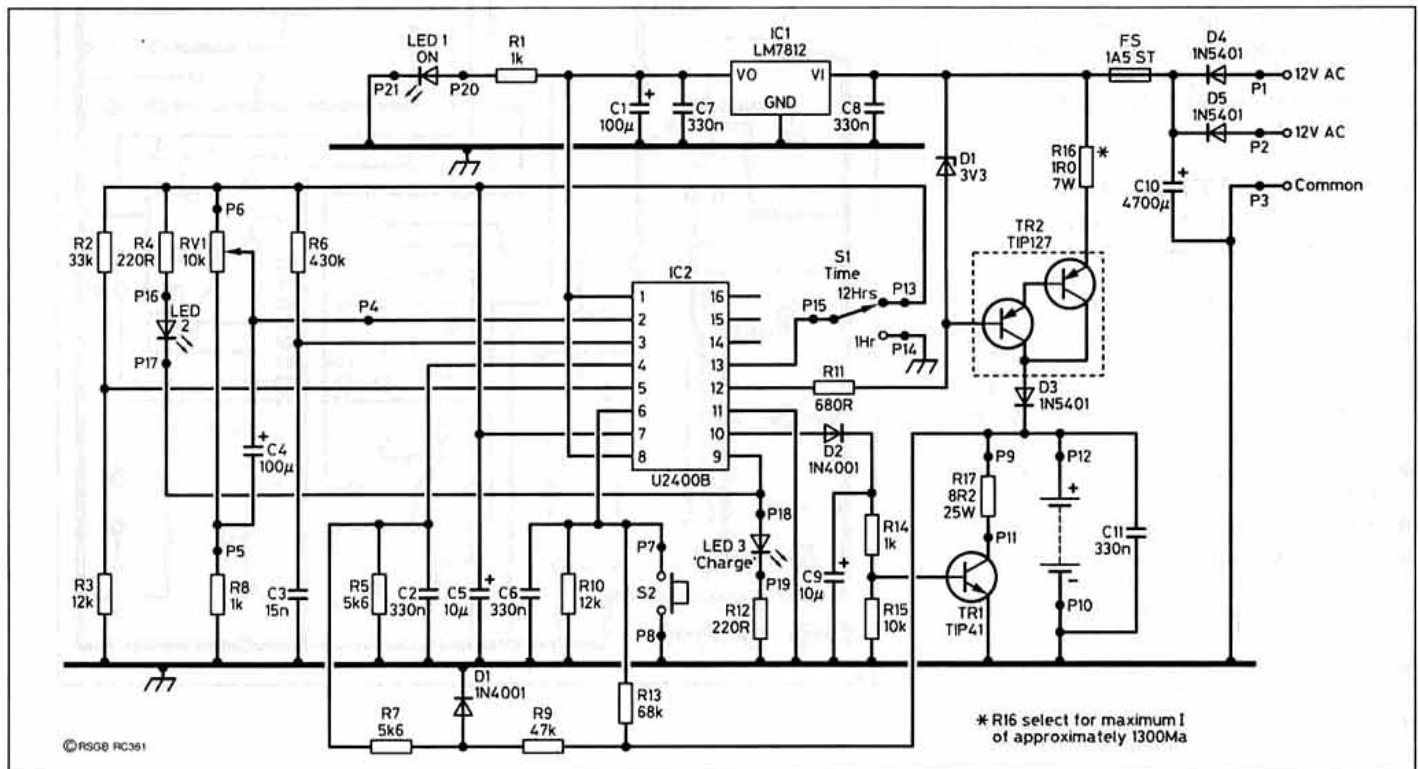


Fig 1: Circuit diagram of nicad charger



## AUTOMATIC NICAD CHARGER

R16 sits on top of it. If an in-line fuse holder is used for FS2 this simplifies construction further. As the battery capacities are changed so infrequently, I didn't bother with any scale on RV1. This, together with an ammeter, can easily be added if you wish. Component values are fairly critical and should be kept as shown. The two LEDs require a mention, as the IC will only supply a current of 5mA. R4, R5 have been chosen to limit the current to 4.5mA. Using standard LEDs gives a satisfactory light output. Lastly do not leave out any decoupling capacitors - they are required.

C4 is mounted on RV1, positive to the center (slider), negative to the tag that is also connected to P5.

### ANYTHING ELSE?

I ALWAYS THINK a lot of good projects are spoiled by the case and poor lettering, making it obvious that the equipment is home-made. Bearing in mind the cost of the transceiver and this charger, it is surely worth spending more time and money to produce a finished article that you don't feel the need to throw a cloth over every time someone visits your shack.

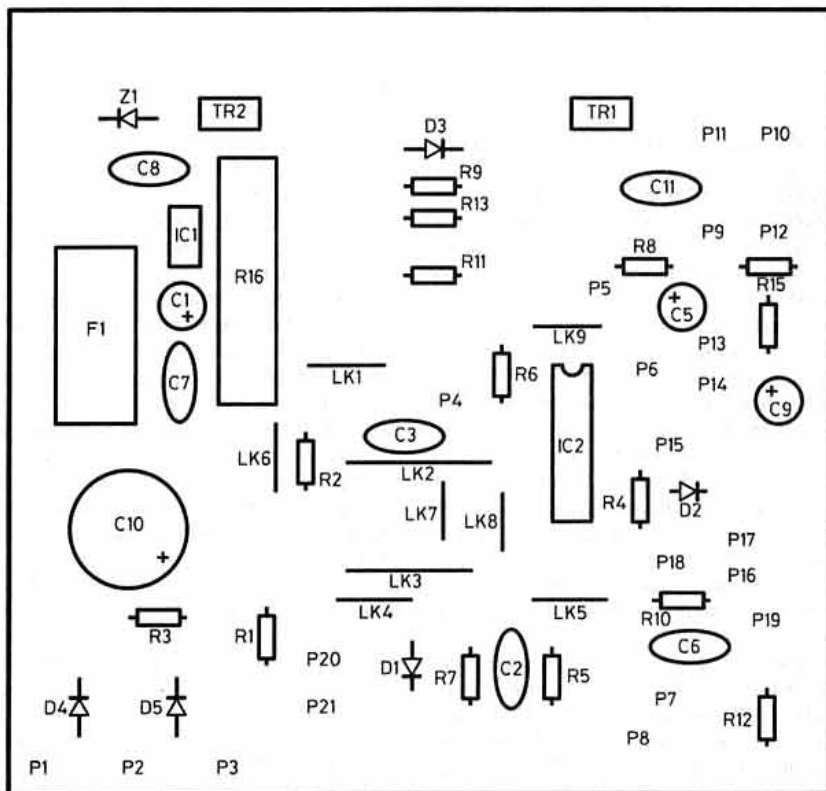
The Nicharge is built in standard 'Verobox' and finished with 'Letraset' or similar. Mark out, drill all holes, clean, draw faint pencil lines where appropriate, count the letters to find the centre of the word, rub on the letters, carefully clean off the pencil marks and finish off with a clear plastic spray, which you can get from most art shops along with the 'Letraset'. The cost of both is about £6, but it will do for several projects. I know this adds a few hours to the completion of your projects, but I feel it is well worth it.

**WARNING:** It must always be remembered that there are lethal voltages on any equipment connected to the mains. The transformer, fuses and switches etc. Disconnect the Nicharge from the mains before working on it. Heat shrink sleeving or similar on exposed 'live' terminals etc is good working practice. A bench power supply set at about 18V (2A) connected from the negative rail and C10 positive will enable you to test/set-up the unit in safety.

### TESTING / SETTING UP.

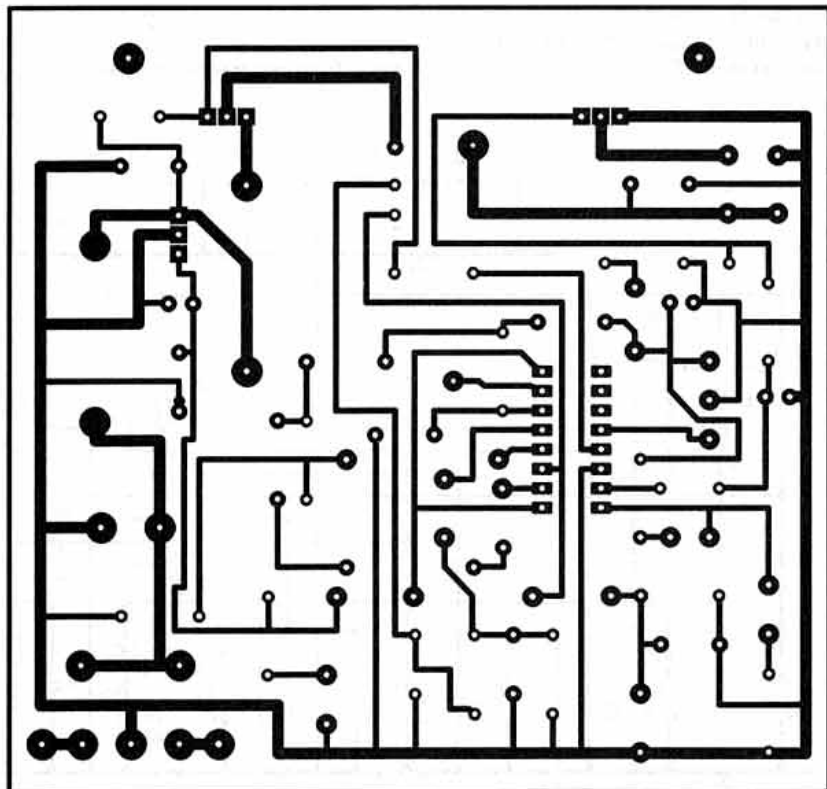
BEFORE COMMENCING TESTING and setting up note the WARNING above.

- Remove IC2 - Remember, when handling, this is a CMOS device.
- Fit a 500mA fuse in FS1, switch on. You should have approximately 18V on FS1, and 12V on pin 1 and 8 of IC2. LED1 should be lit. There should be no voltage on the output terminals.
- If all is well, switch off, insert IC2 into its holder.
- Set RV1 to half-way, and S1 to one hour.
- Connect an analogue ammeter (1A scale) in the positive lead of the battery to be charged, (negative lead to the charger; positive lead to battery.)
- Turn on. Both the 'On' LED and the 'Discharge' LED should glow.
- After approximately two seconds the 'Discharge' LED should flash. The meter should show a discharge current of about 850mA - this depends on the battery's



© RSGB RC363

Fig 3: PCB component layout.



© RSGB RC364

Fig 4: PCB, solder side (actual size).



# COMPONENTS LIST

## Resistors

R1, R8, R14	1k
R2	33k
R3, R10	12k
R5, R7	5k6
R4	220R
R6	430k
R9	47k
R11	680R
R13	68k
R15	10k
R16	1R0 nominal; select for max current of 1300mA
R17	8R2 25W
RV1	10k

## Capacitors

C1, C4	100µF	25vw
C2, C6, C7, C8, C11		.33µF
C3	15nF	
C5, C9	10µF	25vw
C10	4700µF	25vw

## Semiconductors

TR1	TIP41
TR2	TIP127
IC1	LM7812
IC2	U2400B
D1, D2, D3, D4	1N4001

## Additional Items

S1	SPDT
S2	push to make
S3	DPST
FS1	1A5 ST
FS2	250Ma anti surge
T1	Transformer 0-12v @1A

LED 5mm green; 5mm orange; 5mm red, Veropins, 16 pin IC Holder, 2 fuse holders, 2 terminal posts, 3 LED holders, Verobox type 216

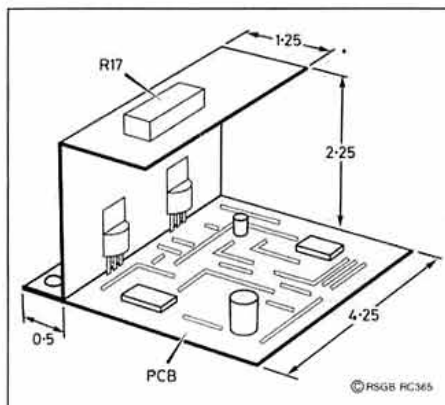


Fig 5: Metalwork and PCB dimensions

charge condition.

- Switch off, reverse the meter leads between the battery and the charger.
- Switch on, press S2. 'Discharge' LED goes out, and the 'Charge' LED flashes.
- Adjust RV1 to give a reading corresponding to your battery capacity +10%. (770mA).
- Switch off, remove meter, Replace the fuse with a 1A5. That's it. No need to touch RV1 again unless you change the batteries for different capacity types.

## NOTES

[1] If you wish to enable the overvoltage facility, change R7 to a 100k, replace R9 with a shorting link, and remove diode D2. This will

set an overvoltage level of about 10V.

[2] As the charger always goes into the discharge mode first, S1 should be switched to charge (1 hour), so that the current level can be set without having to wait anything up to 50 minutes until the battery is discharged.

## OTHER THOUGHTS

THE CHARGER PLACES a small drain on the battery in the 'off' condition. This is more than compensated for in the trickle charge mode. However, when the charger is turned off the batteries should be removed.

When the batteries are being charged in the 12 hour or trickle charge mode there is a faint, but audible 'beep' every time they are pulsed. The 'beep' comes from the batteries themselves (I wonder what is resonating in there?) This, whilst faintly amusing, also gives a reassuring indication that the battery is indeed charging.

Using an analogue meter the pulses of charging current (12 hour or trickle) can just be seen as a slight 'flick' of the pointer. My digital meter did not register at all.

Finally I should like to thank the regulars on my local repeater GB3HG for putting up with me talking about it and trying/buying the prototypes. With special thanks to Brian, G0RHI, for editing the text.

A kit, including PCB but excluding the box, can be obtained from JAB Electronic Components, 1180 Aldridge Road, Great Barr Birmingham B44 8PB at a cost of £34.50.



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G3TSO	0691	80m SSB Tx/Rx	1-A	£77.00	
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G3BIK	1094	Keyer	1+2+3+5	£21.00	
G3TDZ	1094	Display	1-C	£19.90	

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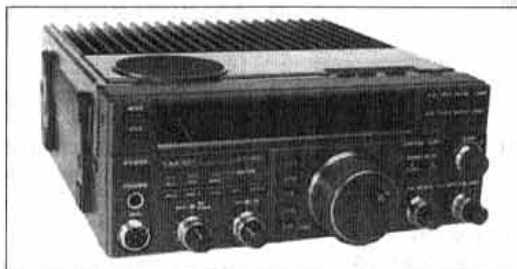
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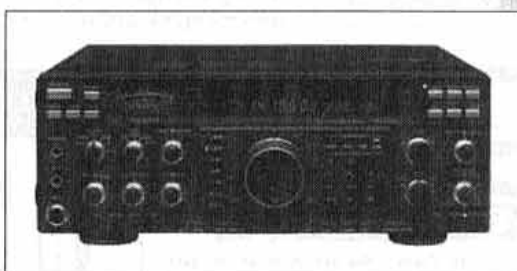
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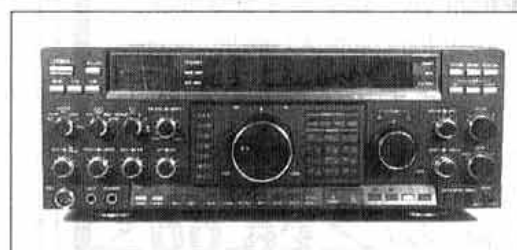
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## THE PETER HART REVIEW

# Yaesu FT-900 HF Transceiver



**Y**AESU CERTAINLY PROVIDES plenty of choice when it comes to small-sized HF transceivers. Their current range of 12 volt operated radios for home, mobile or portable operation includes three models, all similar in size, the fully featured FT-890, the budget priced FT-840 and now their latest addition, the FT-900. The FT-900 is a fully featured radio, retaining all the features of the older FT-890 plus more.

Although these radios are quite small, it is still very difficult to mount them in virtually any car for convenient mobile operation. The FT-900 adopts a fresh approach to this problem. Part of the front panel containing the most used controls and display is made detachable and may be operated remotely via an interconnecting cable. Hence the main body of the radio can be located in the rear of the car, for instance, and the thin lightweight 'sub-panel' simply attached at a convenient place on the dashboard.

### PRINCIPAL FEATURES

THE RECEIVER IN the FT-900 covers the continuous frequency range from 100kHz to 30MHz and the transmitter covers the usual segments around the amateur allocations. USB, LSB, CW, AM and FM modes are all provided on both receive and transmit and FM also provides for repeater operation with +/- frequency offset and CTCSS tone access. The frequency offset is settable over the range 0 - 500kHz and the CTCSS tone over the range 67 - 250.3Hz. Data modes are covered using SSB or FM with audio tones (AFSK).

The frequency band may be selected either by individual band buttons or alternatively by UP/DOWN keys which scroll through the amateur bands or in 100kHz/1MHz steps in general coverage mode. Band stores return the last used frequency, mode and filter setting on each band. Direct frequency entry is also provided using the individual band buttons as a numeric keypad.

On SSB and CW, the rotary tuning knob tunes in 2.5, 5 or 10Hz steps corresponding to 2.5, 5 or 10kHz per revolution of the knob.

... all the  
features of  
the FT-890  
plus more.

This may be increased to 100Hz steps / 100kHz per revolution for fast tuning. On AM and FM, 100Hz/1kHz steps are selectable giving faster tuning rates. The usual twin VFOs (A/B) are provided for split frequency working as well as a clarifier functioning to shift the receive frequency only over the range +/- 9.99kHz on all modes.

Ninety general purpose memories are available together with a further ten memories to store programmable scan limits. These memories and the band stores all store two frequen-

cies, modes, individual clarifier settings, filter bandwidth and split status. Comprehensive VFO/memory transfer features are provided including memory check to allow the contents to be previewed when operating in normal VFO mode. Scanning is provided between up to ten preset limits, across all memories or only selected memories. Scan speed and resume mode are user selectable.

The standard FT-900 transceiver comes with a ceramic SSB IF filter which is also used on CW. A higher grade SSB filter may be optionally fitted and also a narrow CW filter with 250 or 500Hz bandwidth. These filters can only be selected in the appropriate mode. For instance, it is not possible to select the narrow CW filter on SSB which could be useful for RTTY and AMTOR data modes. The receiver is also equipped with an IF notch and IF shift.

The CW pitch is variable over the range 400-1000Hz and normal or reverse sideband may be selected for CW to avoid retuning when switching between CW and SSB modes. Other receiver features include a switchable RF preamplifier and 12dB input attenuator, noise blanker, two speed AGC and all mode squelch.

The transmitter includes an AF based speech processor and an IF processor with an adjustable passband shift over the range of -300 to +500Hz. This enables the transmitted audio signal to be tailored to suit different microphones. For CW operation, semi and full break-in are provided together with a built-in electronic keyer. The keyer covers the speed range from less than 12WPM up to 40WPM and has two weighting settings to



give either 3:1 or 4.5:1 dot/dash ratio. Other transmit features include variable power output down to a few watts, VOX, MOX and the Yaesu ducted flow cooling system with thermostatic fan.

The display used in the FT-900 uses a high contrast orange backlit LCD panel which Yaesu call their 'Omni-Glow' display. This indicates the usual frequencies to 10Hz resolution, memory channel and status indicators and a bargraph S meter with peak hold. On transmit dual bargraph meters are used to display RF output power and either ALC level or antenna VSWR.

When used in remote mode, the detachable front panel contains the display and all tuning and receiver controls with the exception of the individual band buttons. The microphone socket is also contained on the remote panel and a socket at the rear for connecting a separate loudspeaker.

The microphone socket uses a telephone style jack and an appropriately equipped microphone, the MH-31, is provided with the radio. The only controls which remain on the main unit are the keyer setting controls, VOX, AGC speed, mic gain, RF power and individual band buttons. To make use of remote operation with the detachable front panel, the YSK-900 separation kit is needed. This contains 6m of remote extension cable with connectors and items of mounting hardware.

The FT-900 may be fitted with the ATU-2 internal auto ATU or the FC-800 external ATU at the antenna feedpoint. Both ATUs are controlled from the front panel and have 31 memories which store automatically the most recent antenna matching settings for rapid retuning when changing frequency.

The rear panel is identical to the FT-890 and carries the usual interface connections for power, audio and data I/O, linear control, PTT and key. Four dedicated multipin connectors interface to the DVS-2 digital voice system, FC-800 ATU, band data for auto ATU and QSK linears, and 4800 baud CAT computer interface. The VOX and CW delay controls are also located on the rear panel.

A 50-page operating manual is included.

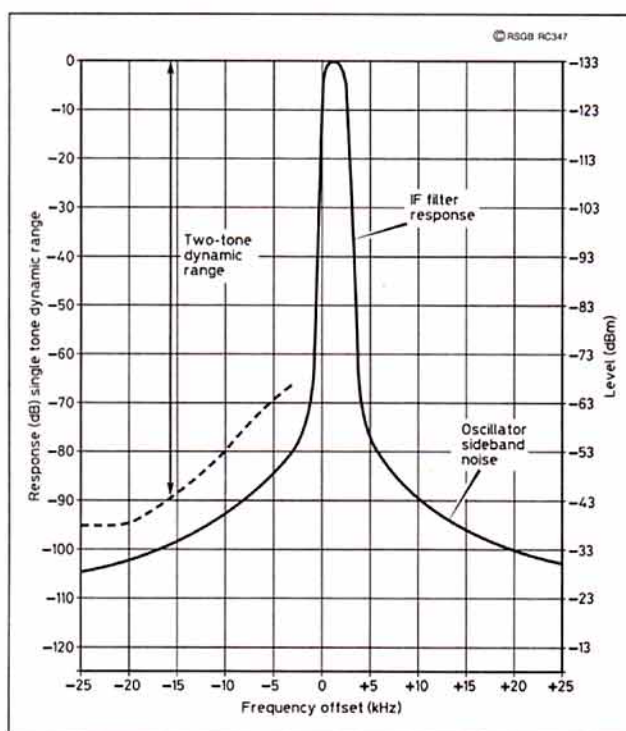


Fig 1: FT-900 effective selectivity curve on USB.

This is very well written and includes foldout panel layouts and a set of circuit diagrams.

## DESCRIPTION

THE FT-900 IS SIMILAR in size to other radios of its type, measuring 238mm (W) x 93mm (H) x 253mm (D) and weighs 5.3kg. The detachable part of the front panel measures 233mm (W) x 55mm (H) x 30mm (D)

... fully lived up to expectations

although the total depth is about 50mm with knob protrusions. The detachable panel is very light weighing around 350gm.

The unit is modular in construction and splits into three basic units. The upper part of

the case comprises a fan blown die-cast heatsink containing the PA and output filters. The lower part of the case contains two main PCBs for the RF, AF and local oscillator, and the auto ATU. The front panel contains the control circuitry with main system microcontroller and lithium back-up battery. A second microcontroller is located on the detachable sub panel. The 6.5cm diameter speaker is mounted upward facing in the top of the case.

The circuitry used in the FT-900 is based on the tried and tested FT-890. The receiver adopts a quadruple conversion architecture with three different intermediate frequencies on SSB, CW and AM. The first IF is 70.455MHz and the second is 455kHz where all the channel selectivity is located.

The notch filter is implemented as a fixed frequency crystal notch at 8.215MHz.

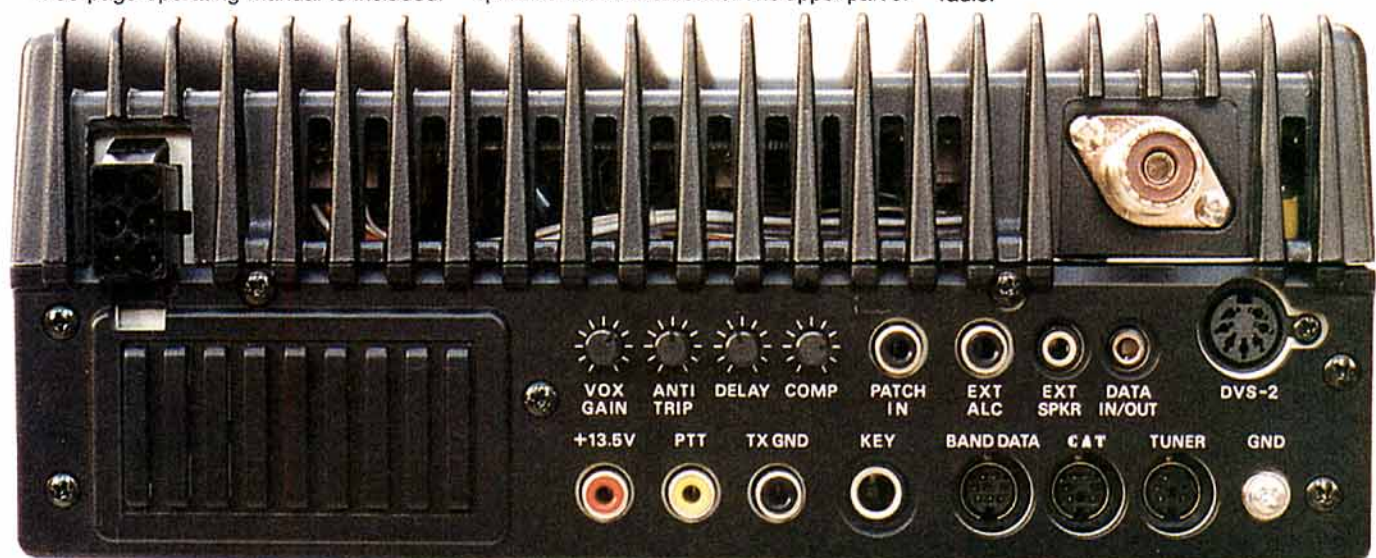
It is possible to achieve a much better performance from a fixed frequency notch than from a variable frequency notch using crystal resonators. Tuning of the notch is

implemented in the same way as passband tuning. The 455kHz IF is mixed up to 8.215MHz, passed through the notch, and then mixed back down to 455kHz using the same oscillator for both conversion processes. By varying the frequency of the oscillator, the effective notch frequency is altered.

For operation on FM, the receiver uses the first two IFs only. The receiver uses a parallel pair of FETs for the RF amplifier and four FETs in an active double balanced configuration for the first mixer.

On transmit, SSB is generated at 455kHz and mixed through 70.455MHz to final frequency. The first local oscillator drive is provided by a single loop synthesiser in conjunction with a DDS (direct digital synthesiser) and magnetic rotary shaft encoder. One of four VCOs is used to give the required tuning range.

A second DDS generates the 455kHz carrier oscillator and a total of four microcontrollers are used for various control tasks within the radio.





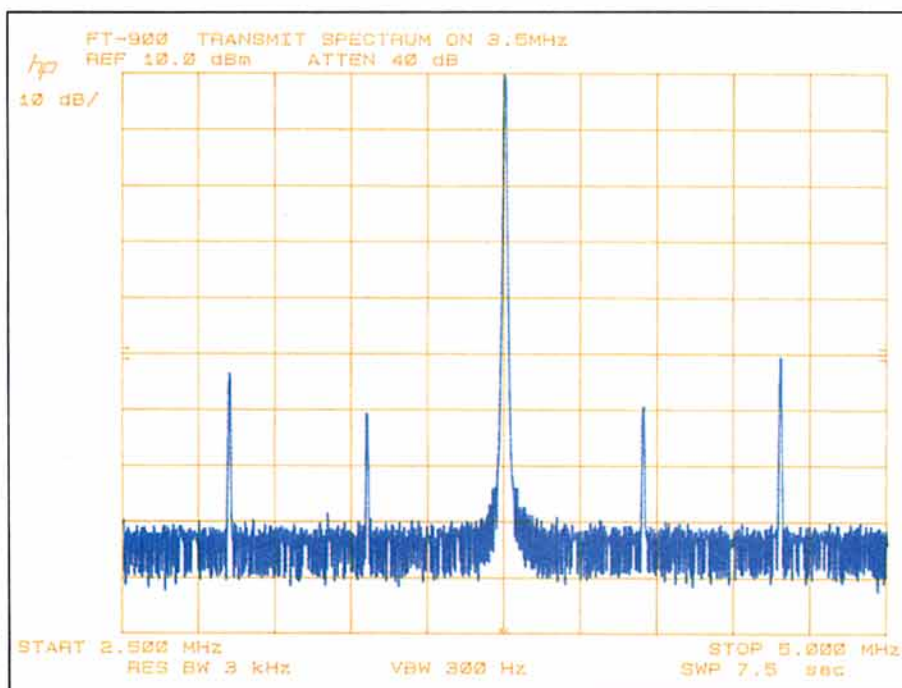


Fig 2: Transmit spectrum on 3.5MHz.

## MEASUREMENTS

THE REVIEW RADIO was provided with the ATU-2 internal auto ATU and standard IF filter (no optional filters fitted). All the measurements were made powered from a 13.55V PSU with the auto atu switched out. The measured performance of the radio is summarised in the table with additional comments as follows.

marised in the table with additional comments as follows.

## RECEIVER MEASUREMENTS

### S-Meter Calibration

The S meter results are only approximate due

to the granularity of the bargraph display. The range and linearity were good and the calibration was similar on all modes.

### Audio Output

Even at maximum audio gain, it was not quite possible to achieve maximum audio output. About 1.2W was achieved into 8Ω, 2.1W into a 4Ω load.

### Spurious Rejection

The rejection of the first mixer image and all IF responses was in excess of 98dB, an extremely good result. The second mixer image response at 910kHz above the on-tune frequency was the only significant spurious response at a level of about -75dB.

### Strong Signal Performance

The third order intercept and close-in dynamic range varied somewhat from band to band but was generally quite a good result. The IF filter skirts were rather wide but this can be improved significantly by fitting the optional higher performance SSB filter.

Fig 1 shows the effective selectivity curve on USB.

### Frequency Calibration

When measured at room temperature the receive and transmit frequencies were accurate to within 75Hz.

## TRANSMITTER MEASUREMENTS

### Power Output

The figures given in the table were measured at maximum output but the power was variable smoothly down to about 2W. With the ATU in circuit, power levels were about 15% less. With a mismatched load, the figures in the table show the power output with the ATU out of circuit. With the ATU switched in, the power was restored to around 90W output. The power output display was accurate to within 10-20%.

### Spurious Outputs

The only significant spurious signals on transmit were at  $\pm 455\text{kHz}$  and  $\pm 910\text{kHz}$  from the wanted signal on all bands. These were at a level of between 50dB and 70dB down on the main signal. Fig 2 shows the transmit output spectrum on 3.5MHz.

### SSB Performance

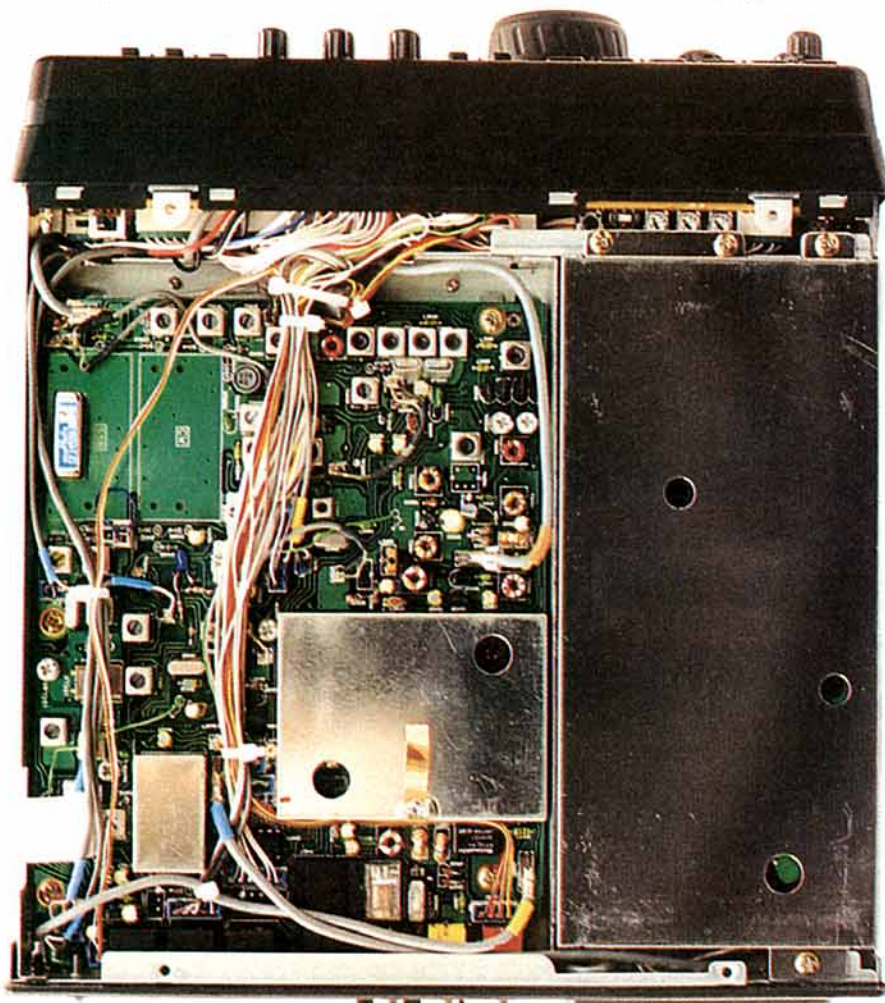
The transmit audio distortion increased rapidly towards the top end of the ALC indication. Keep the microphone gain setting to a minimum acceptable level.

### CW Keying Performance

Figs 3 and 4 show the keying waveform on semi break-in and full break-in respectively at 40WPM. There is slight shortening of the characters on full break-in at this speed.

## ON-THE-AIR PERFORMANCE

THE FT-900 PERFORMED very well and fully lived up to expectations for a radio of this type and price. The receiver performance was good with plenty of sensitivity with the preamp in circuit (NOR) and clean strong signal performance on the LF bands, particularly with the preamp switched out (IPO). The trans





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# YAESU FT-900 MEASURED PERFORMANCE

## RECEIVER MEASUREMENTS

FREQUENCY	SENSITIVITY SSB 10dBs+n:n		INPUT FOR S9	
	NOR	IPO	NOR	IPO
1.8 MHz	0.2µV (-121dBm)	0.5µV (-113dBm)	70µV	250µV
3.5 MHz	0.16µV (-123dBm)	0.45µV (-114dBm)	70µV	250µV
7 MHz	0.16µV (-123dBm)	0.45µV (-114dBm)	70µV	250µV
10 MHz	0.18µV (-122dBm)	0.5µV (-113dBm)	70µV	250µV
14 MHz	0.16µV (-123dBm)	0.45µV (-114dBm)	70µV	250µV
18 MHz	0.16µV (-123dBm)	0.45µV (-114dBm)	70µV	250µV
21 MHz	0.16µV (-123dBm)	0.45µV (-114dBm)	70µV	250µV
24 MHz	0.18µV (-122dBm)	0.5µV (-113dBm)	70µV	250µV
28 MHz	0.18µV (-122dBm)	0.5µV (-113dBm)	70µV	250µV

S-READING (14MHz)	INPUT LEVEL NOR
S1	1.3µV
S3	1.8µV
S5	3.5µV
S7	13µV
S9	70µV
S9+20	700µV
S9+40	7mV
S9+60	45mV

FILTER	-6dB	BANDWIDTH -60dB
SSB,CW	2570Hz	5400Hz
CW(N)		NOT FITTED
AM(W)	7900Hz	16000Hz
FM(N)	2570Hz	8200Hz

AM sensitivity (28MHz): 0.8µV for 10dBs+n:n at 30% mod depth

FM sensitivity (28MHz): 0.18µV for 12dB SINAD 3kHz pk deviation

AGC threshold: 1.4µV

100dB above AGC threshold for +2dB audio output

AGC attack time: 2-3ms

AGC decay time: 0.4-1s (fast), 2-3.5s (slow)

Max audio before clipping: see text

Inband intermodulation products: -30 to -40dB

INTERMODULATION (50kHz Tone Spacing)				
Frequency	NOR		IPO	
	3rd order intercept	2 tone dynamic range	3rd order intercept	2 tone dynamic range
1.8 MHz	-4dBm	85dB	+20dBm	95dB
3.5 MHz	+4.5dBm	92dB	+19dBm	95dB
7 MHz	+10dBm	95dB	+22dBm	97dB
14 MHz	+12dBm	97dB	+26dBm	100dB
21 MHz	+18dBm	101dB	+15dBm	93dB
28 MHz	+1dBm	89dB	+7dBm	87dB

TONE SPACING (7MHz BAND)	3rd ORDER INTERCEPT	2 TONE DYNAMIC RANGE
3 kHz	-34dBm	66dB
5 kHz	-29dBm	69dB
10 kHz	-13dBm	80dB
15 kHz	-13dBm	88dB
20 kHz	-1.5dBm	95dB
30 kHz	+10dBm	95dB

FREQUENCY OFFSET	RECIPROCAL MIXING FOR 3dB NOISE	BLOCKING	TX NOISE IN 2.5kHz BANDWIDTH
3 kHz	76dB	-15dBm	-68dBC
5 kHz	82dB	-13dBm	-74dBC
10 kHz	91dB	-8dBm	-83dBC
15 kHz	97dB	-6dBm	-90dBC
20 kHz	101dB	-6dBm	-95dBC
30 kHz	106dB	-6dBm	-99dBC
50 kHz	113dB	-6dBm	-104dBC
100 kHz	120dB	-6dBm	-106dBC
200 kHz	124dB	-6dBm	-107dBC

## TRANSMITTER MEASUREMENTS

FREQUENCY	CW POWER OUTPUT	SSB(PEP) POWER OUTPUT	HARMONICS	INTERMODULATION PRODUCTS	
				3rd order	5th order
1.8 MHz	110W	125W	-55dB	-30dB	-36dB
3.5 MHz	110W	120W	-56dB	-25dB	-35dB
7 MHz	108W	118W	-56dB	-23dB	-35dB
10 MHz	108W	115W	-51dB	-22dB	-35dB
14 MHz	108W	118W	-56dB	-26dB	-36dB
18 MHz	108W	118W	-58dB	-22dB	-36dB
21 MHz	109W	118W	-60dB	-22dB	-34dB
24 MHz	109W	118W	-61dB	-24dB	-32dB
28 MHz	110W	120W	-60dB	-28dB	-34dB

Carrier suppression: 55dB. Sideband suppression: 60dB @ 1kHz. Transmitter noise: see table above. Transmitter AF response at -6dB: 240-2800Hz. Transmitter AF distortion: 3%. T/R switching speed (SSB): mute-TX 18ms, Tx-mute 3ms, mute-Rx 20ms, Rx-mute 1ms. Power into load mismatch: 2:1 VSWR 83-106W, 3:1 VSWR 40-50W

NOTE: In the above table, the receiver NOR setting corresponds to RF amplifier switched in and IPO to RF amplifier switched out. All signal input voltages given as PD across antenna terminal. Unless stated otherwise, all measurements made on SSB with the receiver preamplifier in circuit. All two-tone transmitter intermodulation products quoted with respect to either originating tone.

43

mit quality was good on both SSB and CW with a clean overall characteristic on semi break-in and QSK. MOX engages keydown on CW which is useful

for tuning a linear, a simple feature so frequently omitted on most rigs.

The ergonomics of the radio are excellent with a robust and attractive styling and many useful and well implemented features. The controls are well positioned and very easy to operate. My only criticism is the tuning knob which is rather small at 40mm diameter and has no finger indent and this makes tuning a little tedious with the smaller step sizes. However, it is very smooth in operation. The cooling fan is quite noisy but very efficient and only switches on infrequently. The ATU-2 auto ASTU is very fast in operation, generally within 1s when tuning from memory or 2s for a full retune.

## CONCLUSIONS

THE NEW FT-900 provides a rugged transceiver for home, mobile and portable use with plenty of useful features, some very good ergonomics and a good overall RF performance. The unique feature of this radio is the detachable front panel which allows for remote location and brings a new dimension of convenience to mobile operation.

The current list price is £1299 without ATU or £1499 for the FT-900AT with built-in ATU. The YSK-900 remote separation kit is priced at £39. All of the prices quoted include VAT.

## ACKNOWLEDGEMENTS

I WOULD LIKE to thank Yaesu UK Ltd for the loan of the transceiver.

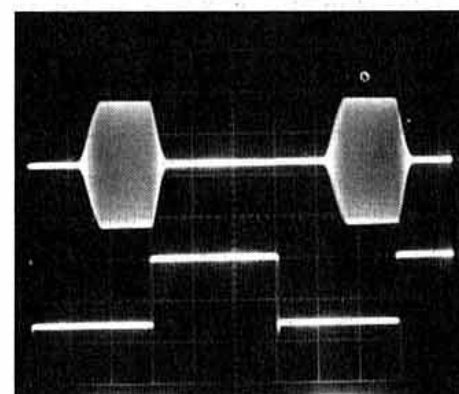


Fig 3: CW keying waveform at 40WPM in semi break-in mode.

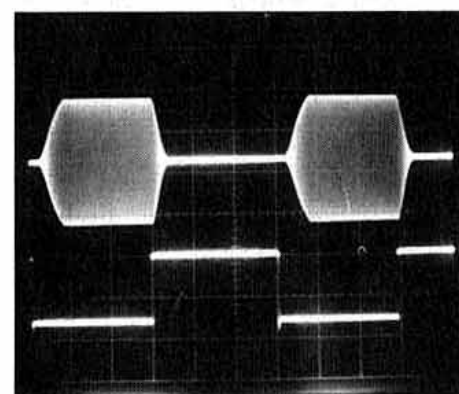


Fig 4: CW keying waveform at 40WPM in QSK mode.



# Stub Filters Revisited

by John Regnault, G4SWX

**M**ANY OF US HAVE READ the texts in the handbooks and manuals on transmission-line stubs, and some of us have even tried a few applications. This article details two new circuit configurations using stubs in a range of very high performance EMC filters. In addition the article describes some very high performance transmitter lowpass filters followed by a set of 'all coax' KISS alternative filters. The article is not intended for those who love pages of calculations, but for home constructors and experimenters who are interested in real filters using practical components.

I have been running high power on 144MHz for moonbounce for several years and know well that extreme care is necessary to avoid major EMC problems. Recently one of my neighbours wanted to add Band 2 FM radio broadcast onto his existing house TV distribution system - a very normal domestic expectation. When he told me (luckily before the event) I had an uncomfortable feeling that 'total wipe-out' was not far off. On checking the specification of his distribution amplifier I discovered to my horror that the VHF input covered 88-270MHz! A filter with exceptional performance was going to be required.

When I started to think what would be needed to do the job, I shuddered: less than 1dB insertion loss from 88-108MHz and at least 30dB rejection at 144 MHz. You might question the very low inband insertion loss - but why should your neighbours suffer degradation of performance of their equipment that you wouldn't accept on your own amateur system? The next question was: where do you find the design? There didn't seem to be any obvious ready-made solutions; bandpass filters were going to be too lossy, while conventional lowpass filters would only have 15-20dB loss at 144MHz - hardly enough with EME power around the neighbourhood. My first attempt was an elliptical filter designed from the data in the *ARRL Handbook*. To cut a long story short it just about worked, but my 144MHz signal was still 20dB larger than anything else on the distribution system.

## ENTER STUBS

I HAVE LONG ADMIRER an article by DL1GBH in *VHF Communications* in which he described a 144MHz lowpass filter using multiple stubs to improve the harmonic suppression at 288 and 432MHz [1]. DL1GBH started with a 5-pole Chebyshev lowpass filter design and substituted 288 and 432MHz quarter-wave open-circuit coaxial stub ele-

ments for the capacitors. In order to make up the full capacitive reactance required by the Chebyshev design he added shorter stub elements in parallel with the 288 and 432MHz elements. The circuit of this design is shown in Fig 1.

The performance of the design is exceptional: more than 60dB rejection at 288 and 432MHz and over 500W power handling capability, albeit at the expense of constructional complexity. What I considered was: could this design be modified to produce a 108MHz lowpass filter with very high rejection of 144MHz?

## 108 MHZ LOW PASS (144MHZ REJECT) FILTER

AFTER STRUGGLING FOR some time attempting to re-work the DL1GBH design with the additional stub elements to make up the total capacitance, I decided to look for some-

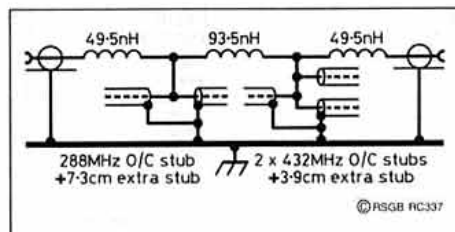


Fig 1: 144MHz Harmonic Filter by DL1GBH.

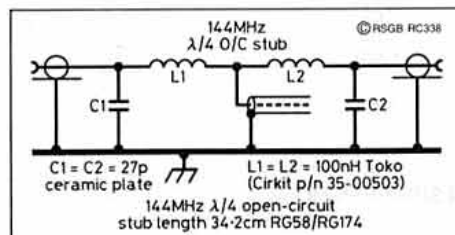


Fig 2: 108MHz Lowpass (144MHz reject) Filter

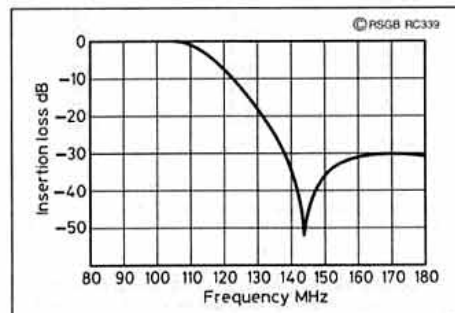


Fig 3: Performance of 108MHz Lowpass Filter

thing simpler and easier. I chose to use a single open circuit stub in a modified pi-network. Rather than struggle with calculations I optimised this configuration with the assistance of a computer circuit analysis package. The circuit of this filter is shown in Fig 2.

This design has been optimised for my neighbour's 75Ω distribution system and it uses readily available Toko inductors and preferred-value ceramic plate capacitors. With the exception of a box and connectors, all of the components should cost about £1.00. Not too bad for an EMC cure?

I am indebted at this point to Sam Jewell, G4DDK, for evaluating this and subsequent designs on his network analyser. To my great surprise these measurements (Fig 3) exactly matched the computer modelling.

The final outcome:

- less than 1dB insertion loss 88-108MHz
- no greater than 1.5:1 VSWR 88-108MHz
- more than 45dB insertion loss @ 144MHz

These characteristics were obtained using RG58 or UR43 coax cable; thinner coax such as RG174 will result in a notch some 6dB shallower, which in practice usually will not make much difference. Changing the cable used in the stub has little effect on the in-band (88-108MHz) insertion loss which is still less than 1dB, an additional advantage is that the stub can be curled-up to fit the box. Construction is flexible; just use your common sense, remembering that at 100MHz lead lengths greater than 1 cm are undesirable.

Setting up the filter is also very easy. In all of my prototypes the stubs were cut to length by calculation only, but if you really want to trim the stub exactly to length I suggest the following. Assemble the filter making the stub 3 or 4 cm longer than you want. Place the filter on the input of a 144MHz receiver and trim the stub, a few mm at a time, until a steady signal is notched out and just starts to increase again. You can leave it at that, or if you are a perfectionist cut a new stub to the length before the previous cut.

## 470-860 MHZ BANDPASS (432MHZ REJECT) FILTER

OVER THE YEARS I have deployed many filters in UHF TV systems and been a believer in the G4GED UHF TVI filter [2]. However, whilst this design provides excellent rejection of 144 and 432MHz it does suffer from greater in-band insertion loss than desirable.

There have been other more recent designs [3] whose claimed 1.5dB insertion loss (more likely >2.5dB) at 550MHz will certainly



be noticeable by viewers of CH21. If our EMC filters cause our neighbours any noticeable degradation in their reception, we should not be surprised if these filters are removed after a few days. If I were to write a specification for a UHF TV filter it would be as follows: insertion loss 470-860MHz less than 1dB, rejection of all amateur bands (especially 432MHz) at least 30dB, cost less than £2. Impossible or unlikely? Then read on!

Flushed with the success of the Band 2 filter I attempted to build a high-pass version, but quickly realised that the values of inductance and capacitance needed were too small to be practical for the average amateur. After an inspiring discussion over several pints with G4DDK I set out to model the circuit in Fig 4.

It seemed perfect on the computer, but the first tests were far from inspiring. The passband was full of ripple, varying by up to 3dB on changing the position of the short-circuit stub, which was loose in the box. With hindsight I should have realised that the braid of the coax stub was 'live' and prone to stray capacitive effects. To date I have only found one cure, which is to ground the stub at the short-circuit and suspend the line in the middle of a conductive box. This removes the option of curling up the coax line and has forced the use of a conductive box 12 x 3 x 3 cm. I would not recommend very thin coax such as RG174 for this application owing to its lack of rigidity and the reduction in depth of the 432MHz notch due to the additional attenuation. However, despite the constructional difficulties the measured results have again exactly matched the computer predictions, as shown in Fig 5.

As can be seen rejection of all amateur bands below 146MHz is greater than 40dB with a healthy 30+dB notch at 432MHz. You shouldn't be surprised at the notch at 1296MHz; it is the 3/4-wavelength resonance of the stub. It does however require great care in cutting the stub to place this resonance exactly at 1296MHz. As with all filters used in combating EMC problems, use ferrite rings or a braid-breaker as well to remove RF currents from the outer of the coaxial download.

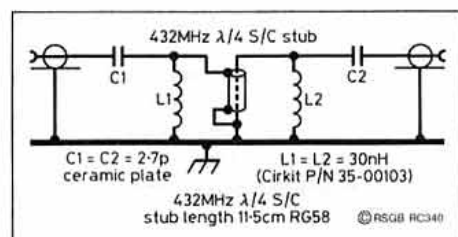


Fig 4: UHF TV Bandpass (432MHz reject) Filter.

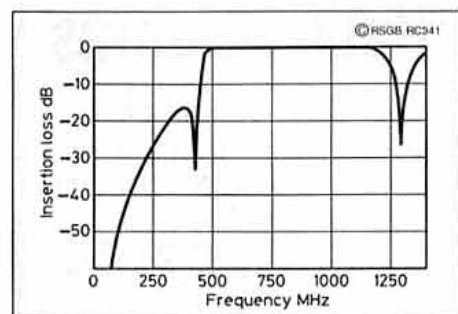


Fig 5: Measured performance of UHF TV Bandpass (432MHz reject) Filter.

## TRANSMITTER LOW PASS STUB FILTERS

DESPITE MY ADMIRATION of the DLIGHB filter design (Fig 1) I must admit to having been tempted to tweak. I tried to remove the additional stub elements, just leaving the one 2nd-harmonic (288MHz) stub and one 3rd-harmonic (432MHz) stub. This was not totally achievable but my revised design includes a stub for the 4th harmonic in parallel with the 3rd-harmonic stub. This revision improves the suppression of the 3rd and 4th harmonics with fewer components. The computerised optimisation has introduced some passband ripple below the operating frequency but this is of little consequence when you consider the relative narrowness of the VHF-UHF amateur bands. This revised design is shown in Fig 6 with component values for 50 and 144MHz using polyethylene dielectric coaxial cable.

The performance of the 50MHz prototype (made with Toko S18 coils and built on Veroboard) was remarkable: less than 0.25dB insertion loss and more than 70dB attenuation on 2nd and 3rd harmonics. The attenuation of the 4th harmonic was lower than expected but this was cured by screening the input coil L1 from the output coil L3. Pre-wound coils with ferrite cores are suitable for filters for transmitters up to 10W, and for higher powers I suggest air-wound coils using the standard formulas in the handbooks. This design should be also realisable on 432MHz but would probably be best constructed using semi-rigid coax.

Despite its simplicity this type of filter has some rather special features (Fig 7):

- Very high harmonic rejection, more than 65dB
- Low insertion loss (typically less than 0.3dB at 50MHz or less than 0.5dB for the

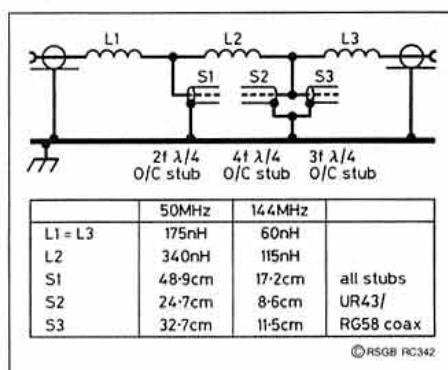


Fig 6: Stub-assisted transmitter Lowpass Filters for 50MHz and 144MHz.

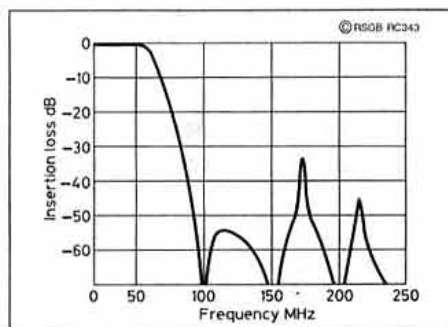


Fig 7: Measured performance of 50MHz Lowpass Stub Filter.

144MHz design, though these values can be further improved using lower-loss coaxial cable.

- Very good passband match, better than 1.2 VSWR over a typical amateur band.
- No specialised components.

## STUB FILTERS: THE KISS OPTION

THIS ARTICLE SO FAR has been concerned with using coaxial stubs in conjunction with conventional inductors and capacitors to form a set of filters with exceptional rejection and bandpass characteristics. What I will now present is a set of KISS alternatives to these designs, made totally out of coax.

The basic principle: a notch filter using two stubs separated by a quarter-wave of transmission line is well documented [4]. However, I would like to extend this principle a little further and demonstrate a range of filters with optimised bandpass characteristics as well as one or more deep rejection notches.

The basic arrangement consists of input and output stubs joined by a length of series transmission line (Fig 8). The stubs are selected to be an open-circuit quarter-wave-length at the frequency to be blocked. The problem then is how to match the filter at the frequency you want to pass.

This can be solved by selecting the length of the series transmission line. KISS stub filters can be simply designed with a Smith chart and a slide rule, or a computer circuit modelling package if you're more up-to-date. If you are conversant with Smith chart notation, the transmission line simply moves the reactance of the output stub from one side of the chart to the other, where it is automatically matched by the reactance of the input stub.

If you are using computer optimisation, you simply select the length of the series line as a variable and say to the software: 'Match that'. Depending on the relationship between the desired frequency and blocked frequency, you may need to change to short-circuited half-wave stubs, but the same principle applies. All of the filters I have described so far in this article have an all-coax KISS alternative in the general arrangement of Fig 8, although some aspects of the performance may be compromised.

Take a case where the frequency that you want to block is different from the frequency that you want to pass. The input and output stubs are selected to be an open circuit quarter wavelength at the frequency to be blocked. The problem is then how to match the filter at the frequency you want to pass. This can be solved by using the transmission line to transform the reactive component of the output stub into the conjugate of the reactance of the input stub. In simple terms the length of the transmission line is selected to match the stubs at the frequency that is to be passed. KISS stub filters can be simply designed with a Smith chart and a slide rule (or a computer circuit modelling package!) If you are conversant with Smith chart notation, the transmission line simply moves the effect of the output stub from one half of the chart to the other. Some situations such as where the desired frequency and blocked frequency are harmonically related may require changing to



## STUB FILTERS REVISITED

short circuited half wave stubs. All the filters I have described so far in this article have a KISS alternative although some aspects of the performance may be compromised.

### BAND 2 KISS FILTER

MY ORIGINAL PROBLEM of passing the FM broadcast band and rejecting the 144MHz band can be solved in the Fig 8 arrangement by selecting open-circuit quarter-wave 144MHz input and output stubs joined by a transmission line of electrical length 0.121λ at 100MHz. Using 75Ω TV low-loss feeder of velocity factor 0.85, the two stubs are each 44cm joined by a 30.8cm piece of series line. This particular design has been adjusted for optimum bandpass across 88-108MHz rather than minimum insertion loss at any one frequency.

The design is equally valid for 50Ω systems if you use 50Ω coax throughout, but mixing impedances will alter the insertion loss or bandpass characteristics. Although this filter has a similar passband insertion loss to the design in Fig 2 and very high rejection at 144MHz (over 50dB) the similarity ends there. The KISS option doesn't have the inherent low-pass characteristics of the design in Fig 2 - in fact it has several additional passbands higher in the VHF and UHF regions.

### UHF TV KISS FILTER

THE UHF TV HIGH-PASS, 432MHz rejection filter shown in Fig 3 does not have an easy KISS alternative, but a bandpass filter for 580 - 680MHz with less than 1dB insertion loss and 432MHz rejection of more than 50dB can be built in the Fig 8 arrangement using two 432MHz quarter-wave open-circuit stubs joined by a 432MHz quarter-wave series transmission line, all in 75Ω coax. Again assuming low-loss semi-air-spaced TV coax with a velocity factor of 0.85, all three pieces of cable are 14.8cm long. This filter will be adequate for all TV reception areas requiring group B, C/D or E antennas (the Maplin catalogue contains excellent reference charts of TV and FM transmitters, channels and frequencies). A similar filter can be built for channels 23-52 (most of groups A and B) using two 432MHz half-wave shorted stubs or 75Ω coax joined by a 432MHz quarter-wave series line in 50Ω coax. (But take care this will probably have a velocity factor of 0.66).

It is important to note that these KISS designs are really for the neighbours of a 70cm-only enthusiast; they do not have the excellent high-pass characteristics of the design in Fig 3 and provide virtually no rejection at 144MHz or below.

### KISS HARMONIC NOTCH FILTERS

THERE IS ALSO A KISS alternative to the transmitter output filters of Fig 6 I am indebted to Ian White, G3SEK, for introducing me to this type of filter and to my colleagues in the Martlesham Radio Society for building the prototypes. An example of this is shown in Fig 9. The rationale for this type of filter is that all your bandpass filtering should have been done at low levels in the exciter, so that the only possible spurious frequencies coming

$\lambda/4$ O/C stubs included	2f	3f	2f+3f	2f+3f+4f	2f+3f+4f+5f
length of matching line $\lambda$	0.175	0.205	0.143	0.125	0.113

Table 1: Combinations of harmonic stub filters.

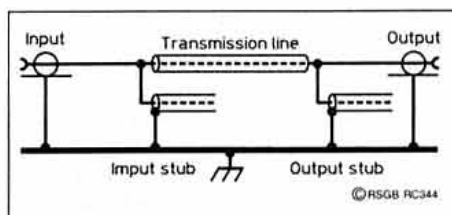


Fig 8: General arrangement of KISS all-coax stub filters. Lengths vary according to application.

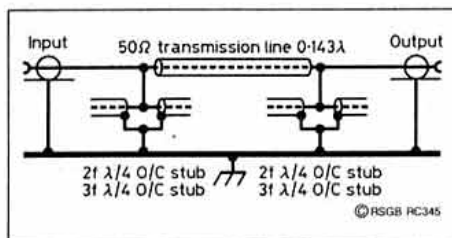


Fig 9: All-stub KISS harmonic filter.

out of the power amplifier are harmonics. Therefore you only need a harmonic suck-out filter rather than a lowpass design, and this again can be built completely from bits of coaxial cable.

Although the filter in Fig 9 may look deceptively similar to the one in Fig 8, the frequencies are reversed: in this filter the rejection notches are at the harmonics, and the impedance matching by the correct length of series transmission line is at the fundamental frequency. Open-circuit quarter-wave stubs are provided at the input and output to eliminate the 2nd and 3rd harmonics, and further stubs can be added to suppress the 4th and 5th harmonics too - all that changes is the required length of the series matching section. In fact you can pick and choose the harmonics that you want to suppress.

For example a commercial 144MHz transceiver may not have enough inbuilt suppression of the 432MHz third harmonic, a simple coaxial filter can provide up to 60dB of additional rejection with very little insertion loss. I have selected five combinations of harmonic stub filters and calculated the lengths of the matching line. These are presented in the Table 1.

If you carefully calculate the lengths and take care to cut the stubs and line exactly you can easily obtain more than 60dB suppression of your selected harmonics.

For example: to build a 144MHz transmit-

ter filter for 2nd and 3rd harmonics made in RG8/UR67:

2nd harmonic stubs	17.2cm long
3rd harmonic stubs	11.4cm long
Matching section	19.6cm long

This filter can even be scaled to other bands, for 432MHz by dividing each length by 3. That is two stubs of 5.7cm and 3.8cm at each end joined with a 6.5cm matching section. However if you choose another type of cable with a different velocity factor it is important to recalculate the lengths starting from the table above.

## CONCLUSIONS

WHAT I HAVE DESCRIBED have been several ranges of filters using either coaxial stubs together with conventional components, or all-coax KISS versions which fulfil some of the same purposes. In all cases, the filters intended for your neighbours' TV or FM receivers will cause far less degradation of performance than any designs previously published. Even for fringe reception areas, they offer some new and workable solutions to EMC problems. The transmitter low pass filters offer a degree of harmonic suppression that would have previously used double the number of components and often specialised transmitting capacitors. As to the KISS designs I hope that I have opened up a new area for others to experiment with 'kitchen table technology' - get building! Finally I would especially like to thank my friends Ian White, G3SEK, and Sam Jewell, G4DDK, for helping me develop my ideas, test all the new filters and in preparing this article.

## REFERENCES

- [1] 'Harmonic Filter for 144MHz Power Amplifier' p250 *VHF Communications* 4/83.
- [2] 'All-band UHF TVI filter' p894 *Radio Communication* July 1978.
- [3] '70cm band-stop filter' p74 *Radio Communication* June 1993
- [4] p17.20 *Radio Communication Handbook* RSGB

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# 26th NOV - AVE

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What a day it will be! Barry Cooper, head of Yaesu U.K. and other International Yaesu staff will be here celebrating their first anniversary at the Lynch shop. A raffle will take place during the day to win a new Yaesu FT-416G 2m handheld transceiver. In addition, other representatives from the leading manufacturers including Kenwood, Icom, Lowe, AOR and more will be on hand to answer your queries.

### Make a note in your diary NOW.

Last year nearly a thousand people poured through the door and grabbed tens of thousands of pounds worth equipment at virtually trade prices. Further more, they were fed and watered for free. ARE YOU SURE YOU'RE BUSY THAT DAY? What ever you've got on - cancel it and come to MARTIN LYNCH. Make him sweat and give yourself a big grin - grab a bargain!

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Yaesu FT-900AT List Price: £1499  
Lynch Price: Super Low!

#### FT-990



It amuses me that after a couple of years people are still finding out for the first time, just how good the FT-990 HF transceiver really is. No other employs digital filters. Both this and the Icom IC-736V7 continue to attract the majority of our used HF stock as part exchange.

Yaesu FT990DC List Price: £1899  
Lynch Price: Super Low!

#### FT-840



When you consider the performance offered for so little, it bodes me that the price is constantly slashed to bits to make it "more attractive". Perhaps other retailers don't realise just how good a performer the FT-840 really is. Compare it to the "Flagships" and it will stack up well. I've bought FIFTY pieces so I can offer this gem to you at a much reduced price and still leave me enough profit to give you after care.

Yaesu FT-840 List Price: £879  
Lynch Price: Unprintable!

#### FT-890



Yes it really is, an FT-900 without the removable front panel. A full feature HF Base station the size of a Mobile. Available with or without internal Auto ATU.

Yaesu Special offer price:  
FT-890 £1049.00  
or with ATU £1249.00

#### FT-1000



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Yaesu FT-1000 lists at £3495.00  
Lynch Price: How low can I go?

#### FT-747GX



OK! I'll admit production is now finished. Guess what! I've found another ten pieces. I've also located a very limited supply of matching Yaesu FP-700 power supplies with speaker.

Yaesu FT-747GX £649.00 (List £829)  
Yaesu FP-700 £159.00 (List £229)  
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#### FT-736R



Remember last month when you could buy an FT-736R and get a 5X METRE CARD for only £100. from Yaesu U.K.? Couldn't quite afford it then, but with the same deal was available now? It is. The first TEN customers who buy for cash or finance before the end of October will have the same deal! Further more, I'm still offering the FT-736R at an amazingly low purchase price and producing a finance plan that would make bank managers queue for!

Yaesu FT-736R list price: £1699.00  
Lynch Price: Not even close!

#### FT-5200/FT-5100

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FT-5200 List £649.00  
Lynch Price: Much less!

#### FT-2500M



"M" for military, (or is that Mercho?), this beastie will run 50 Watts of 2M FM with out even a murmur. Its built like a tank and hasn't got loads of fiddly knobs or Christmas tree displays. The Land Rover of 2M radio!

FT-2500M List £359.00  
Lynch Price: FREE CTCSS BOARD!!

#### FT-2200



The ideal slimline 2M mobile. I've bought too many, so grab a bargain whilst I save up for that hot meal I promised myself at the end of the month...

FT-2200 List £369.00  
Lynch Price: FREE CTCSS & MOBILE SPEAKER!

#### FT-530R

I've got Ten pieces left out of crate loads so grab one quick before you miss the only Dual Bander to offer CTCSS as standard. Are Yaesu in step with today's requirements - I should say so!

Yaesu FT-530R List £499.00  
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Yaesu FT-416G List £349.00  
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### KENWOOD

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It's been around some four years now, but sales haven't slowed down one bit. The TS-850S is one hell of a hard act to follow and at my Leicester show price, even more so!

Kenwood TS850S (without ATU) Lists at £1699.00  
Lynch Price: Klower!

Kenwood TS-850SAT with auto ATU Lists at £1849 - Much lower!

#### TS-450S



The TS450S seems to have lost its way a little recently but to remind you once more, it really is a scaled down version of the TS-850S. Save yourself some coins of the realm and take a closer look at this classic TS-440S replacement.

Kenwood TS-450S or "SAT" (with/without ATU), lists from £1399.99. Massive savings available.

#### TS-50S



They are so good even I talked myself into using one mobile on HF. If you were one of the few that were sold a TS-50S for exclusive home use, then it definitely wasn't my company. Ideal for what it was designed for, the TS-50S still has no competitors in size versus performance. Employed as a mobile, portable or "second rig", the TS-50S is still unbeatable. Ask about our improved SSB selectivity mode too!

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Kenwood TH-79E Lists at £449 + £32.95 for CTCSS.  
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Yes I know Kenwood have bought out YET ANOTHER DUAL BANDER, but have you seen this brilliant piece of kit? Quick release front panel, inexpensive accessories, loads of features. It retails at over £700, but I've put a package together that you may find interesting.

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ty. Who says Kenwood aren't tops for value? Don't forget the 9600 baud packet input ether!

Kenwood TM-251E lists at £389.95, the TM-451E at £429.95.  
Lynch Price: come and talk to mamma.

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So you wanted a remote head single bander, didn't you? FM only? Blast! They thought you said MULTIMODE. Listen, if they are good enough for Barry, GAUK, believe me, the pair are good enough for anybody! The successor to the TR-751E & 851E, these two are so loaded with features and BRILLIANT receivers they are worth a closer look. Just ask Barry.

Kenwood TM-255E (2m) lists at £899, the 455E (70cm) at £999.  
Ouch!  
Talk to me at the open day.

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### NEW NEW NEW! Icom IC-738



It's so new I haven't even had time to sling one at Mr Lewis, G3GIQ for a "First Impressions" review. Identical in appearance to the IC-737A, but with some of the IC-736 enhancements like R.F. Gain, larger RIT/TXT tuning range, more comprehensive metering showing ALC, SWR etc. No internal PSU or 6M coverage.  
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## IC-820H



The latest Dual Band Multimode Base Station, the IC-820H has a 1Hz synthesiser that convinces me Icom are showing off yet again. When I was a mere lad, Icom introduced the first decent synthesised 2m Base rig. (You can't count the TAuti 2000). The rest of the playing field have been trying ever since to catch up with their 'reciprocal mixing free' designs. If you're serious on VHF DX then take an IC-820H home with you this winter.

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*See You There*

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NEW AEA PK-12 ..... £139.95	including the AEA range of power and SWR
NEW PK-96 ..... £199.95	meters and antenna tuning units.

Phil Bridges of Siskin will also be there at the open day to discuss or take orders for any of the packet range.

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TRANSLATED AND EDITED  
BY ERWIN DAVID, G4LQI

**M**Y BENCHER PADDLE weighs 1.4kg. It would have been the straw that broke the camel's back had it been packed with the family luggage for a holiday flight. On field-day or for mobile use, a key with a heavy base is not very practical because of the lack of a firm support. Furthermore, dropping the key off a table may cause considerable damage, and losing one of its bits of special hardware renders it useless.

After some head scratching and several experimental models, I devised a paddle which can be manufactured with ordinary hand tools from junkbox materials. It worked flawlessly. I presented it to the CW fans at our local club where, after some initial scepticism, it was enthusiastically accepted.

## HOW IT WORKS

UNLIKE THE PADDLES OF a traditional squeeze key, those of the Mousetrap are positioned at an angle of 45°. The bracketed numerals in the following text refer to part numbers in Fig 1 and the component list.

The paddles turn on horizontal axes through the notches in the hinge frames (3) and are held together by two springs (7). These also define the rest position of the paddles. The shape and tension (2 x 300g) eliminate all play and ensure impeccable contact closures.

Strips of foam rubber (6) between the springs and the base (1) dampen self-resonances. Keeping the moment of inertia of the paddles down also helps, so light-weight finger pads (10) are indicated.

Both 'hot' contacts are surrounded by earthed metal parts, so there is no danger of RF pick-up.

## EASY KEYING ACTION

IN OPERATION, THE HALF-OPEN keying hand, covering most of the Mousetrap, rests in front of the operator. The thumb (thumb-nail towards the operator) operates the dot paddle and the index finger the dash paddle. Because of the light weight (<100g) of the Mousetrap, the third finger of the sending hand must hold the base. The Mousetrap does not have the traditional paddle key's tendency to slide because the paddle action is from outside-up to centre-down.

The location of the Mousetrap permits changing hands while sending, an impossibility with traditional paddle keys.

When changing between right-handed and left-handed operators, dot and dash leads of traditional paddle keys must be reversed. Not so with the Mousetrap.

You can also rest the Mousetrap on the third and fourth finger and key with the thumb and index finger of the same hand, even with that hand in your pocket; not just a stunt but a real boon to cold-weather operators!

## EVERYONE COULD DO IT

SEVERAL PEOPLE FAMILIAR with paddle keying tried the Mousetrap and could send with it without any 'relearning'.

We also gained the impression that those unfamiliar with automatic keying mastered the Mousetrap quicker than a traditional paddle key. The hand using the Mousetrap is positioned much like a hand-at-rest which

The Mousetrap squeeze paddle, a light-weight key with a new feel, was designed and made by Hans Widter, OE1WH, and presented as a zero-cost weekend project in qsp (Austria) 5/93.

reduces fatigue and the error rate decreases.

Newcomers to paddle keying should critically examine which finger to use for dots and which for dashes before settling into the rut in which experienced users find themselves. Index fingers are more agile than thumbs.

## DIFFERENT TECHNIQUE

The semi-automatic mechanical 'bug' keys, which became popular half a century ago, made automatic strings of dots, but the dashes had to be keyed individually. The index finger was assigned to dashes because they required greater agility, while the stronger thumb dealt with the hard-sprung dot paddle. Electronic keyers make strings of both dots and dashes automatically with the dots being most

difficult to control. While old-timers see no need to change their routine, new users may well wish to assign the dots to the index finger and the dashes to the thumb.

## CONSTRUCTION TIPS

THE LAY-OUT, DRILLING AND countersinking of the hardwood base plate (1) is best done before cutting the corners to get the elliptical shape.

File the notches into the hinge brackets (3) with these brackets bolted to the base. That makes it easier to make all four notches the same height above the base and of the correct depth to get the two hinge axes exactly parallel.

The two identical paddle frames (8) and (9) are bent to the pattern of Fig 1, starting with the shorter hinge hook (leave 2cm extra wire length). You probably will spoil several pieces before getting a good frame; discard rejects immediately as they cannot be successfully reworked.

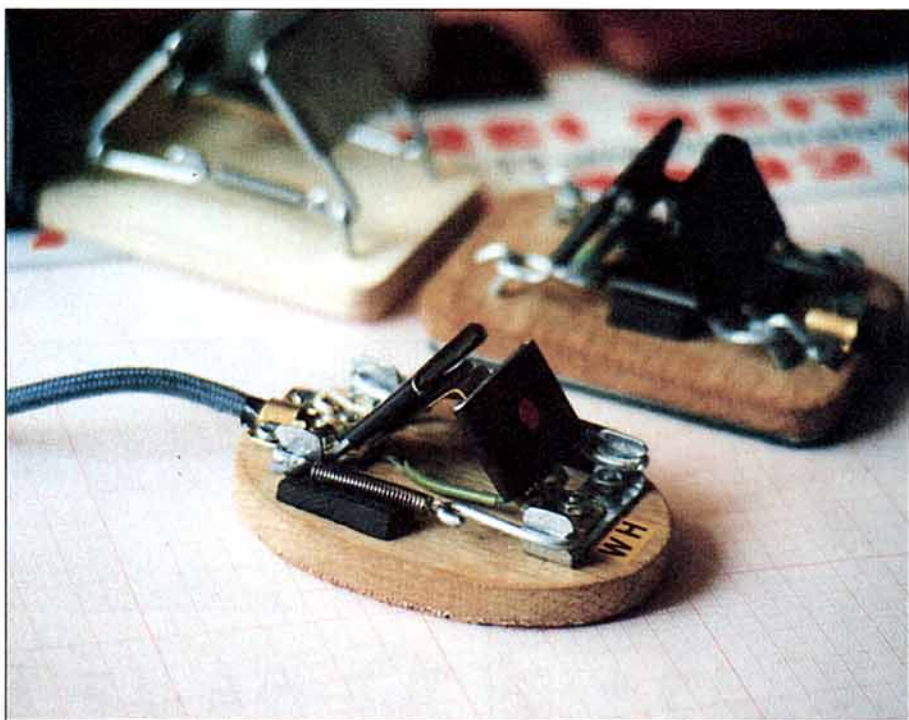
Eventually you will make two identical, precisely fitting frames. Cut the ends to size, deburr, and bend the centre U up 45° along a line 10mm from the hinge axis.

Cut and drill the contact carriers (5); tin them completely before soldering the contacts to them. A short length of 0.6mm bare copper wire (13) is soldered to each. Attach the contact carriers to the contact bracket (4) with double-sided tape at the top and fix with adhesive (such as Uhu) at the bottom; this allows some contact adjustment before the adhesive sets.

Roll opposing edges of each finger pad (10) over the sides of its paddle frame, closed side up, and solder in place.

Install the paddles, mark the contact location, disassemble, drill and solder the contacts in. Sand the top sides smooth.

Clamp the cable (16) to the base and solder its wires to the contact leads (13) and the earth lug (12).



OE1WH's unique Mousetrap paddle key.



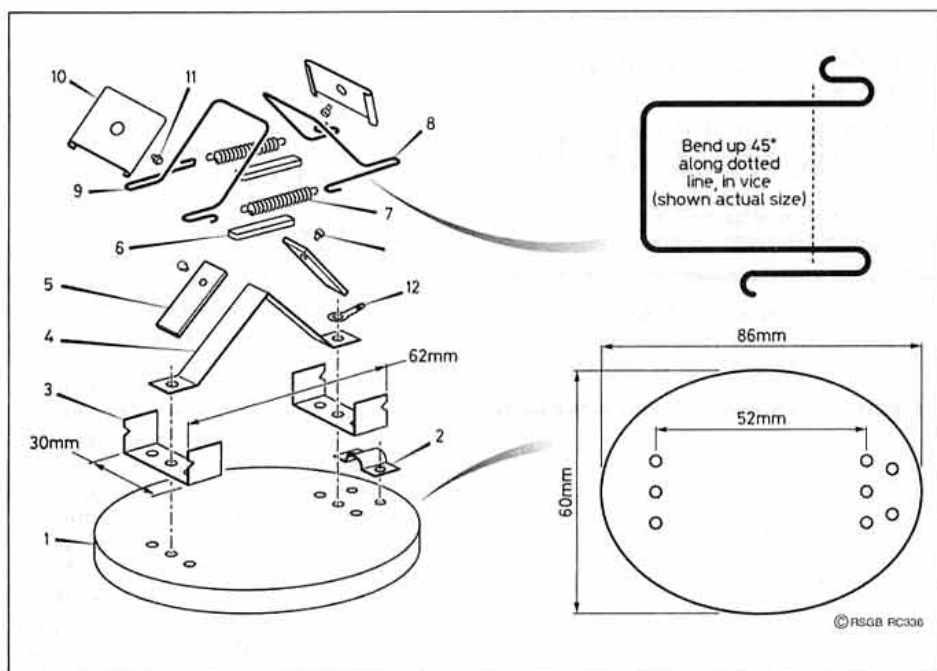


Fig 1: Exploded view of the Mouse Trap paddle with frame bending template. The item numbers are referenced in the components lists.

Re-install the paddles. Adjust the contact spacings to between 0.5 and 1mm by bending the long hook of each paddle frame. Cut strips of foam rubber (6) to fit between the springs (7) and the base (1). Attach with double-sided tape. The foam rubber should increase the contact spacing only marginally.

The upper surface of the finger pads can be finished and insulated with adhesive plastic tape, or decorators' foil secured with double-sided adhesive tape. The underside of the base can be faced with cork or rubber sheet (18). As a final touch, mark the dot paddle with a dot in contrasting colour.

## COMPONENTS LIST

No:	Description
1	Base, hardwood, 8mm thick
2	Cable clip
3	Hinge frame 2x, 1mm steel plate, galv, 50 x 10mm
4	Contact bracket, galvanised 1mm steel plate, 79 x 10mm
5	Contact carrier, 2x glass-epoxy PCB material
6	Strips, foam rubber, see assembly instructions
7	Helical spring 2x 4mm D, 20mm L, (radio dial cord tensioner); stretches to 30mm under 300g pull
8&9	Paddle frame 2x, 2mm D galvanised steel wire, (ex clothes hanger) bent as per template
10	Finger pads 2x, 0.5mm tin plate, 40 x 21mm
11	Contacts 4x, silver, 4mm D, 2.5mm neck (ex relay)
12	Solder tag
13	Wire 2x, bare copper, 0.6mm D

### Other materials (not illustrated)

Double-sided adhesive tape  
Plastic tape or decorators' foil to cover finger pads  
Cable, shielded pair, with stereo plug  
Adhesive, general purpose, Uhu  
Cork or rubber sheeting for under base. Approx. 2mm thick (felt is not recommended - it slides)  
Bolts & nuts x8, M3 x 8mm

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FIRST OF ALL, THANKS to everyone who has written to me about *In Practice* - and particularly for new questions which other people will find interesting too. It often takes some time for the answers to come through into *RadCom*, so bear with me if you don't see anything for a few months. Questions and comments arriving by packet radio are often answered sooner, because it's that much easier to write an answer for future use in the column and send an advance copy as a personal reply.

## BLOWERS FOR POWER AMPLIFIERS

**HOW DO I CHOOSE** a blower for a power amplifier using a pair of 4CX250Bs or similar? Should it blow into the grid compartment or the anode compartment?

IN DAYS OF OLD, transmitting valves were very similar in construction to valves for receiving - much bigger, of course, but still recognisable. The revolution that the Eimac company began with the 4X150A was to eliminate the glass envelope and move the anode to the outside, in the form of a finned heat-exchanger cooled by forced air. Glass was relegated to the insulation around the base pins and between the screen ring and the anode. The 4CX250 (Fig 1) completed the transformation by replacing glass with ceramic, which can withstand higher temperatures.

In case the 4CX doesn't look like any valve you've ever seen before, the anode cooler is the finned structure at the top, separated by a ceramic cylinder from the screen ring around the base (also connected to the right-most pin). The centre spigot connects to the control grid, and the remaining pins on the base are for the heater and multiple grounding of the cathode. This construction results in a very compact valve, only 63mm long and 42mm in diameter, which is suitable for use up to UHF



Fig 1: An Eimac 4CX250R ceramic-metal tetrode.



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

and in a coaxial cavity if required, yet it is capable of delivering several hundred watts of RF power. Other manufacturers quickly followed suit, and now valves with the same air-cooled 'external anode' construction are available up to the hundred-kilowatt level.

Air is a poor heat-exchange medium, so you have to push rather a lot of it through the anode cooler of a 4CX to keep the temperature within limits, typically 250°C for ceramic-to-metal seals. The normal way to do this, as originally recommended by Eimac (nearly 50 years ago now!), is by blowing the air into a sealed grid compartment (Fig 2). A special 'air system' socket allows a healthy cooling blast directly on to the base and up past the valve. A ceramic or PTFE chimney keeps the air flow confined around the outside of the valve and through the anode cooler. The hot air then escapes into the anode compartment and eventually out of the amplifier.

The manufacturer states the minimum pressure required in the grid compartment to produce the necessary air flow through the anode cooler. You can measure this pressure very easily using a home-made water gauge (Fig 3). This need be nothing more than a length of transparent plastic tubing (6mm typical diameter, from most DIY stores) taped to a ruler and partly filled with water. Add some red ink for ease of viewing, and a tiny drop of dilute detergent to stop the water sticking to the walls of the tube. When the free end of tube is inserted into the grid compartment this simple gauge will show you the air pressure. For accurate readings, take care not to locate the open end of the tube anywhere where there is a strong airflow; a quiet corner is usually a good place. Allowing for pressure losses elsewhere in the system, you need at least 1 in water-gauge pressure for a 4CX250 blown in this way. For a pair of 4CX250s the airflow requirement doubles but the pressure stays the same.

Unfortunately small blowers aren't very good at generating pressure. Propeller-fan blowers are useless for this purpose because they are designed only to move air against a very low resistance. You need the centrifugal type of blower shown in Fig 2. Fig 4 is a rough estimate of the pressure generated by such blowers, according to the diameter of the vaned 'hamster wheel' inside which moves the air. Note: this information is only valid for motor speeds of 2600-2800RPM. Do not use a blower with a lower motor speed than this - it definitely won't give you the pressure you need. Also, do not remove the casing of the blower, as suggested in one long-running

ARRL design for 144MHz. There's a reason for that special 'snail' shape, and the blower won't develop much pressure without it. According to Fig 4, either one or two 4CX250s in the configuration of Fig 2 will need a blower with about a 4.5-in wheel diameter, such as the Airflow Developments 45CTL or the Air Control Installations VBL5/3. The more common '4in' blowers are marginal, and if your amplifier continues to survive using one of those, it's a tribute to the valves and not the blower! There's a lot more detail in Chapter 6 of *The VHF/UHF DX Book* (see RSGB Bookshelf, pages 94, 95).

Meanwhile Fig 4 gives you some idea of what to look for in a blower, either new or surplus. Once again I emphasise, the motor speed **must** be 2600-2800RPM (on a 50Hz supply), and you measure the diameter of the wheel across the vanes, not the diameter of the casing which is of course much larger. You can't judge if a blower is any good by the amount of air it delivers in free-discharge conditions - that doesn't tell you anything you need to know. To test the blower properly, just find yourself a small cardboard box and cut holes in it for the blower and the valve socket. Make a much smaller hole in one corner for the water manometer. It doesn't matter if the box leaks; if the blower has sufficient pressure-generating capacity, you'll be surprised how much extra airflow it can supply while hardly affecting the pressure at all. If the pressure does drop significantly due to leakage, the blower is marginal for your application. The whole job takes about 15 minutes, or half an hour if you have to make the manometer as well. This is time well spent before committing yourself to any metalwork, so don't ever plan to use a blower without testing it first.

However, there's more to this story. Ever since K2RIW published his novel stripline amplifier using a pair of 4CX250s on 432MHz,

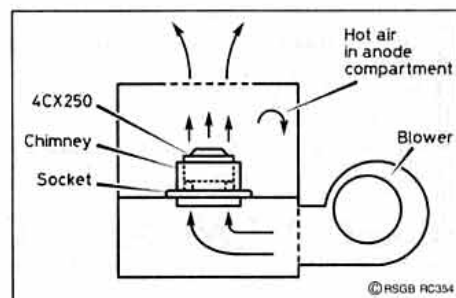


Fig 2: Traditional cooling method using a centrifugal blower and a sealed grid compartment.

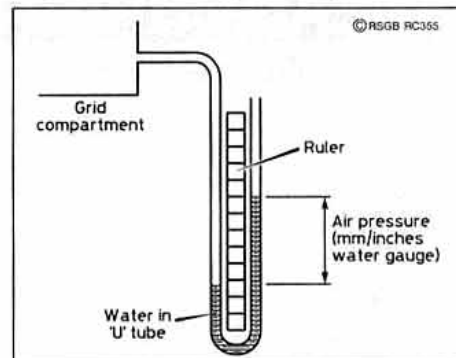


Fig 3: A simple U-tube water gauge for measuring air pressure - from *VHF/UHF DX Book*.



there has been controversy over his equally radical method of cooling the valves. The RIW blows air into the anode compartment and places the chimney on top of the valve rather than around it (Fig 5). A fraction of the air is bled down into the grid compartment, cooling the base as it goes.

This arrangement has several advantages and one big disadvantage. The main advantage is that the airflow resistances of the anode cooler and the base are now in parallel rather than in series, so the blower needs to develop significantly less pressure. You may even be able to use a smaller blower, for example one with a 4in wheel diameter which would be marginal in the traditional configuration of Fig 2.

Also the anode compartment is cooled by the incoming air rather than heated by exhaust air, which can significantly decrease tuning drift and the overall temperature of the amplifier case. The big disadvantage is that the seals around the base of the valve are no longer cooled by a direct blast of air; instead the air flows past and around the base, and out through a vent in the grid compartment. The need to regulate the outflow through the grid compartment places more responsibility on the constructor, and if you get it wrong you may well lose the valves by overheating the base seals.

Yet the K2RIW cooling method does work. Almost every new design of VHF/UHF amplifier I've seen in recent years has adopted it, and some valve manufacturers now recommend it alongside the traditional method. Many HF amplifiers using 'external-anode' valves continue to employ the bottom-to-top method of cooling, although some now fit an exhaust chimney to the top of the valve and have the blower air inlet inside the case. Cool air thus flows inwards from all around the

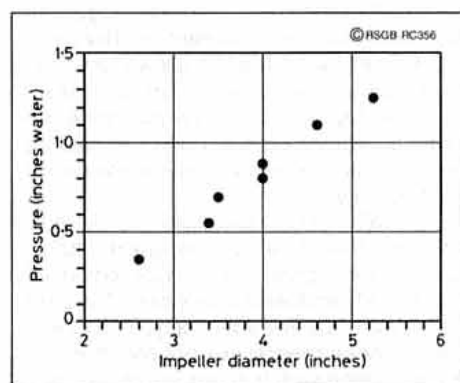


Fig 4: Approximate pressure-generating capabilities of 2600-2800 RPM centrifugal blowers depends on the wheel diameter (from manufacturers' data).

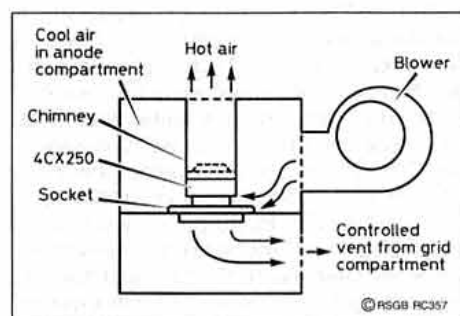


Fig 5: The 'K2RIW' method of cooling.

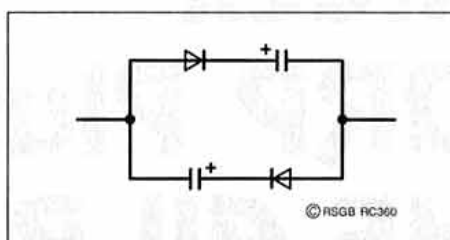


Fig 6: Vertical-plane radiation pattern of a dipole one wavelength above ground. Maximum gain is almost 6dB over the same dipole in free space.

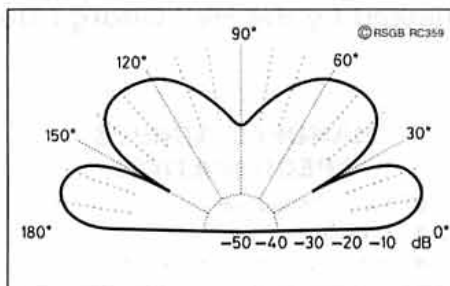


Fig 7: Simulating a bipolar electrolytic capacitor using two capacitors and two 'steering' diodes.

amplifier case, keeping the overall temperature down, and the slightly warm air then enters the blower which pressurises the sealed grid compartment. The upper chimney exhausts the hot air directly out of the amplifier and into the room.

This seems a very effective system for amplifiers which do not have a sealed anode compartment.

Returning to the K2RIW amplifier in particular, experience suggests that the size of vent originally recommended for the grid compartment, 0.75in diameter and screened, is far too small, amounting to much less than 0.5in<sup>2</sup>. The grid compartment vent in my own amplifier has more than twice that area, and a 4in blower has continued to cool the same pair of valves over several years of punishing use in contests and moonbounce.

Equally to the point, it is possible to entirely remove the cover of the grid compartment without the pressure in the anode compartment changing at all, so there is plenty of scope for increasing the vent area without losing cooling flow through the anodes. Obviously this will depend to some extent on individual blowers, so build yourself a manometer and check it out.

## ANTENNA ROUNDUP

### GAIN OF ANTENNAS OVER GROUND

The question keeps arising about the quoted gains of antennas mounted over reflecting ground. At 144MHz and above, antenna gains are always quoted relative to a reference antenna in free space, and professional gain measurements take great pains to control or eliminate ground effects. But at HF (and also the 'border country' of 50 and 70MHz) the

effect of ground cannot possibly be ignored.

At certain wave angles above the horizontal, the signal from any antenna placed over reflecting ground will be enhanced by the ground reflection. At other vertical angles the signal will be cancelled, and the effects of ground reflections will totally dominate the antenna's radiation pattern in the vertical plane. Fig 6 is a typical example, though the angles of the maxima and minima in the pattern will change with height.

Up to 6dB of 'ground gain' is available at the best angles, so if you compare the gain of an antenna over ground with the standard reference antenna, a dipole in free space, you immediately pick up an extra 6dB of 'free' gain! Unless you're aware of this, it can lead to absurdities such as "The gain of a dipole over ground is 6dBd." More importantly, it can lead some antenna manufacturers to inflate the gains of their products. For example, a 3-element HF yagi may have a true gain of about 5dBd (dB over a dipole, both antennas considered as being in free space), but the manufacturer adds another 6dB to account for the ground reflection, inflating the 'catalog gain' to 11dBd.

The only way to avoid falling into this trap is to know your antennas, and have some idea of the gain you can expect from other antennas of a similar type. I keep saying this, but evidently can't repeat it often enough: Antenna technology is sufficiently mature that it's no longer possible for new designs to produce a lot more gain than the competition. Comparing antennas of similar size and appearance, you're most unlikely to see more than 1-2dB of difference in real gain - and that's an outside estimate. Anything higher than that is either over-enthusiasm or calculated commercial hype.

### BIPOLAR ELECTROLYTIC CAPACITORS FOR ROTATORS

In July's column on rotators I mentioned the common fault, that the bipolar electrolytic capacitor in the motor circuit fails. If your rotator turns more slowly than it used to, suspect this component; and if it is housed in the rotator itself, remove it and fit the replacement in the control box where temperatures are kinder.

Although bipolar electrolytics are now available from most of the major component dealers, Ted Hatch, G3ISD, reminds us of an old trick (published in *Technical Topics* and elsewhere) for simulating a bipolar electrolytic using two ordinary electrolytics of the desired value and voltage rating. Fig 7 shows two alternative circuits that have the same effect.

The two diodes (1N4002 or similar) 'steer' the alternate AC half-cycles through the appropriate capacitor so that neither capacitor experiences reverse voltage. Although I would not recommend it for use with 240V AV split-phase motors, the diode trick works fine for rotators.

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.



# Index QRP Plus HF All Bander

reviewed by the Rev George Dobbs, G3RJV

**T**HE QRP PLUS is a fully synthesized, processor controlled, all band, CW/SSB transceiver from Index Laboratories.

An essential part of a user review is to use the equipment and, in some two months of operation, I have put the QRP PLUS to the test in both home station and portable conditions.

The most interesting period of portable operation was during the Friedrichshafen Hamfest. The QRP PLUS was situated in a Lithuanian tent, using a 20 metre dipole strung from a Russian ex-army pole, operated by a Croatian, a Slovak and a German, we were refreshed by beer from a Turkish CB group and the evening finished with Russian brandy. It was a very good field test by any standards!

## MADE BY MEDICS

THE QRP PLUS is the first amateur radio product of Index Laboratories, a company which normally produces medical equipment, owned by Bruce Franklin, KG7CR. The high standards usual in medical equipment seem to have been applied to the transceiver.

It is well made in a sturdy 1/8" aluminium case which holds five printed circuit boards: four of them stacked on top of each other, separated by screens and the fifth holding the large LCD display and switches. Ease of operation is aided by large knobs and buttons and the top panel is filled by a more than adequate 3.5" round loudspeaker.

## INSIDE THE BOX

THE TRANSCEIVER IS based upon an Intel 80C39 processor chip, chosen because of its high immunity to RF energy. The chip controls the frequency, display, filters, RIT, SPLIT, iambic keyer, sidetone and memories. Most functions are controlled by a combination of buttons and the main tuning knob. This is a gratifyingly large knob with a finger indentation for ease of use. The tuning knob serves a number of functions. It sets the frequency of operation. There is no band change switch. When the MEM button is pressed, the tuning knob controls steps from one stored frequency to the next. When the BANDWIDTH button is pressed the tuning knob sets the receiver bandwidth and when the BANDWIDTH and REV buttons are pressed together, the key speed is set by the same knob. The normal tuning rate is about 4kHz per revolution, but the FAST button increased this rate to about 100kHz per revolution.

In addition to the tuning knob, LCD display

## MANUFACTURER'S SPECIFICATION

- 5 watts CW and SSB
- All Bands 160 - 10 metres
- SCAF Digital Audio Filter (Variable Bandwidth 2400Hz to 100Hz in 100Hz steps)
- Compact Size: 5.5" W x 4" H x 6" D
- Low Power Drain: 12VDC at 1.2A Transmit, 140mA on Receive
- 20 Memories
- RIT and SPLIT operation
- Full CW Break In
- Built In Keyer
- General Coverage Receiver (but no AM)
- Transverter Facilities

and function buttons, the front panel also includes a volume control with on/off switch, a fixed 20dB attenuator and a relative power / S-meter. A three position toggle switch gives the options of normal transceiver operation, RIT or SPLIT working. The MEM button has the useful feature of being able to toggle between the working frequency and another frequency in memory.

The back panel contains three recessed preset controls: The SIDETONE level (but not the frequency) can be adjusted, the CW POWER can be adjusted from zero output to more than 5 watts on each band, the MIC GAIN sets the appropriate gain according to the microphone in use.

The QRP PLUS uses a single conversion up-converting design. The IF frequency is 50MHz with bi-directional circuits in the IF and filter chain. Selectivity at the 50MHz IF frequency is provided by a 6-pole 2.4kHz crystal filter with an adjustable SCAF (switched capacitor audio filter) digital filter at audio frequency.

Principle function of the crystal filter is to reject the opposite sideband. Overall receiver bandwidth and filter shape factor are controlled by the variable digital audio filters. The synthesizer is a single loop design. Both the first mixer and the product detector are SBL1 passive mixers.

The basic synthesizer uses 2kHz steps with intermediate steps of about 10Hz obtained through direct microprocessor control of the reference. In practice this produces a very smooth tuning rate of CW and SSB signals. A power MOSFET, used well below its maximum rating, provides the transmitter output stage.

## PERFORMANCE

HOW DOES THE QRP PLUS perform? The receiver is a delight to use. It appears to detect signals down to about 0.25µV, certainly it can hear more signals than one could hope to work.

A key feature is the variable SCAF filter. The operator presses the BANDWIDTH button and the display shows the bandwidth frequency in kHz. The tuning knob is used to toggle the bandwidth of the filter from 2.4kHz to 100Hz in 100Hz steps. As the bandwidth is closed, should the required station begin to fall out of the passband, the BANDWIDTH button can be released and the tuning control reverts to tuning to readjust the frequency. The filter is free of ringing even in the 100Hz position and its effectiveness is quite remarkable. CW stations can be resolved in very difficult conditions in the narrowest positions and the 2.0 and 1.8kHz positions help to resolve SSB signals in crowded situations.

On transmit, the results are what is to be expected with a 5 watt signal .... and that is quite a lot. One of my first contacts from home using a simple wire doublet was a two way QRP QSO with VE2KN. He was using 3 watts and we exchanged S 5/6 reports. The break-in is smooth full QSK which allows for snappy operation and is invaluable for contest and DX work. My SSB operation was rather limited but I worked several European stations, mainly on 20 metres with good reports on the audio quality.

The QRP PLUS does seem to be rather 'microphone critical'. It is designed to take a speaker microphone of the type commonly sold for FM handheld transceivers. The termination did not agree with the type I had and I used a cheap electret microphone insert and a push button switch. Index will sell a matching microphone and can quote available microphones which will suit the QRP PLUS.

## HOWEVER...

I REALLY ENJOYED using the QRP PLUS but like every piece of equipment it has its weaknesses. The AGC is audio derived and has that slight asthmatic sound common to audio AGC, although it is better than most. Like most modern synthesized transceivers, the QRP PLUS uses the output low pass filters to provide the receiver input filtering. In practice the QRP PLUS performed surprisingly well on the 40 metre band in the evening, the SCAF filter and 20dB attenuator are also a great help. One good test of the receiver did occur during my portable operating at Friedrichshafen. There was a high power





SSB portable station on the same field, operated by a gentleman from a country where they eat a lot of pasta, which was producing splatter on every HF band! A combination of the attenuator and audio filter allowed successful CW operation with the QRP PLUS.

There was a report of birdies from an early example of the QRP PLUS. These were just

below 7.3MHz, out of the UK band but just within the US band. I could find them on my receiver but they were of a low order and the current production models include an extra lowpass filter on the output of the BFO, the source of the problem.

The receiver is general coverage and will tune from 1.8MHz to 29.7MHz but, sadly,

lacks an AM detector, although to be fair to Index they do not promote the general coverage facility in their advertising literature. I hope they add an AM detector in later models, it could prove to be a popular additional feature.

I would also like to see the very clear, LCD display provided with back lighting. It seems this was omitted as part of the effort to provide the surprisingly low power consumption on receive.

## CONCLUSIONS

TAKING INTO ACCOUNT the range of facilities, the ease of operation and the performance on the air, the QRP PLUS is probably the best dedicated QRP transceiver that I have ever used.

The standard of construction is excellent, the receiver is well above average and the SCAF filtering is a joy to use. In spite of my few complaints, it offers a real option for the serious QRP operator. Its compact size, rugged construction and low power consumption also make the QRP PLUS an ideal transceiver for portable operation.

## AVAILABILITY

THE QRP PLUS is now being imported into the United Kingdom by Waters & Stanton, and is available at a cost of £649. For more details contact Waters & Stanton, 22 Main Road, Hockley, Essex SS5 4QS. Tel: 01702 206835.

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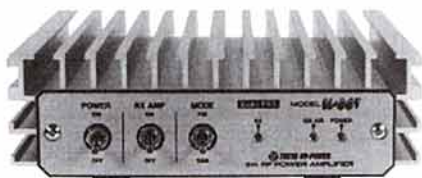
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## STABLE LC OSCILLATORS

DESPITE THE ATTRACTIONS of crystal resonators in conjunction with frequency synthesis as a means of obtaining stable frequency generation, there remains a real need for free-running LC-type VFOs with stabilities approaching those of low-cost crystal oscillators. The search for improved stability of LC oscillators began in the 1920s and continued in the 1930s and 1940s. By the mid-1950s, virtually all the basic requirements needed for reasonably stable LC oscillators were understood and suitable circuits developed for use with thermionic valves. Since then, there have been few major developments with most work focused simply on adapting the proven valve circuits for use with solid-state devices, although much more attention has been paid to oscillator noise since the publication in 1953 of the book *Vacuum Tube Oscillators* by W A Edson.

One of the earliest oscillators that provided good stability on HF was the Franklin oscillator developed in the 1920s: Fig 1. This used two active devices, providing sufficient gain in the amplifier/phase inversion section to permit very loose coupling to the frequency-determining high-Q LC resonant circuit. The Franklin has several other advantages including the connection of the tuned circuit directly to earth and the use of a two-terminal coil. Curiously, the Franklin oscillator, developed for the Marconi Short Wave Beam system, has never been widely used in the USA where engineers continued to investigate single-valve circuits based on variations of the Hartley and Colpitts oscillators.

The early 1930s, with the coming of higher-gain tetrode and pentode valves, saw the introduction by J R Dow (*Proc IRE*, Vol 19, (1931) pp 2095-2108) of electron coupling within the valve in conjunction with either Colpitts or Hartley oscillators to provide an oscillator much less affected by variations in the HT supplies. The ECO took advantage of the fact that a drop in screen voltage can compensate for a drop in anode voltage. The ECO, as adopted by amateurs, also had the advantage that the tuned anode circuit from which output is taken can be at double the frequency of the frequency-determining resonant circuit, making it easier to achieve good stability.

The introduction of neon-stabilised voltage regulator tubes by the end of the 1930s also made it possible to achieve better stability from basic Hartley and Colpitts oscillators without electron coupling, provided always that the components and circuit parameters were well chosen. It was soon recognised that a high-C tank circuit was particularly important, although this limited the frequency span of the oscillator; no problem for amateur bands but a disadvantage for general-coverage receiver oscillators.

A simple but important modification to the basic Hartley circuit was described by A F Lampkin (Lampkin's Laboratories, Florida and also a radio amateur of 1924 vintage who wrote frequent articles in *QST* in the 1930s) in 'An improvement in constant-frequency oscillators' (*Proc IRE*, March 1939). Surprisingly little advantage has ever been taken by amateurs of his discovery that by simply tapping the grid connection down the coil, the influence of the active device can be reduced

## Pat Hawker's Technical Topics

by a factor of ten or more: Figs 2 and 3.

Lampkin's idea was however recognised by Walter Van Roberts of the RCA Patents Division, but also, as W3CHO, the first person ever to describe a unidirectional close-spaced rotary Yagi beam antenna (*Radio*, January 1938, pp19-23 & 173). In 'The limits of inherent frequency stability' (*RCA Review*, April 1940) he concluded that to obtain optimum stability from an LC oscillator:

- Make the fundamental frequency as low as possible.
- Make the Q of the coil as large as possible at the fundamental frequency. This means that the coil should be as large physically as there is room for within the shield can, subject to clearance of at least half a diameter, as well as that the coil design should be good in other respects.
- Use the loosest couplings between the tuned circuit and the tube that will give the required output, and use a low enough bias resistor so that the effective transconductance in the oscillating condition is not seriously reduced.
- For the oscillator tube choose one which has a high ratio of transconductance to capacitance fluctuations when operating at the required level.
- Keeping the oscillation strength constant, vary the ratio between the grid and plate couplings. The best ratio depends on the ratio between the capacitance variations of the grid and plate.

These points remain as valid for solid-state devices as for valves. Walter Roberts also advocated as 'tricks of the trade': The use of temperature compensation; supporting the tuned circuit on a single rigid member to avoid bending and vibration of its parts; reducing the power taken from the oscillator as much

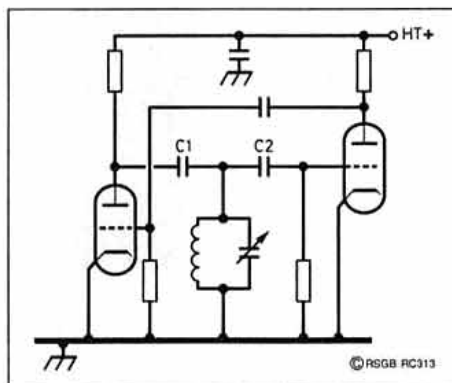


Fig 1: The basic Franklin Master Oscillator, first described in 1930, uses very low value capacitors C1, C2 (about 1 to 3pF) imposing a very light load on the high-Q tuned circuit. Further advantages include the two-terminal inductance, and the earthing of one end of the resonant circuit. This form of oscillator can be readily adapted for use with MOSFET devices.

as possible and preferably taking output at a harmonic frequency; supplying screen voltage from a voltage divider whose two portions have resistances forming the combination that best compensated for variations in supply voltage, and stabilising the supply voltage.

About 1938, Geoffrey Gouriet of BBC Research developed a series-tuned form of oscillator (Fig 4) sufficiently stable to be used as a crystal-substitute for broadcast transmitters. Because of the war, full details of this was not published until after J K Clapp of the General Radio Company had independently developed a similar circuit in 1946, details of which were published in 'An inductance-capacitance oscillator of unusual frequency stability' (*Proc IRE*, March 1948). Clapp later recognised that his oscillator, quickly taken up and widely used by amateurs as the Clapp oscillator, should rightfully be called the Gouriet-Clapp oscillator. He also noted that the same form of oscillator had also been developed independently by O Landini in Italy and described in *Radio Rivista* in 1948. A detailed paper by Gouriet was published in *Wireless Engineer*, April 1950.

E O Seiler, W8PK (later W2EB) described in *QST* (November 1941) a 3.5MHz keyed VFO which he described as a 'low-C electron coupled oscillator' as an alternative to the popular high-C Colpitts oscillator and with a

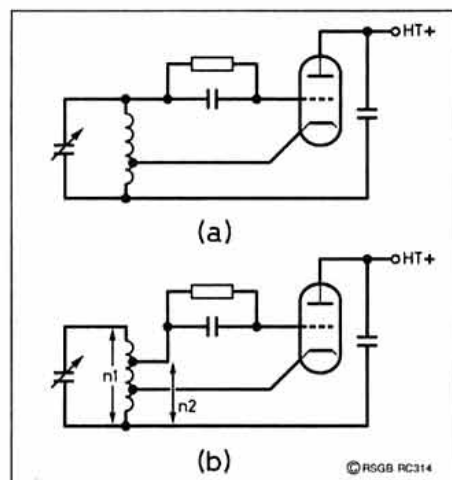


Fig 2: A F Lampkin in 1939 showed that a high-C Hartley oscillator (as typically used in the once popular ECO VFO) could be improved by a factor of about ten times simply by tapping the grid [gate or base] connection down the coil.

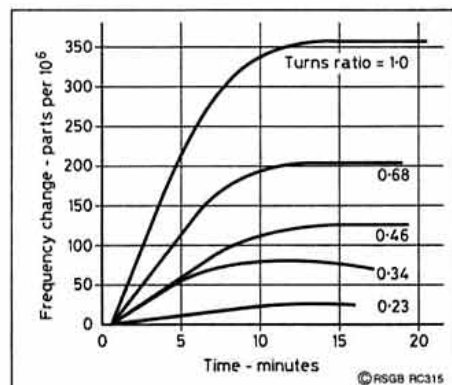


Fig 3: Showing how the long warm-up drift of a Hartley valve oscillator can be much reduced by tapping down the coil. Performance with various ratios of n1:n2 are shown.



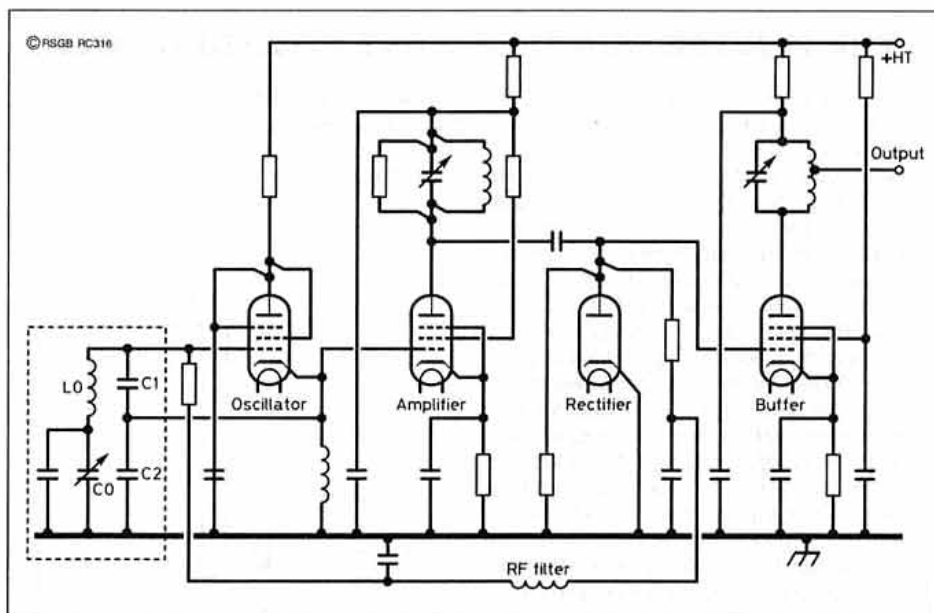


Fig 4: The BBC high-stability master oscillator developed by Geoffrey Gouriet about 1938 but not fully described by him until 1950. The stability obtained is, for all practical purposes, a function only of the parameters of the single tuned circuit at series resonance. The unit provided a one hour stability of the order of  $\pm$  one part in a million, and ten parts in a million over 24 hours. The same basic oscillator circuit was later developed independently by J K Clapp and published in 1948.

circuit arrangement similar to but different in some respects from the later 'Vackar' or 'Tesla' oscillator developed by the Czech engineer Jiri Vackar who worked for the state-owned Tesla organisation. Vackar developed his oscillator circuit in 1945. It was described with English-text in *Tesla Technical Reports*, December 1949.

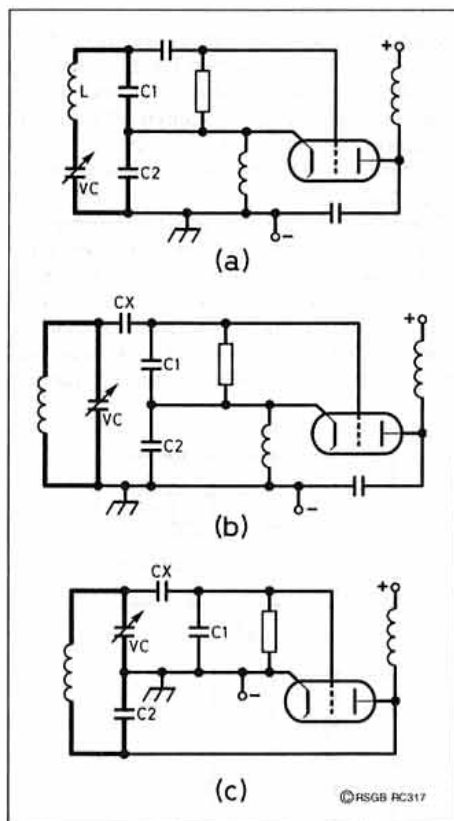


Fig 5: Three high-stability oscillator circuits showing the minor, but significant, differences between them: (a) Gouriet-Clapp with series resonance; (b) Seiler low-C Colpitt's oscillator with parallel resonance; (c) The Vackar oscillator in which the ratios  $C2:CV$  and  $C1:Cx$  should both be about 1:6.

The Gouriet-Clapp, the Vackar (Tesla) and W8PK's Seiler oscillators (Fig 5) were analysed by J K Clapp in *Proc IRE*, August 1954 ('Frequency Stable LC Oscillators') suggesting that the good frequency stability range of the Vackar extends over a tuning range of 2.5:1 compared with 1.8:1 for the Seiler and 1.2:1 for the Gouriet-Clapp, thus awarding the edge (at least for receiver applications) to the Vackar. In March 1955, Tesla submitted a report on the Vackar oscillator to the CCIR SG1, Document 57E, pointing out that the high frequency stability was accompanied by low harmonic content.

The first publication in an amateur journal was by David Deacon, G3BCM, *RSGB Bulletin*, March 1956, pp3471-2 ('The Tesla Oscillator') reproducing information on the precautions required to achieve high stability. Unfortunately, somewhere along the path from Czechoslovakia to Brussels to the UK there was an unfortunate mix-up with the result that G3BCM inadvertently transposed the suggested values for  $Cx$  and  $C1$  of Fig 5(c). These should have a ratio of about 1:6 to provide an impedance step-down from the resonant circuit to the active device. This quite serious error, which impaired stability, was reproduced in the *RSGB Amateur Radio*

*Handbook* (3rd edition, pp 169-70) and also in several designs published in the 'Bull'. It was not until 1965-66 that the error was spotted and corrected by W H ('Bert') Allen, G2UJ, and Lyell Herdman, G6HD, (see correspondence in the 'Bull', January and March 1965).

In September 1966 in a reply to E Chicken, G3BIK, I drew attention to the differences between the Seiler and Vackar designs. A Seiler-type oscillator using a bipolar transistor was designed by W3JHR in the early 1960s and became popular as the 'synthetic rock VFO': Fig 6.

By then bipolar transistor and FET devices were being used for Vackar type oscillators, although many designs continued (and still continue) to neglect another requirement of the Vackar for optimum stability and minimum harmonic content: the need to use a relatively high capacitance across the tuned circuit. Indeed one of the very few Vackar oscillators that meet all the original requirements for optimum performance was the FET design by Peter Martin, G3PDM, published originally in *TT*, (December 1969, pp846-847) and since reproduced in a number of other RSGB publications including *Amateur Radio Techniques* 7th Edition (pp166-167) and *Radio Communication Handbook* (4th Edition, pp 4.27 and also the new 5th Edition).

The G3PDM Vackar design (Fig 7), although now 25 years old, remains possibly the most stable LC oscillator ever described for home construction. His design intended as a tuneable local oscillator covering 5.88 to 6.38MHz in a double conversion hybrid valve/transistor receiver had a switch-on drift of 500Hz in the first 60 seconds (caused by the gate-source capacitance changing as the 2N3819 junction FET achieved thermal stability) and thereafter a drift of only about  $\pm$  2Hz per 30 minutes, that is about 3 parts in 10-million! As for all LC oscillators, the mechanical stability and correct choice of good-quality components is as important no matter which basic oscillator configuration is used.

To achieve the sort of stability quoted, G3PDM listed 15 points to watch. An updated version is given below:

- Strongly recommend the genuine Vackar circuit, ie with  $C1/(C4 + C6) = C3/C2$  and both approximately 6:1 [ $C4 + C6$  should have sufficient capacitance to form a high-C tuned circuit. In the original Vackar prototype covering frequencies around 1.7MHz, a 1000pF trimmer was used across the coil. The Seiler is a low-C

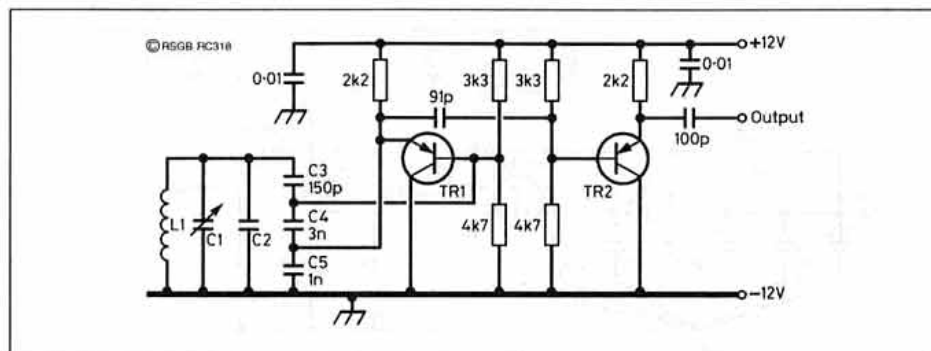


Fig 6: W3JHR's 'synthetic rock' popular transistor VFO of the early 1960s was an adaptation of the Seiler oscillator. In the original design, W3JHR used high-quality components from the American surplus ARC5 equipment. Transistors were 2N384 but similar later devices can be used.



- configuration, the Vackar high-C - G3VA].
- Use a FET rather than a valve; they are more stable, last longer, use the same circuits, and are cheaper. [But note that solid-state devices are more affected by changes in the ambient temperature than valves once these have fully warmed up - G3VA].
- Use a strong box (die-cast or better).
- Use a high-quality variable capacitor. The so-called straight-line-frequency (SLF) laws are for a tuning range of 2:1 and not useful for normal amateur use. However Jackson Type U101 (or surplus RF-26 type) capacitors provide an almost perfect SLF law when tuning 500kHz in this circuit.
- To reduce the heating effect of the RF currents in C2, this should be an air-spaced trimmer; this allows adjustment of feedback so that the circuit just oscillates, reducing harmonic output and drift due to interaction of harmonic energy.
- All variable capacitors should be effectively cleaned, preferably in an ultrasonic bath, before using (G3PDM stressed this really makes a difference).
- Preferably use (continuously) adjustable temperature compensation. Originally G3PDM used an Oxley 'Tempatrimmer' or the lower cost Oxley 'Thermo Trimmer' with a more restricted range of compensation. [These appear to be no longer available. Suitable temperature coefficient capacitor(s) may have to be chosen by trial and error. Alternatively if a differential capacitor is available as shown in Fig 8(a) or with conventional trimmers as in Fig 8(b) - G3VA].
- C1, C3 and C6 should be silvered-mica types, Araldited to surrounding solid object (this reduces 'warbling' during a 'mallet test').
- The gate resistor should be a 2-watt solid carbon type for minimum heating and low inductance.
- Use of a buffer/isolating amplifier is essential. With a feedback pair, the gain is readily adjusted while negative feedback maintains low harmonic content.
- Circuits using a diode from gate to earth for rectification outside the FET appear to increase drift.
- Power supplies must be very well stabilized, and disc ceramic by-pass capaci-

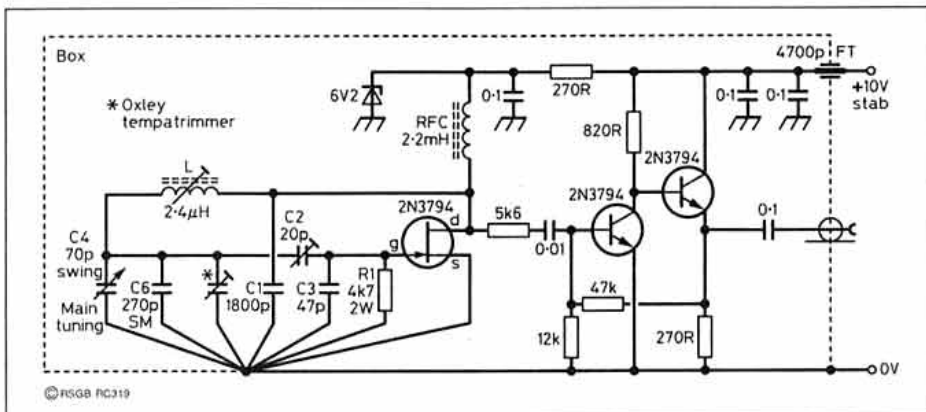


Fig 7: The high-stability FET Vackar oscillator covering 5.88 to 6.93MHz developed by G3PDM in the late 1960s but still a valid design for HF VFOs for receiver, transmitter and transceiver applications.

## THE MULTIEE QUARTER-WAVE FOLDED DIPOLE

RECENTLY IN DISCUSSING folded dipole antennas, I mentioned that I had not come across the concept of a quarter-wave folded dipole with high-impedance feed until following up a reference to the original American TV-sound antenna erected on the Empire State Building in the late 1930s. Memory is fallible - I now realise that the dual-band W6BCX Multiee (Fig 11), described in *TT* over 30 years ago and reproduced in all editions of *Amateur Radio Techniques* (but in which an error has crept in giving the feed impedance of the  $\lambda/4$  element as 600Ω instead of up to 6000Ω although this does not affect the dimensions or matching) has the top radiator (as used on the higher of the two bands) in the form of a  $\lambda/4$  folded dipole, fed from 50Ω coaxial cable by means of the vertical section which forms a linear impedance transformer on the higher band while acting as a top-loaded vertical radiator on the lower band.

This antenna, described in various editions of *The Radio Handbook*, is claimed to form a compact antenna which can be used 'with excellent results on 1.8/3.5MHz (with 52ft vertical section and 70ft span) and 3.5/7MHz (with 28ft vertical section and 35ft span). The 'feedline' should be held as vertical as possible, since it radiates vertically polarized signals on the lower (fundamental) frequency. A good 'earth' system, preferably of buried or

elevated radials, is desirable for the lower-frequency band but of little importance on the higher band with horizontally-polarized radiation from the  $\lambda/4$  'top'.

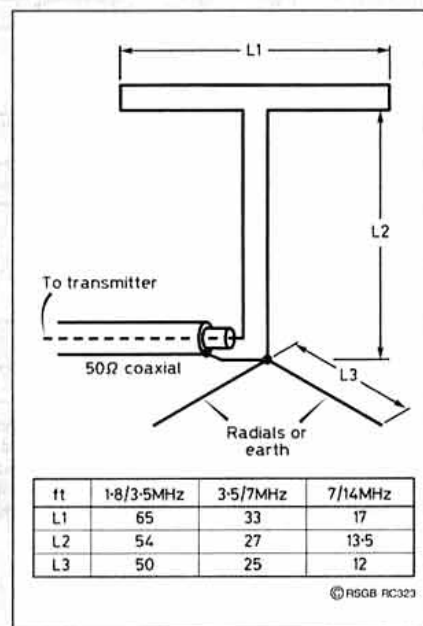


Fig 11: The Multiee two-band antenna using L1 as a  $\lambda/4$  folded dipole on the higher band, with the high feed-impedance (up to 6000Ω) provided by L2 acting as a linear transformer ( $\lambda/2$  times velocity factor).

tors should be liberally used to prevent unwanted feedback along the supply rails. [Note modern IC regulators would be an improvement on the use of Zener diodes - G3VA].

- Oscillator components around the tuned circuit (L, C1, 2, 3, 4, 6, R1 and FET source) should have a single common earthing point. (This usually means using one of the fixing screws of C4).
- Ceramic coil formers are preferred. An iron dust core facilitates VFO calibration, but ferrite cores must be avoided.
- Keep leads short, and use stiff wire (16 or 18SWG) for interconnections in the oscillator tank circuit.

G3PDM added that performance achieved

included: resetability - after switching off for 12 hours, returns to within 10Hz of previous frequency; voltage stability (without zener diode or other voltage regulation), 10% change in supply results in shift of 8Hz; G3PDM standard mallet test results in average shift of 6Hz; scale linearity - maximum error over 500kHz band, 12kHz 'without any codging'.

American amateurs have been relatively slow to adopt the European Vackar circuit. However, a number of articles have appeared in the American magazines since the 1970s, although few seem to have appreciated that the Vackar, unlike the Seiler, really requires a

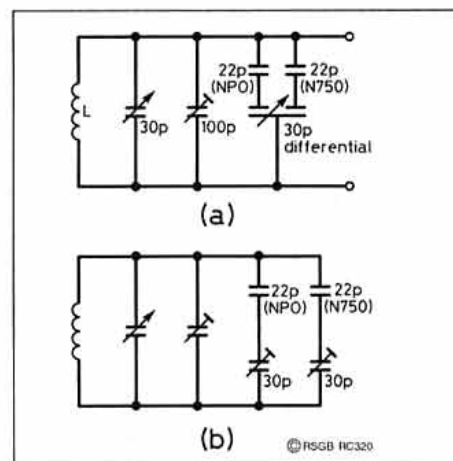


Fig 8: How adjustable temperature compensation can be achieved without the special Oxley devices. (a) With a differential capacitor; and (b) with two conventional trimmers.



high-C tank circuit. This factor is still missing from an otherwise useful article 'The Vackar High-Stability L-C Oscillator' by Floyd E Carter, K6BSU (*CQ*, June 1994). He uses a dual-gate MOSFET (40673 or SK3050) and gives component values for tuning 4.0 to 4.3MHz: **Fig 9**. Although he gives impressive performance figures, it seems likely that these could be improved simply by reducing the inductance of L1 and adding considerably more capacitance to the trimmer C2 and tuning capacitor C3 to make it a true Vackar circuit, and possibly by removing D1.

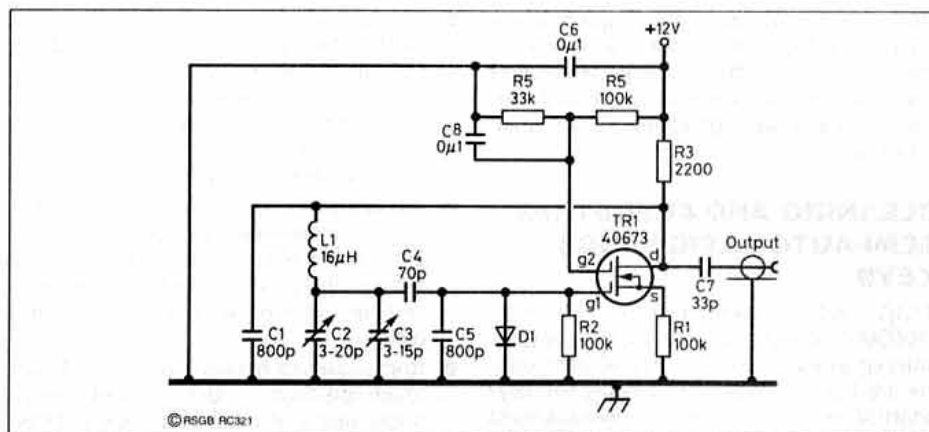
Among the constructional features he recommends is the use of a high-quality double-bearing air variable capacitor for C3, with the trimmer C2 also a ceramic-base air variable. C1, 4 and 5 are made up from parallel capacitors adding up to the required value since the use of multiple capacitors reduces the RF heating of the dielectric in the individual capacitors. C1 and 5 are each implemented from two polystyrene capacitors, while C4 is a combination of an NPO ceramic and a silver mica capacitor, providing temperature compensation for the positive temperature coefficient of L1. This seems an odd way of providing temperature compensation since the purpose of C4 is to form part of a capacitive potential divider with the effect of tapping down G1.

In his prototype, he used a 62pF NPO ceramic with 8pF silver mica but I feel that G3PDM's use of a trimmer adjusted to just beyond oscillation together with temperature compensation directly across the tuned circuit should prove the better approach. For supply regulation, K6BSU uses an adjustable IC regulator type LM317 set to provide 12V, although he found that the circuit oscillated well with 7V supply. He recommended following the oscillator with a high input impedance Class A buffer amplifier. The use of a diode (D1) between gate and source of the MOSFET to provide a form of AGC is common practice but has been criticised by some designers. An effective AGC system (as used for example in the original Gouriet BBC VFO) is undoubtedly beneficial; a simpler arrangement has been proposed for use with a dual-gate MOSFET Vackar oscillator (**Fig 10**) although I have not heard of this being used in practice.

## 1:1 BALUNS - FURTHER ELUCIDATION

THE BRIEF QUOTATIONS from the long article in the April 1994 *CQ* magazine by W2FMI (*TT*, August 1994, pp44-46) concluded with the comment that W2FMI was quite sure that some readers would disagree with his views. Certainly his rather dogmatic criticisms of baluns other than his favoured bifilar toroidal designs based on the Guannella current balun concept stirred Les Moxon, G6XN to put a seemingly incontestable case for trifilar rod and toroidal types. He writes:

"In comparing my own considerable experience of baluns as set out in my *HF Antennas for All Locations* (2nd edition, pp56-60 includes considerable updating) published by the RSGB there appears to be little common ground with the views of W2FMI. I rest my case on the excellent performance of the 1970s KW balun, an early, low-cost design using a single-layer trifilar winding on ferrite



**Fig 9:** A recent 4.0 to 4.3MHz oscillator design by K6BSU. It seems likely that performance could be improved by increasing the value of C2 + C3 and decreasing that of L1 to make it a true Vackar oscillator. Component information recommended by K6BSU. C1, C5 800pF polystyrene (see text). C2 air trimmer for setting calibration. C3 air variable for main tuning. C4 70pF made up of NPO ceramic + silver mica to provide required temperature compensation. C7 33pF NPO ceramic. C6, C8 0.1µF 25V monolithic capacitor. TR1 40673 or SK3050 dual-gate MOSFET. D1 1N4153 or 1N914 silicon signal diode. L1 16µH 34 turns No 26 enam rod in full conformity with KISS principles. Far from observing any poor high or low frequency responses, I found the SWR was close to unity over the entire range from 3.5 to 30MHz; moreover it was remarkably tolerant of mismatch. See also the views of Ian White, G3SEK, as set out in his excellent article on baluns in the December 1989 *RadCom*.

"It is instructive to try to trace conflicting views on the reason for the failure of many early (and some later) balun designers to recognise the over riding importance of leakage inductance, an error *not*, repeat *not*, made by KW Electronics whose baluns first came to my notice in 1971. W2FMI's views on some 1:1 baluns are fully in line with my experience of one widely advertised balun kit (Amidon) which falls (or fell) into this error, although the fault is easily remedied as described in the 2nd edition (p58 col 2 and top of p59 col 1) of my book. A balun is not always needed but this is rarely a safe assumption (see my Fig 4.36 and related text), and the need for a tertiary winding is clearly demonstrated by J J Nagle, K4KJ (*Ham Radio*, February 1980).

"My view that SWR within the balun is usually not important appears to lack supporters but rests firmly on the assumption (admittedly not valid if one tries to cover four octaves with a single balun) that the line length is so short that it can be treated as a fragment of lumped circuit; as I have shown

(2nd Edition, page 56) this and the transmission line approach used by G3SEK give the same answer as regards line imbalance, and both demand closest-possible spacings in the specially important case of low-impedance loads. I am not clear as to the reasons why W2FMI wants to cover 2-30MHz with the same balun."

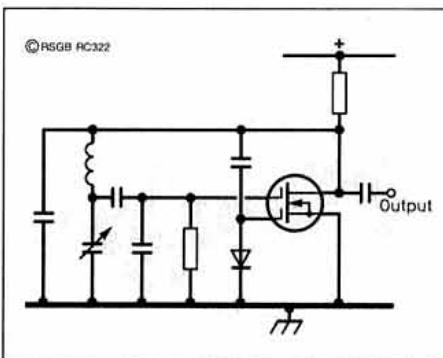
Nic Hamilton, G4TXG, is also concerned that there is evidently still some confusion about 1:1 baluns and the third wire. He writes:

"There are two types of true balun as defined by W7EL in 'Baluns: What they do and how they do it' (*The ARRL Antenna Compendium Vol 1*): (1) the voltage balun, which forces the potential difference at its output terminals to be equal in magnitude and opposite in phase with respect to ground; and (2) the current balun, which forces currents through its output terminals to be equal in magnitude and opposite in phase.

"The two-wire 'balun' has been christened a 'sortabalun' by W6DEZ (see *Solid State Design for the Radio Amateur* by W7ZOI and W1FB, pp55-6). The two-wire 'balun' is a 'sorta current balun': when it is connected to a balanced load, the 'live' conductor carries a slightly greater current than the 'earth' conductor due to additional current through the magnetising inductance and resistance. This bias can be corrected by connecting a third wire between the 'live' output and ground.

"When the two-wire 'balun' is used on a transmitting antenna, the effects of this imbalance are very small, because the transformer is usually arranged to have small losses and large inductance. However, the imbalance becomes very important when the balun is used in an impedance bridge, a reflectometer or a hybrid transformer.

"There are three different types of three-wire winding for the 1:1 balun: (1) trifilar winding (Turrin): a true voltage balun; (2) bifilar winding with a third wire on a different core: a true current balun, as used by DJ7VY in 'Wideband directional coupler for VSWR-measurements on receiver systems' (*VHF Communications*, 3/83, pp158-162). [This article has a reference to the Hewlett Packard application note AN86, p11 'Using the vector impedance meters'. If anyone has one, G4TXG, 78 High Street, Henlow, Bedford-



**Fig 10:** Possible simple AGC system for use with a Vackar oscillator which should be an improvement over a diode connected directly between gate and source. D1 any good quality RF silicon diode.



shire, SG16 6AB would much appreciate a copy). (3) Bifilar winding with a third wire on the same core (Ruthroff), a voltage balun at low frequency, a current balun at high frequency, and a 'sorta goodness knows what' in between."

## CLEANING AND ADJUSTING SEMI-AUTOMATIC ('BUG') KEYS

'DOC' WESCOMBE-DOWN, VK5HY/VK4CMY, believes that a straight hand keys and bug-keys are the only true Morse senders around - the electronic keyers and keyboard Morse generators have dehumanised the basic skill of Morse code, which is the making and spacing of characters, numbers and symbols correctly by hand".

While I guess that this is today a minority opinion it is true that "seasoned CW operators take pride in the upkeep and adjustment of both straight and bug keys, this never being seen as a chore but the key element in the formation of Morse." In *Amateur Radio*, July 1994, pp11-12, VK5HY provides detailed information on maintaining and adjusting semi-automatic keys, and the following information has been abstracted from his article:

He stresses that no two operators key exactly the same way and that the most important aspect is correct adjustment of the key for sending well-formed dots (dits). Again, just as a person's handwriting changes so does the 'feel' of the key change, so that you need to be able to adjust it to suit your current keying. Fig 12 shows the usual adjustment points of most makes of semi-automatic keys. Note that some experimenting with the following adjustments may be needed.

- Adjust both the left and right trunnion screws so that the vibrator arm (pendulum) lies perfectly straight and butts lightly against the damper wheel. This sets the initial 'hands off' key position.
- Slide the speed weight(s) on the vibrator arm to the end position giving the slowest dot speed. Tighten the weight(s) ensuring they do not contact the damper wheel.
- Hold the flat thumb paddle in the constant dot position and adjust the left trunnion screw so that the vibrator dot can move to the left about 0.4mm (1/64 inch). Use a small scale rule to check. Then tighten the left trunnion screw.
- Hold the paddle for steady dots and allow the vibrator arm to stop vibrating. Now adjust the dot contact screw (on the dot post) so that the contact just makes firm connection with the vibrator dot, giving steady tone from your monitor. Tighten contact screw and release paddle.
- To check dot adjustment, hold paddle to activate string of dots - there should be at least 40 dots for each paddle movement, if necessary repositioning dot contact screw to obtain this. When the vibrator arm stops oscillating, the vibrator dot should come to rest lightly touching contact screw.
- With two speed weights, to speed up dot rate, slide the innermost weight towards the paddle end. Always keep the outermost weight at end of vibrator arm, regulating dot speed with innermost weight.

- For dash adjustment, position dash contact for a lateral movement of 0.4 to 0.8mm (1/64 to 1/32 inch). Typically, thickness of a sheet of typing paper or a business card. Movement is a matter of personal preference, but the smaller the spacing the better the feel of the key.
- Adjustment of spring tensions is a matter of personal preference. Typical about one third of the tension available. The less tension, the easier the feel. It depends on whether you have a 'light' or 'heavy' arm action.
- Some users have been seen to use finger touch operation similar to that preferred by some users of electronic keyers. However, the bug key was developed to prevent 'glass arm' in protracted operation. VK5HY suggests "set the key side on to you (ie vibrator arm longways to the front of your body) located directly in front of the shoulder of your non-keying arm and rest the non-keying forearm parallel to the key. Also rest the keying forearm flat on desktop so your body weight is taken evenly by both forearms. The key is now operated by wrist rotation towards (dashes) and away (dots) from your body front. This posture immobilises whole arm action and encourages rolling of the wrist - just as with a straight key, wrist action produces rhythmic Morse, not 'nerve Morse'. Once this basic action is acquired, the bug can be repositioned to suit individual situations."

On the subject of key maintenance, VK5HY recommends periodic inspection of the condition of gold or silver contacts. They should be clean and bright. Place clean typing or copying (bond) paper between the contacts and pull it through several times to wipe the contacts. Use switch contact cleaner also but *no*, repeat *no*, matchbox striker paper, wet'n'dry paper, or any abrasive cleaner such as Brasso or Silvo. These should be used only when attempting to resurrect badly pitted and burned contacts although it is better to have new contacts or re-plate old ones. If you do wish to resurrect pitted contacts use (1) very fine emery paper; (2) very fine wet'n'dry paper; (3) crocus cloth or toothpaste on a polishing cloth; (4) bond paper.

To remove leftover polishing debris, use cotton buds and rubbing alcohol or petrol. Clean the areas thoroughly. Don't use CRC, or sewing machine oil, etc on a bug as these attract lint and dust. Use tiny dabs of silicone

lubricant at pivot points. When not in use keep the key in a dust cover.

## HERE & THERE

PERRY CRABILL, W3HQX (*QST*, August 1994, pp68-69) draws attention to RF interference caused by household electronics, including some TV sets, VCRs, cordless phones, fax machines and even the Kenwood R-5000 general-coverage receiver *when turned off*. The usual problem is that with remote-controlled equipment, the switching-mode type power-supplies remain on when the equipment is in a stand-by mode, radiating harmonics primarily at low frequencies (long- and medium-waves).

The June *CQ* magazine reports the deaths of two well-known amateurs: Captain Paul H Lee, USN (Rtd), N6PL "a veritable fount of antenna and communications information" whose articles and books on vertical antennas are read world-wide"; and also that of well-known DXer and author Katashi Nose, KH6IJ (one time K6CGK).

Drawing on information supplied by IOD (Station Road, Crewkerne, Somerset TA18 7AR), Martin Eccles in 'Applying Crystals' (*Electronics World + Wireless World*, August 1994, pp659-663) provides a useful round-up of general-purpose crystal oscillator designs and practice - both discrete component and logic-gate based - covering oscillators from VLF to VHF.

In the May *TT*, in the item 'Working with balanced line' I mentioned the increasing use in the USA of 450Ω 'windowed' (ladder) cable but added that such cable "does not seem to be advertised in the UK but would clearly simplify the use of balanced feeders." Les Hawkyard, G5HD, points out that 450Ω ribbon feeder has been available for some time from W H Westlake of Holsworthy, Devon (see *RadCom*, May 1994, p17).

G5HD adds: "As an enthusiastic user of open-wire feeders I have tried various matching units and note that some care is needed to avoid power loss in some of the ATUs often advocated for balanced lines. Using the ferrite or iron-dust-cored transformer; split or not, in each feed line produces enlightening results. In particular those using a balun followed by an 'L' match as suggested in *QST* and *G-QRP* seem to result in the RF in the feeder being about 60% down on the usual parallel-tuned unit."

Pat Painting, G3OUC, draws attention to the press and broadcast publicity given to the development by Trevor Baylis of a radio receiver powered from a clockwork motor, giving some 20 minutes operation from a single winding of the motor. Such a receiver could be of value in countries where the cost of batteries tends to limit the use of radios. G3OUC assumes that the clockwork motor drives a small alternator of the rotating permanent magnet type, the output passing through diodes and then a regulator to provide about half-watt DC at about 9V. He feels it could provide a unique challenge to QRP operators to make the first 'clockwork-driven' transceiver contact! I recall in my youth having a toy steam-engine which could drive a small electric generator giving sufficient output to light a small pilot-bulb so that it could well be possible to make either clockwork- or steam-radio QSOs. **G3VA**

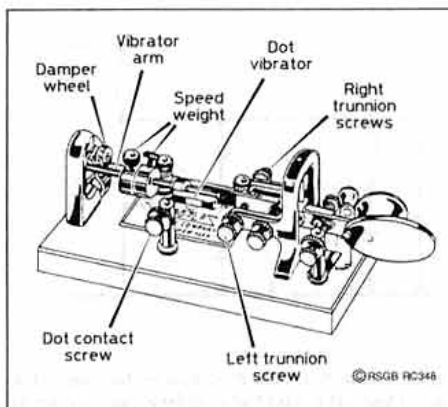


Fig 12: Adjustment points as found on most semi-automatic ('bug' or 'speed') keys.



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# 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 **MULTISCAN** modem transforms your IBM-compatible PC into a professional station which enables you to transmit and receive SSTV and FAX images, and to monitor RTTY, AMTOR and NAVTEX transmissions. The Multiscan consists of a single board to receive all modes, and the optional plug-in transmit board enables you to transmit SSTV and FAX modes. For UK prices and more information contact:

**CombiTech Computer Applications, Morelstraat 60, 3235 EL Rockanje, The Netherlands.**

AMDAT NOW supply the **ADC-60 Radio Controlled Clock** which brings the accuracy of a time standard to any computer, such as a PC, MAC or mainframe. The unit locks the internal clock to the 60kHz MSF transmission of the NPL time signal, and to the 77.5kHz DCF transmission from Germany. An LCD displays the time and date together with an indication of Lock Status. The unit comes complete with two software packages for MS DOS, (the TSR runs in the background updating the PC clock from the data received on the serial port, and the display program which graphically shows the time being received from the ADC-60). More information is available from:

**AMDAT, 4 Northville Road, Northville, Bristol BS7 0RG. Tel: 01179 699352.**

THE NEW **Waters & Stanton catalogue** is excellent value at just £1.50. It comprises 96 pages and includes good quality black and white photos of all the items listed, as well as plenty of advice for the would-be purchaser. A very useful book to keep by you. The catalogue can be obtained from:

**Waters & Stanton, 22 Main Road, Hockley, Essex. Order Line: 01702 206835/204965.**

WE HAVE JUST received Issue 18 of the **PC Shareware Update Reference** catalogue for Windows and DOS, which includes programs available from the Public Domain and Shareware Library. The software is available on CD ROM and Disk - so before spending out on expensive software, invest in this catalogue at £1.50 and see if it includes what you are looking for:

**The Public Domain and Shareware Library, Winscombe House, Beacon Road, Crowborough, Sussex TN6 1UL. Tel: 01892 663298.**



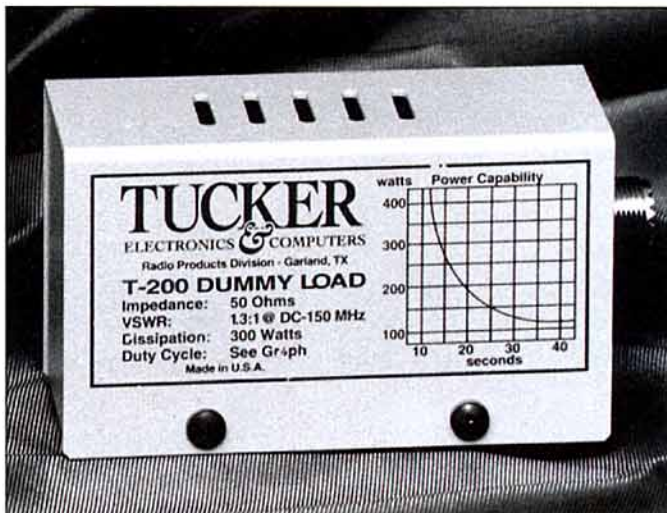
**JACKSON BROTHERS (London) Limited** has launched a new range of 6:1 **precision vernier dial drives**. Available in anodised aluminium or black finish, these are attractive for the home-brewer requiring precise, repeatable adjustment of rotary controls. Available in three sizes, 43, 50 and 70mm, with front of panel depths of 18, 20 and 22mm, shaft couplings for 0.25 inch or 6mm diameter spindles, and with a 100-division scale covering 180°. Alternative scales are available to order.

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THE **TUCKER ELECTRONICS** Company have sent us details of their range of equipment for the radio amateur and, in particular, of three new **dummy loads**. All three come with a 1 year warranty and a 30 day 'no questions asked' return privilege. The T-200 handles up to 300W and has an SWR of less than 1.5:1 from DC to 600MHz. The T-275 handles up to 1500W and is the largest dummy load produced for amateur radio use. The T-200 starts at approx £20, with the T-275 costing approx £140. For more details and a free catalogue write to:

**Tucker Electronics Company, 1717 Reserve Street, Garland, TX 75042-7621, Texas, USA.**

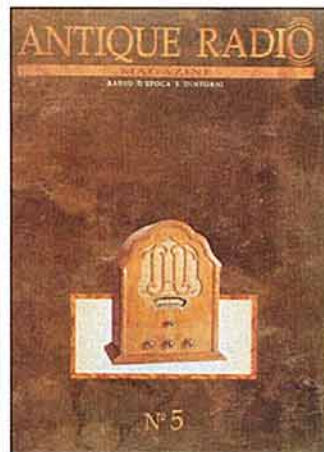


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FOR THOSE INTERESTED in **antique radio**, the new bi-monthly magazine published by Mose Edizioni is a delight. *Antique Radio Magazine* is available on subscription by post, and is written in Italian and English - a free copy will be sent on request. The magazine, printed on antique-type paper, covers the invention of radio from Marconi, through the evolution of gramophones, phonographs, military transmitting/receiving stations, telegraphs, telephone and television. The graphic image of the 30s is faithfully reproduced in the vintage prints and drawings.

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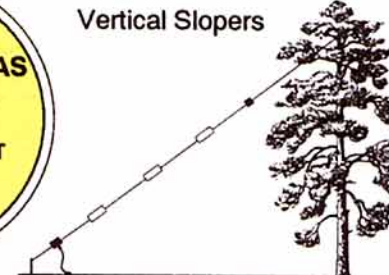
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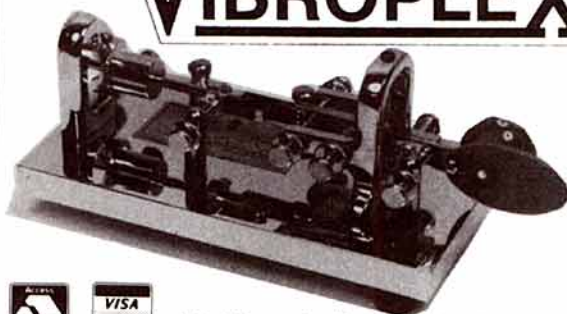
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# Getting Started on Microwave ATV

Concluding the two part article by Dave McQue, G4NJU

**C**URIOSLY, THE easiest band to get going with a transmitter is 3cm. There are many Gunn diode units (originally used in burglar alarms as movement detectors) on the surplus market. Those without an Rx diode are best although the Rx diode can be used to indicate that the Tx is working. These units were designed for 10.687GHz use but can be retuned down to 10.3GHz and sometimes lower.

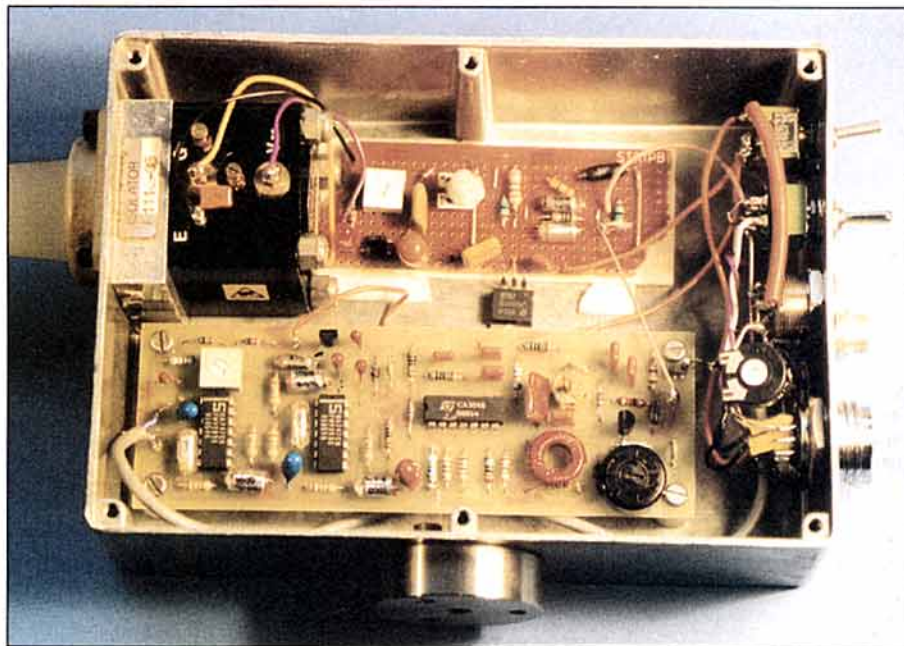
With the Solfan unit this is done by slackening the nut on the tuning screw, setting the screw with only one thread showing and then gently retightening. The power output is only about 10 milliwatts, but as antenna gains of 20dB from simple horns and over 30dB from moderate sized dishes are normal this is adequate for line of sight paths. The important thing to remember is *not* to look into the waveguide where, due to the small aperture, the local field strength is more than 10mW per square centimetre. Of course with a horn attached the aperture is increased and the field density reduced. The cast horn that comes with these units has a gain of about 10dBi and will give results over a kilometre or so. For groups of ATVers in line of sight this is the band to use. There are a few 10GHz repeaters and some of the 1.3GHz repeaters are proposing 10GHz inputs.

## GUNN DIODE MODULATOR

THE CIRCUIT OF a suitable video modulator for a Gunn diode transmitter is shown in Fig 4 and can be built on Veroboard. The Gunn diode requires a supply of about 7 to 8 volts at about 120mA. Apply more than 5V of the correct polarity to ensure the survival of the diode.

Varying the voltage varies the output frequency. Given that the input signal from the camera is 1 volt p-p into 75Ω and less than this is required for 3.5MHz deviation a compound emitter follower is used. The BF259 output transistor is one normally found in the output stages of colour TVs driving the cathodes of the CRT and I obtained some from scrap TV sets.

The input network provides the standard pre-emphasis. The 10μH choke and sound trap coil are available from Maplin as WH35Q and UL55K respectively. The video from a typical colour video camera is limited to a bandwidth of 5MHz or less but the digital output of the home computer will require a 5MHz low pass filter. A board for this is available from the BATC and this can be fitted inside the case of a Sinclair Spectrum.



10GHz Transmitter and modulator.

## RECEIVER FOR 10GHz

FOR RECEIVING 10GHz I now use modified satellite LNBs. The earlier 'Skyscan' and 'Echostar' have proved the most straightforward to convert. Pristine versions cost about £30 with secondhand ones somewhat cheaper. Ensure that they have not suffered water damage due to leakage before parting with cash. The modifications involve removing the 10GHz local oscillator dielectric reso-

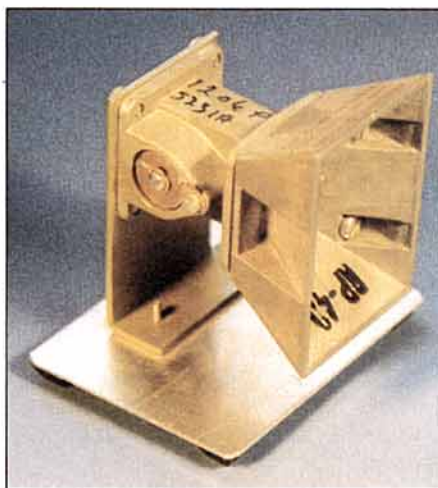
nator puck and replacing it with one that will tune the oscillator to 9GHz, I use a nominal 8.2GHz oscillator obtained from Oakbury Components.

The oscillator drain line has to be extended so it will work at 9GHz. Two other lines need to be extended in the amplifier section, (see photo opposite). The performance is such that GB3TG at 4 km distance on 10.15GHz is received just on open waveguide, although a small horn is used to avoid desensing when transmitting on 10.25GHz and to enable 'look-through'. When so retuned and connected to the Amstrad the frequency indicated, if you assume a nought inserted after the lefthand one, is that in the 10GHz band.

If you have a suitable sound LNB I can retune it for you for £20 including the resonator.

## CONCLUSION

HERE I HAVE ATTEMPTED to give you a glimpse of what is possible and show that ATV is no longer the preserve of the well heeled or highly skilled. However, those of you wishing to take a more than casual interest in ATV will be well advised to join the British Amateur TV Club (BATC) which is the specialist body affiliated to the RSGB. CQ-TV is sent to BATC members quarterly and many specialist components and publications are available to members. The annual subscrip-



10GHz Gunn diode assembly transmitter.



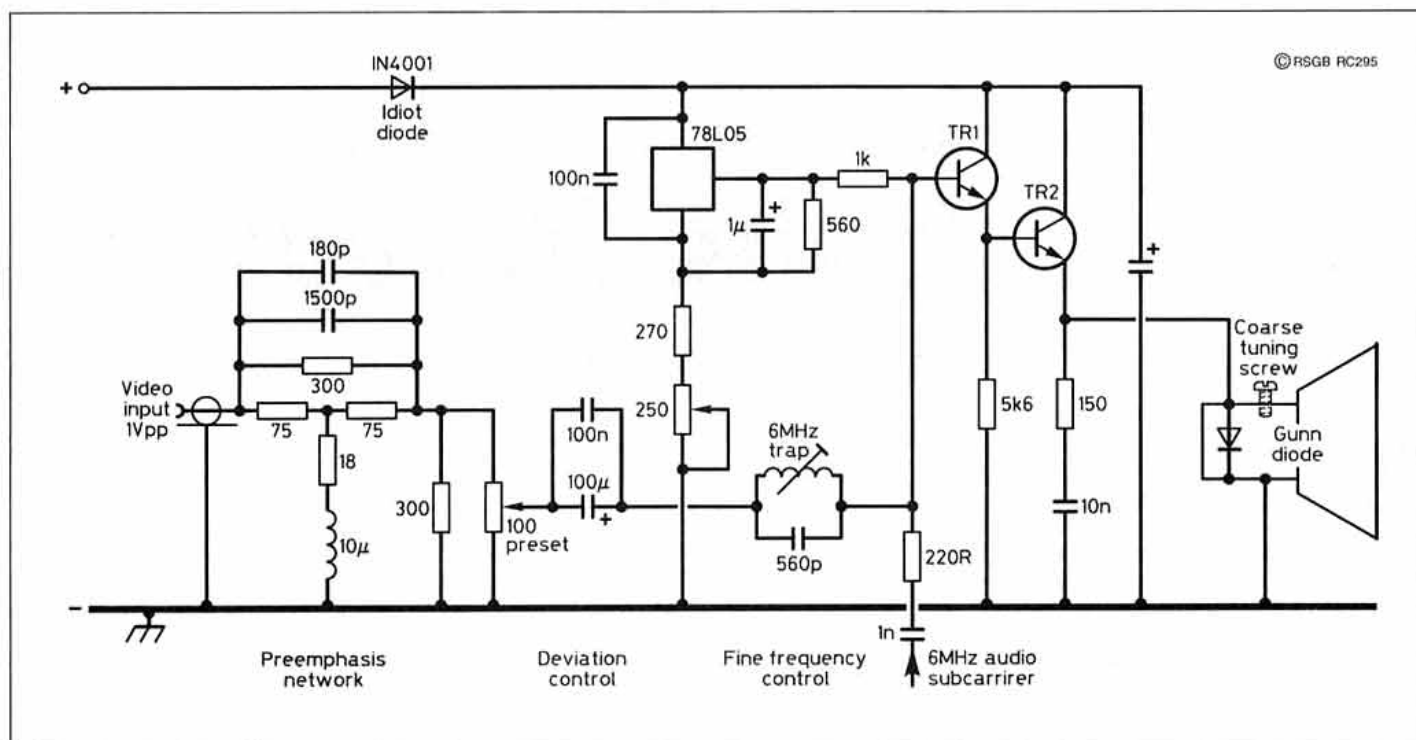


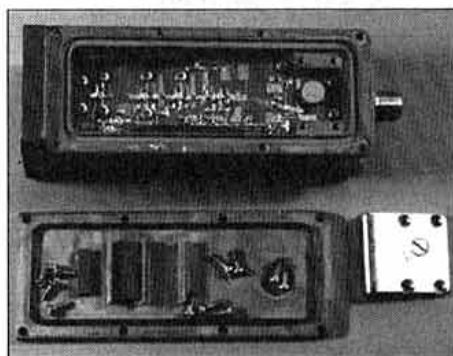
Fig 4: 10GHz Gunn diode modulator.

tion is £9. You can obtain an application form from The Subscriptions Dept, Greenhurst, Pinewood Road, High Wycombe, Bucks, HP12 3BR.

#### TV EQUIPMENT SUPPLIERS

- FOR UHF COMPONENTS, microwave transmitter and receiver kits (send for a catalogue): Mainline Electronics, Manor Court, The Ford (off Little Glen Road), Glen Parva, Leicester LE2 9TL. Tel: 0533 780891.
- The British Amateur Television Club. Please contact Dave Lawton, G0ANO, 'Grenehurst', Pinewood Road, High Wycombe, Bucks HP12 4DD.
- Worthing and District Video Repeater Group. Please contact R Stevens, G8XEU, 21 St James Avenue, Lancing, West Sussex BN15 0NN.
- QuartSLab Marketing Ltd, PO Box 19, Erith, Kent DA8 1LH (for crystals).

- Camtech Electronics, 21 Goldings Close, Haverhill, Suffolk CB9 0EQ. (for very low noise preamplifiers).
- Severnside TV Group, 15 Whitney Close, Saltford, Bristol.
- Oakbury Components, Oakbury House, Mill Lane, Berks. Tel: 0488 71458



LNB with modified tuning for 10GHz.

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# Top Band Loop for Low Noise Reception

by Richard Q Marris, G2BZQ

**T**OP BAND (1.81 TO 2.0MHz) is undoubtedly very noisy. Much of the high ambient noise is man-made or atmospheric, to which must be added the usual QRM.

This is all very well-known to users of Top Band, which is the only amateur radio band in the MF Spectrum (300-3000kHz). It can be most frustrating to hear others working DX when at your QTH the DX signals are lost in the ambient noise.

Few have the real estate to erect a Beverage antenna [1] to solve the problem. Most either give up Top Band altogether, or resort to a multi-turn small frame loop, usually indoors, either of the 'box' type or 'Spiral' type. The 'Spiral' produces superior nulling to the 'Box' but is more difficult to construct. Such a small frame loop can be anything from 24in x 24in to in excess of 60in x 60in if it is square; or the equivalent in size if octagonal, diamond or round. If properly designed it will enable DX to be heard, where previously it was lost in the ambient noise. However such an indoor loop can be somewhat cumbersome and unwieldy. The answer could well be a small ferrite loop, which if properly designed will give excellent results. The Top Band experimental loop described here has been designed to meet this requirement.

## DESCRIPTION

THE EXPERIMENTAL FERRITE LOOP is shown in Fig 1. It comprises of an 8in long x 0.25in diameter, nickel-zinc ferrite rod ( $\mu=125$ ) on to which is wound L1 resonated in a balanced circuit by a 2-gang variable capacitor C1 + C2. L2 is a small winding which couples the loop to the receiver via a length of 50 $\Omega$  coaxial feedline.

Experiments have shown that, by a careful selection from the several different ferrite materials available, it is possible to produce useful ferrite loops from VLF to lower VHF. Also that by careful permutation of rod lengths and rod diameters; turns and turns spacing; and the gap between windings and core, it is possible to tailor-make a desired directivity, or degree of nulling, or sensitivity.

It has been found that a long

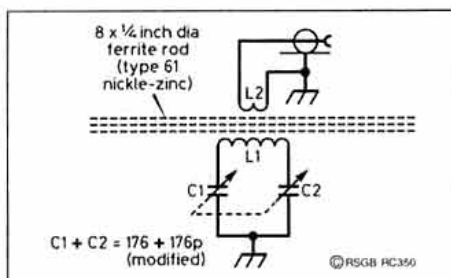


Fig 1: Loop antenna circuit diagram.

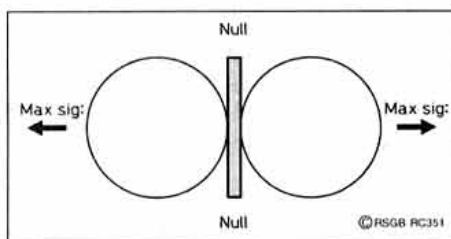


Fig 2: Loop antenna signal pattern.

thin ferrite rod with a centre winding can be made to produce the sharp and deep nulling needed for Top Band noise reduction and elimination as shown in Fig 2. Such long thin ferrite rods have to be treated with respect, and carefully protected against damage. A sharp tap or dropping it on the floor will probably result in a fracture or chipping; or it may possibly change the permeability of the core material. The ferrite rod is protected by encapsulating it in a tight-fitting plastic tube, which also acts as the coil former and provides the gap between winding and core. The device is assembled on an 8in wide single sided copper clad base board. This width offers additional rod protection.

## CONSTRUCTION

THE OVERALL CONSTRUCTION of the loop antenna is shown in Fig 3, the Ferrite Rod/Coil Assembly and (Fig 4), the Main Assembly. Details are as follows:

### The Ferrite Rod/Coil Assembly

The construction of the 8in long x 0.25in diameter rod is shown in Fig 3a. It can be constructed by fixing, end to end, a pair of more readily obtainable nickel-zinc 4in x 0.25in diameter Type 61 rods from Amidon (USA). The rod ends should be cleaned and slightly roughened by rubbing on fine sandpaper, and given an application of Superglue, and quickly and firmly pressed together while the Superglue hardens. A simple wood 'V' jig should be made to ensure that the resulting 8in rod is absolutely straight. It is a good idea to use kitchen gloves to keep the adhesive off your fingers.

The rod is pushed into an 8in length of 5/16in outside diameter clear polycarbonate plastic tubing available from Aquarist shops (Fig 3b). It may be necessary to apply a film of silicone oil to get the rod into the tube - it will depend on the manufacturing tolerances of the rod and tubing.

L1 is then wound over the centre of the tube covered rod. This coil comprises 52 close-wound turns of 26SWG DCC double cotton covered enamel copper wire. The cotton covering is a simple way of slightly spacing the coil

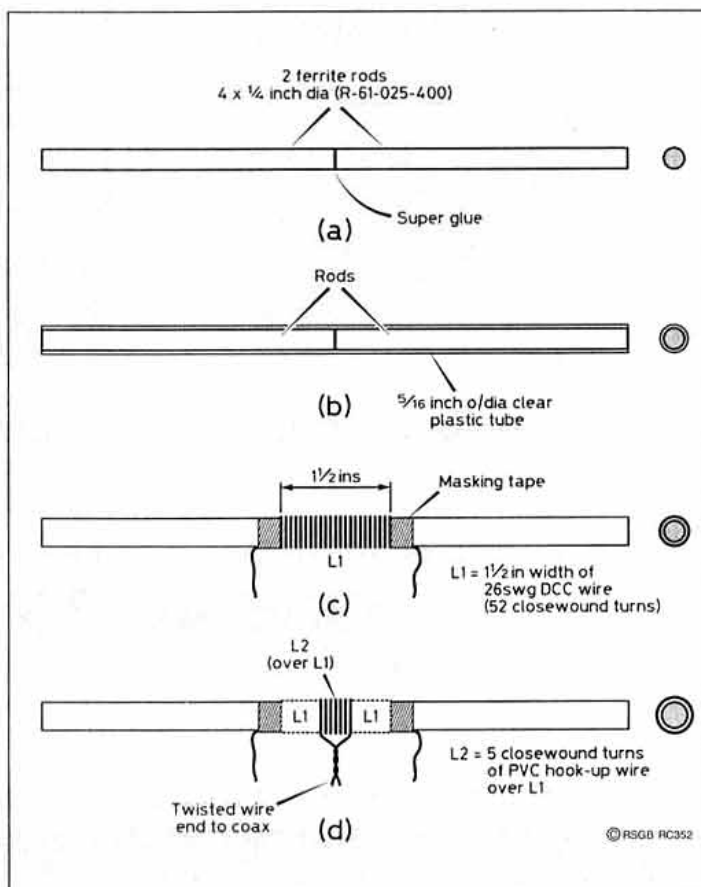


Fig 3: Construction of loop coils.



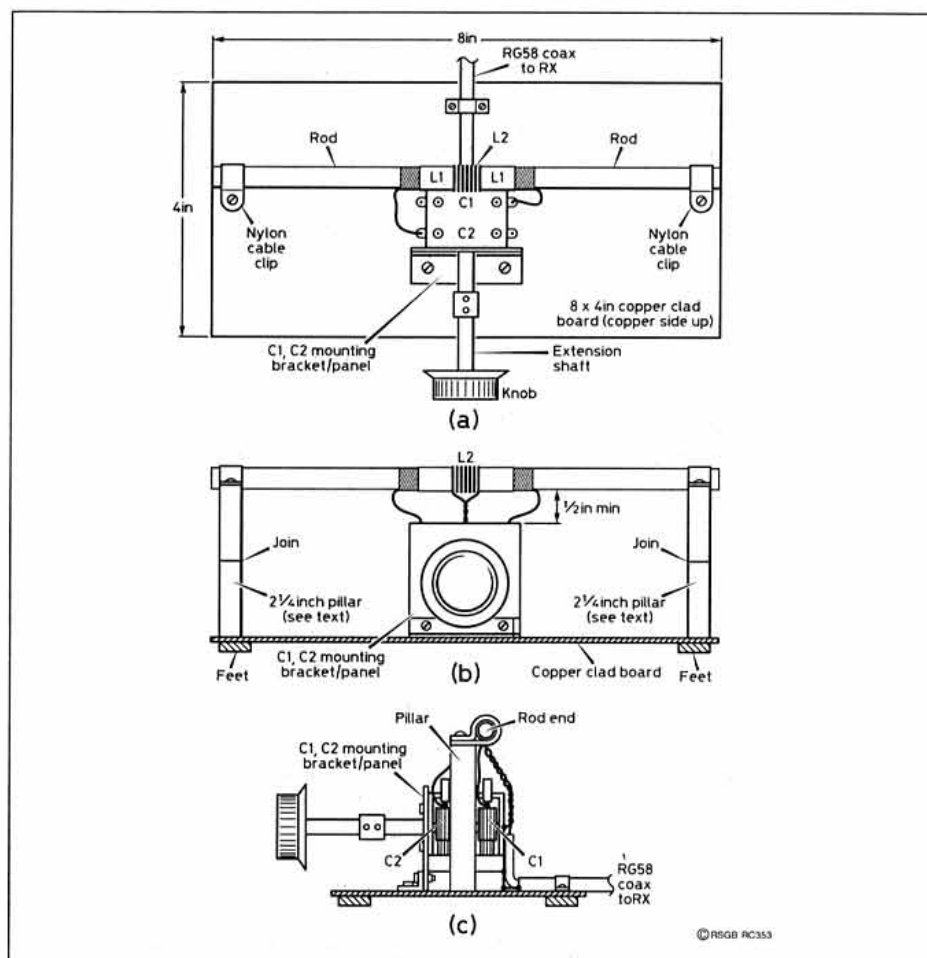


Fig 4: Construction and layout of complete antenna: (a) Plan view (b) Front view (c) Side view.

turns. The winding width is 1.50in (52 turns) - see Fig 3c.

L2 comprises five close-wound turns of PVC-covered hook-up wire, close wound over the centre of L1, with the ends slightly twisted together for later connection to the coaxial feedline (Fig 3d).

### Main Assembly

The unit is built onto an 8in x 4in piece of single sided copper clad SRBP board, acting as a baseboard. The copper surface faces upwards so that connections can be soldered to it. A self-adhesive plastic foot is fitted near each corner of the board.

The rod/coil assembly is mounted on two 2.25in vertical insulated pillars, as shown in Fig 3, and held in position with two nylon cable clips. The pillars could be fabricated from 5/16in diameter hardwood dowel. On the prototype each pillar consists of two conventional insulated pillars joined together, end to end, with a short length of M3 studding and a spot of Superglue (see parts list).

The two-gang variable capacitor C1, C2 is 176 + 176pf per section, with an integral slow motion drive. An extension shaft is fitted as shown. The two 15pf trimmers on C1 + C2 are removed. The variable capacitor is secured inverted to a small SRBP panel and a bracket as shown in Fig 4.

The wire ends of L1 drop down and are soldered to the fixed plates of variable capacitor C1 + C2. The main frame (and variable plates) of C1 + C2 is securely connected to the chassis plate with a short length of 18SWG tinned copper wire. The twisted ends of L2

are taken to the end of a 36in length of RG58 coaxial feedline. The RG58 is cable clipped to the base plate (see Fig 4a & c), and brought up the rear of the variable capacitor to meet the ends of L2. The RG58 outer braid is securely soldered to the rear main frame of the variable capacitor (see Fig 4c).

### TESTING AND OPERATION

**TUNE THE RECEIVER** for a Top Band signal on the main antenna. Remove the main antenna and connect your mini-loop antenna. Rotate C1, C2 to bring the loop to resonance, indicated by a sharp increase in signal level.

The tuning to resonance of C1, C2 is quite sharp, and tuning to one or other sideband eliminates much QRM. Loop maximum directivity is deliberately not too critical, but the nulling is very deep and very sharp, and will, with practice, eliminate or greatly reduce most man-made interference. Rotating the loop should produce a point where the signal is at maximum clarity and interference at an absolute minimum. It is useful to stand the loop on a simple turn-table, on a wood (not metal) table or bench, well away from electrical wiring and appliances.

A preamplifier may be necessary if the signal levels are low. The pre-amplifier should have a 50Ω input/output and it should be connected in the coax line between the antenna and the receiver. A suitable simple RF amplifier circuit board kit is available for under £10. If the ferrite loop is to be used as the receiving antenna in a transmitting station, then the pre-amplifier should be protected on

### COMPONENTS LIST

The following are the items used on the prototype, and their sources of supply. Most will be available from alternative sources, with the exception of the Amidon Ferrite Rods specified.

- 2 Nickel Zinc Ferrite Rods - 4in long x 0.25in diameter. Type R - 61 - 025 - 400 from Amidon Associates Inc, 2216 East Gladwick Street, Dominguez Hills, California 90220, USA.
- 1 2oz Reel 26SWG Double Cotton Covered Wire. The Scientific Wire Co, Tanaka House, 18 Raven Road, London E18 1HB.
- 1 8in long x 5/16in o/d clear plastic rigid tub from Aquarist shop.
- 4 M3 Insulated Spacers - 30mm - Maplin type FS40T.
- 2 Cable 'P' clips - natural colour nylon to UL 94V-2 5/16in - Maplin type LR46A.
- 1 8in x 4in single sided copper SRBP board - Maplin HX00A
- 4 Stick-on Feet - Maplin FW38R
- 1 2 gang 176 + 176pf variable capacitor with integral SM drive. Jackson Bros type 004 Cat No 5318/4.
- 1 Extension shaft + 1in diameter knob for above.
- 1 36in max RG58 coaxial feedline.

### Optional suggestion

Low Noise Pre Amplifier Kit (SL560C), Order code = LT42V - Maplin Electronics.

transmit, (see *Radio Communication Handbook* (RSGB) 'Receiver Protection').

### PERFORMANCE

THE FOLLOWING RESULTS may serve to give some idea of performance:

- Using this little loop, CW signals are receivable from East Coast America, and elsewhere, where previously they were lost in the ambient noise.
- A Sunday morning AM Net some 30 miles away (5 watters) can be heard comfortably whereas previously it was lost in the noise.
- It is also interesting to note that during the UK heatwave of July 1994, when twice lightning has been seen in the distance, the resultant QRN obliterating all signals when using the main antenna. However when the loop null was connected and the null pointed towards the lightning source the noise reduction was sufficiently for CW signals to be clearly heard.

### REFERENCE

- [1] *ARRL Antenna Book*, 17th Edition. Available from RSGB Sales, see pages 94/95.





## Data Stream

**RICHARD STERRY G4BLT**

1 Wavell Garth, Sandal Magna, Wakefield,  
West Yorkshire WF2 6JP

**A**POLOGIES TO THOSE readers who attempted to obtain files from the HamGopher packet radio database featured in the September column. They will have received a reply informing them that the database has closed down. The notification of the closure arrived just slightly too late for the article to be withdrawn.

### NEW ADDRESS FOR ARUG

THE ATARI RADIO User Group (ARUG) contact is still Graham Raynor, G7KCT, but he has a new address. Anyone interested in the Atari machines should send an SASE to Graham at 8 Caernarvon Court, Caernarvon Close, Hemel Hempstead, Herts HP2 4DH. To date, Graham has produced three newsletters for ARUG members.

### JVFAX VERSION 7

HARDLY HAD THE ink dried on the September column, when JVFX version 7 was announced. I referred to JVFX as 'non commercial' to avoid the risk of incorrectly describing the status of the program. However, the author, DK8JV, has now apparently clarified the position, and declared the software to be 'Freeware'. You should have no difficulty in obtaining copies from other amateurs, including Peter, G8SLB, who I mentioned in the September column.

### JVFAX INTERFACE ERROR

I AM GRATEFUL to Peter Lumb, G3IRM, for pointing out a small error in the circuit diagram of the 'big' interface for the JVFX program, supplied by some sources. Peter has been in contact with DK8JV, who has confirmed that the integrated circuit U11 should be a 74LS158, and *not* a 74LS157.

Apparently, if the wrong IC type is fitted, it is impossible to follow the alignment instructions, though with trial and error the interface can be made to work after a fashion.

### COMPUTER-RIG INTERFACING

MANY MODERN RECEIVERS and transceivers are fitted with a serial interface, so that they can be controlled from a computer. In some cases, such as on the AOR 3000(A) and AOR3030 receivers, and current Drake equipment, this is a 'proper' RS232C port that can be connected directly to a computer without any additional interface. So, if you can wire up a couple of plugs, and have a little programming aptitude, it isn't too difficult to 'Do It Yourself'. Sadly, this isn't always the case.

### TTL NOT RS232C

Most radios with serial ports do not conform to the RS232C electrical 'standard'. This includes some AOR, and all Yaesu, Kenwood and Icom equipment. Instead, the signals are at TTL levels, ie switching (nominally) between 0V and +5V.

The user must purchase an external interface, to convert the signals to RS232C levels for connection to the computer. In fact, on much non-current Kenwood equipment, and also on the TS-50, even the TTL interface is not fitted as standard, so you have to obtain a secondary internal interface in addition to an external converter interface.

I have seen a 'mods' file on packet radio, which claims that to fit the internal interface entails little more than adding two cheap and commonly available integrated circuits. This may be worth looking into, and I'd be happy to provide a copy via packet on request, but not via snail mail; sorry. Do be very careful that the information is correct, before opening up your expensive radio, and don't blame me or Kenwood if it doesn't work!

The Yaesu IF-232C external converter has a built-in mains PSU, whereas the Kenwood FIF-232C converter is powered from a 13.8V supply, and has opto-isolation of all signals, but they do a similar job. It has to be said that these converter interfaces are not cheap, so what about a bit of DIY?

### CONNECTIONS

THE FIRST PROBLEM is to establish the connections on the transceiver, as the connector used varies not only from manufacturer to manufacturer, but can even vary from radio to radio! The Yaesu FT757 MkI had a 3-pin Molex connector for the CAT interface, (Computer Aided Transceiver), whereas the FT757 MkII had a 6-pin miniature DIN connector. Yaesu have since standardised on a conventional 6-pin 240° DIN connector across their range.

Unfortunately, the information given in the FT736R manual is misleading, as is the errata sheet issued on the subject! The confusion arises because whereas 180° DIN connectors have the pins numbered in the sequence 1-4-2-5-3, looking into the socket and counting clockwise from the notch, 240° connectors have the pins numbered 1-2-3-4-5, with an optional pin 6 in the centre. The FT736R manual errata, and diagram, make sense only if you use the 'wrong' numbering sequence. Using the correct 1-2-3-4-5 sequence, the connections are shown in Table 1.

The FT990 and FT1000 use the same connections, but with minor differences. For example, pin 4 is used for a hard-wired PTT input, pin 5 is an analogue AGC output, and pin 6 is not used. However, the all-important serial data connections are the same.

Pin 1	Gnd
Pin 2	Serial Out (to computer)
Pin 3	Serial In (from computer)
Pin 4	not used
Pin 5	BUSY (squelch)
Pin 6	+13.8V

Table 1: FT736R CAT interface connections.

Kenwood radios use the same type of connector, but it's wired slightly differently. Pins 1-2-3 are the same, though Kenwood refer to the signals as TXD and RXD instead of Serial Out and Serial In respectively. However, pin 4 is a CTS handshake input line, (computer ready), and pin 5 is an RTS handshake output line, (radio ready). Pin 6 is not used. If you do not wish to use handshaking, then you only have to strap RTS and CTS together, and do the same at the computer end of the cable.

### ICOM CI-V BUS

ICOM HAVE A RATHER different system for computer interfacing, called CI-V, (ie the fifth version of their Computer Interface), using simple 2-pole 3.5mm jack connectors. The levels used are TTL, and with inverted polarity like the Yaesu system. However, this deceptively simple arrangement is used very cunningly as a single-wire bus, and can link a computer and up to four Icom radios together in a miniature network.

Each of the Icom products has a unique 'address', so the computer can direct commands to the appropriate one, and the radios can transmit information on the bus as well as receive it, eg front panel status etc.. Command data is sent in the form of packets, and these are acknowledged or rejected as appropriate.

Obviously, this rather sophisticated protocol makes DIY a little more difficult, but software developers can obtain the CI-V reference manual from Icom UK. The external RS232/TTL converter interface, model CT-17, is therefore rather more sophisticated than the Yaesu and Kenwood equivalents, as the TTL side has to combine both the send and receive RS232C data onto the single-wire bus. As with Kenwood, certain non-current models require an additional internal secondary interface.

### SIGNAL POLARITY

HAVING SORTED OUT the connections, the next job is to establish the exact 'polarity' of the signals. The RS232C lines will switch between approximately -12V (referred to as 'Mark' or '1') and +12V (referred to as 'Space' or '0') nominally, although the minimum requirement in the specification is only +/-3V. The TTL lines will switch between 0V and +5V nominally, but which is Mark and which is Space?

This information isn't always stated explicitly, so I've checked the circuit diagrams of the interfaces to verify it.

The Yaesu CAT and Icom CI-V are what could be termed 'inverted', that is to say, RS232C -12V (Mark) is translated to TTL +5V, and +12V (Space) is translated to 0V. This can be rather convenient, as you will see later. The Kenwood system, on the other hand, could be termed 'non-inverting', and the TTL levels are 0V (Mark) and +5V (Space). This is actually more logical in one sense, but not quite as convenient in some ways, as we shall see.

### DIY INTERFACES

FINALLY, THERE IS the question of physically interfacing the radio to the computer. As



I mentioned earlier, the polarity of the Yaesu CAT makes it particularly easy to establish uni-directional communication; ie controlling the radio via Serial In, but not using Serial Out (see Fig 1).

All that is required is a single general-purpose NPN transistor, two resistors, and a diode. More or less any reasonably fast high-gain general-purpose Si NPN transistor will do, eg BC107/108 etc, and more or less any general-purpose Si signal diode, eg IN914/916/4148.

The resistor values have been selected to avoid any possibility of applying excess voltages to the CAT input, even if the transistor fails. I have heard from several people who are using similar interfaces successfully. The RS232C signal is taken from the computer via pin 2 of a 25-way connector, (with pin 7 as Gnd), or pin 3 of a 9-way, (with pin 5 as Gnd). Since handshaking is not required, you should strap pins 4-5 and pins 6-8-20 on a 25-way, or pins 7-8 and 1-4-6 on a 9-way.

### GROUND ISOLATION

THE YAESU FIF-232C interface does not isolate the Gnd connections of the radio and computer, but the Kenwood IF-232C does, using opto-isolators. Although this is technically an elegant method, and may help eliminate RFI problems, isolation is probably not strictly necessary. However, because the Kenwood signals are not inverted in polarity, you cannot get away with an ultra-simple interface. You would require an extra inversion stage, which requires a +ve voltage supply, though this could be derived from the 13.8V supply to the radio.

### MORE COMPLEX DIY INTERFACES

IN ADDITION TO the above, interfacing from TTL outputs to RS232C isn't so simple either, as a negative supply rail is needed.

A better solution is to use an RS232C/TTL converter, such as the one from Maplin Electronics. This is available as a PCB, a kit, or ready-assembled, under part numbers GD93B (£3.25), LM75S (£10.99), and AM10L (£15.99) respectively.

The kit is simple to assemble, so even a timid constructor should be able to tackle it with confidence. The board derives all necessary voltages from a single +5V incoming supply, and can handle normal or inverted polarity TTL signals. Two sets of inputs and two sets of outputs are provided, so you can handle handshaking lines as well the data lines, if required. If you want to run the board off a 13.8V supply, then it's only a matter of adding a 78L05 voltage regulator IC and a couple of 10mF tantalum capacitors. How-

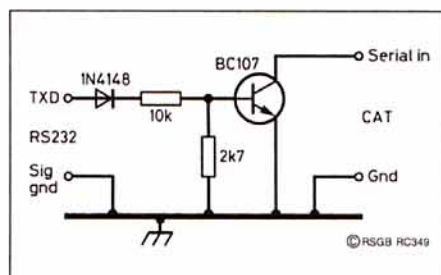


Fig 1: An ultra-simple uni-directional interface from RS232C to Yaesu CAT TTL.



The MSOFT ScanMate-3 SSTV/FAX interface unit for the Amiga.

ever, it does not provide ground isolation.

At the heart of the interface is the very clever MAX232 IC, which contains not only the line transmitters and receivers, but also the charge pumps to generate the necessary +ve and -ve supply rails, so if you want you could design your own interface around this very versatile device. It costs £2.80 from Maplin, part number FD92A, and the above board also uses a 74HC266 quad XNOR gate with open drains, (sounds unhygienic), which is priced at 45p, part number UB71N.

### SOFTWARE

HAVING INTERFACED THE radio to the computer, there is the question of software. This can be obtained from the suppliers of the radios and interfaces, and there is a certain amount of independent software available. If you know of some good software, please let me know and I'll pass the information on, as I am always seeing such requests via packet radio.

You can of course write your own, and in fact only a few simple BASIC statements can form a rudimentary control program.

Both Yaesu and Kenwood use 4800 baud, (which can be altered on the Kenwoods), with eight bits, no parity, and two-stop bits, (rather than the more usual one-stop bit). I found that the Yaesu FT990 and FT1000 manuals are very helpful in describing the software commands, though the BASIC programming examples may not be applicable to all versions of the language.

The only modern Kenwood manual I've seen recently, (TS790E), did not appear to have any information on the software commands, so presumably these are documented separately.

### SISKIN MULTI-CAT

I NOTICE THAT SISKIN Electronics have recently announced their Multi-CAT interface and software, which is fully compatible with Yaesu, Kenwood and Icom systems. This means that you can use one interface even if you have several different makes of radio. However, you cannot connect more than one radio at a time, except in the case of Icom radios via the CI-V bus.

### WARNING!

FINALLY, I SHOULD issue a caveat. Whenever connecting external equipment to an

expensive radio, you should be very careful that you make the connections correctly, and that excessive/inappropriate voltages are not applied. Switch the radio and computer off before connecting or disconnecting the serial port.

Also, be aware of the possibility of RFI. The computer may cause interference on the radio, via the interface leads, and the radio may cause interference to the computer when transmitting. A lack of opto-isolation in any homemade interface to Kenwood radios may or may not be a disadvantage from the point of view of RFI. By all means experiment, and learn, but please do it carefully!

### AEA DISTRIBUTION CHANGE

YOUR ATTENTION is drawn to the item in this month's *News and Reports* concerning the change of dealership of AEA products. It is hoped that this will lead to price reductions.

### SSTV/FAX FOR THE AMIGA

MSOFT OF KÖLN (Cologne), Germany, have brought out an SSTV/Fax system for the Commodore Amiga, called ScanMate. This consists of an interface unit with built-in processor for signal processing and filtering, which connects to the parallel port of the computer. Software is supplied on floppy disk, and the minimum system requirements are 1Mb RAM, DOS 2.0, and a hard disk drive. If you also have the VLab video digitiser, then you will have the additional advantage of being able to digitise and transmit pictures in real time. Otherwise, like JVFAX, you can send and receive files in GIF format. A variety of Fax and SSTV modes are supported, including JV colour fax.

There are two versions of the interface, ScanMate-1 at £269.95 inclusive of VAT, and also the ScanMate-3 at £369.95, which can be interfaced to three transceivers simultaneously (see photo). The UK agents for MSOFT are ICS Electronics in West Sussex, tel: 01903 - 731101, (fax 731105).

### PACKET DELETION CHARACTER

INCORRECT SETTING OF the DEL parameter on packet TNCs can cause unexpected problems, especially if you make corrections while typing a call sign. If you normally correct typing mistakes with the BS (Back Space) key, sometimes marked with a backward-facing arrow, then you should set DEL OFF, (DEL 8 on Kantronics TNCs). If you normally use the actual Delete key, eg on the old BBC Micros and a number of dumb terminals, then you should set DEL ON, (DEL \$7F on Kantronics TNCs).

G6JPG's method for checking if the setting is correct, is to type some random text against the 'cmd:' prompt, delete it all, and then press RETURN/ENTER. If the response is another prompt, then all is well. However, if the response is an error message such as 'Eh?' or 'unknown command', then the DEL setting is wrong.

### AR SK

'Rick' G4BLT @ GB7WRG.#19.GBR.EU





## Emergency!

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**A**T A TIME when we are assured that the threat of nuclear hostilities has been long removed, and the function of local Emergency Planning Officers has changed dramatically, it is sometimes all too easy for us to lose sight of the need for organisations such as Raynet to be constantly in a state of readiness to assist the civil authorities.

On 23 and 24 August, the authorities in Nottinghamshire were faced with an emergency of a kind we might not normally think necessary to plan for in 1994.

In Gateford, Worksop, in the northern part of the county, a construction company uncovered an unexploded 500lb World War II bomb. The bomb was unearthed by a mechanical digger which was carrying out ground-work for a new development and, as the tail-fins had long since rusted off, it was initially mistaken for a 4ft-long, 18in diameter, piece of scrap water pipe.

As soon as it was realised that the 'drain-pipe' was, in fact, a large unexploded bomb, the local Police, Fire Brigade and Ambulance were put on immediate stand-by and an Army Bomb Disposal Unit was called in to make it safe. Approximately 1,000 local residents were immediately evacuated to safe Rest Centres in Council buildings while the work was commenced.

It quickly became clear that the bomb was fitted with an anti-interference booby trap, and it was by no means certain that it could be safely defused. Contingency plans were drawn up to evacuate a further 3,000 people if the Bomb Disposal Unit decided that it would have to detonate the bomb in a controlled explosion on site.

Raynet was called out by the Chief Emergency Planning Officer shortly after 0800 hours on Wednesday, 24 August, to provide essential communications between the Rest Centres and the Council offices. This was because it was predicted that telephone lines would quickly become overloaded and, in the event, that is exactly what happened. Raynet provided satisfactory radio communications between the main area of concern, as requested, until additional telephone lines with secure numbers could be installed.

North Nottinghamshire Raynet Group were first on the scene, being the Group most local to the incident, and later both Bassetlaw and Nottingham Raynet Groups were also involved. Members not immediately called out were placed on stand-by for twenty-four hours so that they could be asked to replace active members, thereby ensuring that everyone involved got a break.

During the night of 24/25 August, the Army Bomb Disposal Team by-passed the booby-

trap and steamed-out the explosive, before detonating a controlled explosion to destroy any explosive which remained inside the bomb. Local residents were permitted to return home at 0530 hours on Thursday, 25 August and Raynet was stood down at that time.

The CEPO recorded his grateful thanks to all Raynet members who had been available to help, whether they had been turned out or merely stayed on stand-by. This is obviously not one of the most common incidents at which Raynet is asked to assist but it does highlight the variety of such emergencies and the need for an immediate response in support of the emergency services.

### BE PREPARED

EMERGENCIES, BY definition, are the exception rather than the rule but, because they can have such very serious consequences, it is necessary for comprehensive plans to be made for their containment.

As an integral part of its own self-training, Raynet very often assists numerous other organisations by providing safety communications at their various events. This kind of self-training is mutually beneficial even when no real emergency develops but a Raynet presence can often be a real life-saver.

Langdale, in the Lake District, is an area much favoured by the Scout organisation for many of its outdoor activities. Scout troops from across the country visit the area for various competitions and hill-walking events every year and Raynet is often asked to assist by providing radio operators at numerous check-points. In the hostile terrain around Langdale, it is not at all unusual for people unconnected with the Scout event to approach Raynet operators with urgent requests for help because an accident has occurred.

On 9 July operators from Cleveland, Leicesters, Calderdale, Derbyshire Dales and Morecambe Groups were helping Sunderland County Group provide safety cover in Langdale for the Scouts' 'District Mountain Advisers' Challenge' when one of the Scout Checkers came across an accident. A Scout Leader from a different event had fallen in the vicinity of Stickle Tarn and had broken his leg just above the ankle. It was a complicated fracture with copious bleeding and exposed bone. After administering immediate and highly competent First Aid, the Scout Checker was able to run to the Raynet operator at Stickle Pike and initiate rescue procedures.

The local Mountain Rescue Team were mobilised and a Raynet operator was immediately despatched to the site of the accident, from where he was able to inform the MR team of his precise location. RAF Boulmer provided a helicopter to lift out the casualty and the doctor's task was made much easier because he was able to establish, even before his arrival, details of precisely what First Aid had been provided and what facilities would be required for the casualty's safe evacuation. The rescue operation was completed much more quickly than might have been the case if Raynet had not been on hand and, by use of the radios, it was possible to arrange for the injured Scout Leader's party of Scouts to be brought safely off the mountain by Leaders from the DMA event.

### MEMBERSHIP AND MOBILITY

SOME RAYNET GROUPS are obviously more active than others and the nature of the work they undertake will obviously differ, just as these two incidents highlight.

It is perhaps easy to sustain interest and membership levels within busier Groups, and those Groups which are prepared to travel to help other Groups man larger events whilst extending their own expertise. Other Groups seem to have less success at replacing members lost for a variety of good reasons and, in some areas, membership levels are uncomfortably low. Groups in parts of London and Kent, for example, would like very much to hear from people who might be interested in joining Raynet and most other Groups throughout the UK will always welcome enquiries from interested parties.

No special experience or equipment is necessary and there is a place, too, for Novice Licence holders and disabled operators. If you are aged between 14 years and 75 years and are prepared to commit to turning out to train and support the group occasionally, why not think about joining? Training and Insurance cover is provided and you would have the satisfaction of knowing that you were 'putting something back into your hobby by making yourself available - as a trained Raynet operator - to assist the civil authorities in time of need. If you think you might be interested in helping and would like further details, please let me know.



● Graham, G4FUJ, would like to start a 'register' of **motorcycling radio amateurs** through the UK. The main purpose will be the exchange of technical information regarding motorcycling mobile installations, problems encountered and their resolutions. If anyone is interested please contact Graham on 0242 518776, or write to him QTHR.

● Lawrie, G4ZSB, wants a circuit diagram and layout drawings for a **Racal RL17 or RL17L**. Main problem is that neither of them will lock in the 'Megacycle' dial. Any details appreciated. Please write to Lawrie Wood, 61 Denison Street, Beeston, Notts NG9 1AX.

● Andrew, G4EAQ, has a modern telephone operators' headset unit, which he'd like to use with a **Kenwood TS440S**. Can anyone give any data on the unit or details of how to interface. The headset has a single earpiece, with 3-terminal electret Mic, one transistor amp and a magnetic earphone all built-in. Contact Martin on 0925 265813 or write to him QTHR.

● Stan, G2HAX, needs a manual/service information for a **Heathkit SB300 Receiver**. Also a circuit diagram of a Simpson (USA) Multirange Meter model 260 series 6XLP. Expenses reimbursed. Information to G2HAX, tel: 0734 410235 or write to him QTHR.





# Satellites

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**T**HE NINTH AMSAT-UK Colloquium was held at the University of Surrey from 28 to 31 July last. 133 people from 22 countries in five continents attended, adequately justifying the claim that this is the largest international gathering of amateur satellite enthusiasts in the world. Whilst the lectures formed the main proceedings, the usual social activities contributed to the success of the occasion.

The lectures covered a very wide spectrum of amateur radio satellite activities. Amongst which must be mentioned those given by the University Space Engineering Department, on the equipment now available and the topics they were developing, such as mini-satellites - up to 200kg weight - as opposed to the much smaller Microsats, low cost propulsion motors, use of the S-band, and so on. With regard to S-band operation, use of this facility was called for. Doug Loughmiller in particular, spoke about the S-band facilities on UoSAT 11, which has had its beacon switched on for some considerable time, but he has had no reports on it at all. He appealed for folk to let him know if they hear it.

## ARSENE

It was particularly interesting to hear from Gerals Auvrey, F6FAO, of the fate of ARSENE, the French sponsored satellite of which much was expected. It is now feared lost; the cause is thought to have been a connector on the aerial lead not having been tightened properly during a last-minute cable change just before launch. A new project planned by the French is to build a microsat carrying a 2.4GHz linear transponder and maybe a camera, for a launch in four or five years' time.

## PHASE 3D

Updates on Phase 3D brought the position of this project up to date. The design, construction, testing and transport costs are about three million DM and another two million DM will be needed for the launch, so appeals for more contributions to the Phase 3D Fund were called for. The launch date is July 1996 on Launcher 502.

## NEW SATELLITES

The Colloquium is the occasion for the announcement of proposals for new satellites. This time FASAT, a Chilean non-amateur earth observation satellite based on the UoSAT bus was announced. It is planned to fly in July 1995 into a 650km, 82.5° orbit. SUNSAT is a South African satellite planned for launch in January 1996. It will measure 45 x 45 x 40cm and weigh 50kg; 400/800km altitude, period 100 minutes. Amongst numerous other modes, a 5W S-band transmitter is planned.

## THE PROCEEDINGS

One of the valued procedures at the Colloquium has been the putting together by Ron Broadbent of *The Proceedings* - a collection of those lectures submitted for presentation during the days of the Colloquium. These make up into a nicely presented booklet, which enables one to browse over the presentations at one's leisure. Unfortunately not all presenters get their contributions to Ron in time for printing so they do not appear. However, of those which do get in, there is much of interest.

The presentation by Mike Wade, G8OGO, entitled 'The Future of amateur radio and its Satellites in the New Environment' I found particularly interesting. As Mike says: "Its history has shown that having to adjust itself to change is nothing new to amateur radio, but the change in the environment in which we operate from now on is going to need much more than just 'course corrections' in amateur radio policy which may have been sufficient to cope with previous changes."

"To come straight to the point, there has been discussion in some quarters, suggesting that the experiments and scientific side of amateur radio is not being upheld sufficiently today, for it to continue to be regarded in the same way as earlier."

"One example recently was the editorial in the December 1993 *Wireless World* asking what gets done by radio amateurs today and what investigations can still justify our experimental status and not just allow ourselves to become regarded by others as solely a recreational communication medium."

Mike goes on to say that the editorial did say that the activities encouraged by AMSAT and the University of Surrey were examples which did encourage the scientific and experimental status of amateur radio. However, as he says, even amateur satellites operate in subsections of the amateur radio bands and it is how these bands are regarded that we should be watching carefully from now on.

Another presentation which caught my eye was that from Ken Willis, G8VR, who used to write the *VHF News* column for this Journal. He supported the theme mentioned in this column in September last from John Branegan, GM4IHJ, that recent satellites "appear to have little to do with amateur radio". Ken's presentation also contained comments which should be taken to heart by the satellite planners. He comments that he has given

many talks to amateur radio clubs and, from these and the correspondence he received in the years when he wrote the VHF column in *RadCom*, there is little doubt that the vast majority of amateurs remain convinced that communication via satellites is a very complicated business. It is difficult to argue against this when so many of the Oscars launched in recent years seem to cater for everything except simple communication.

Ken's presentation makes good reading. Much of it covers other matters which Ken calls his 'heresies'. I would say most is common sense which should receive the attention of those directing the future of the amateur satellite service. It was good to see these thoughts being aired in public.

On the technical side, *The Proceedings* have much of interest covering a wide field of satellite topics such as 'Automatic Microsat Ground Stations' by WB1HBU; 'The Proposed Reallocation of the 2400MHz Band in the USA' by Ray Soifer, W2RS; the 'Micro-Wave Links of P3-D' by Dr Karl Meinzer, DJ4ZC; the 'Stanford SQUIRT Micro Satellite' from the Stanford University, USA; and 'Investigating the Integrated Control of Payloads with Amateur Satellites', also from Stanford.

A very good account of the history of amateur radio satellites is contributed by Keith Baker, KB1SF, and Dick Jansson, WD4FAB, under the title 'Telecommunication Satellites from the World's Garage - the story of the Amateur Radio Satellites'. Ray Soifer also contributes a piece on Moonbounce. Victor Kudielka, OE1VKW, writes on 'The Taming of the Shrewish Gyro' - this is very technical! MicroSat Ground Station Software for LINUX and X-Windows by John Melton, G0ORX/N6LYT; SUN BAR by Bruce Lockhart, SM0TER - a very simple gadget, I will leave you to guess what it is! VITA - Volunteers in Technical Assistance produced an interesting paper on their experiences with UoSAT - 3 by Eric Rosenberg, WD3Q. An excellent compilation for the Satellite enthusiast, to which my very sketchy review does not do justice! [For further information on receiving a copy of these Proceedings please contact Ron Broadbent, G3AAJ - Ed]

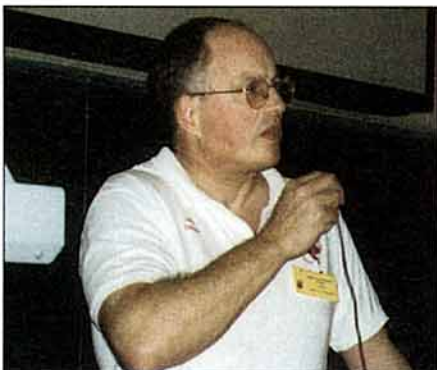
## DOVE

DOVE - OSCAR 17 is still sending down good signals. It is now sending musical tones as well as the phrase "Hi. This is Dove in space". So good progress seems to have been made with its software.

## PHASE 3D BUILDING FUND

AMSAT-UK ANNOUNCED that the fund now stands at £31,000 but they have also given £68,500 from their general funds. \$500,000 are still required before launching in July 1996. If that date is missed there will be no replacement for OSCAR 13 which is due to cease to function in early 1996.

Also a further launch is not likely to become available until several years after that date. Donations have recently been received from AMSAT-SM of £1,665 and from AMSAT-OZ for £1,053 for which the Fund is very grateful. Donations to: AMSAT-UK, Hon Treasurer, 94 Herongate Road, Wanstead Park, London E12 5EQ.



Hans Van De Groenendaal, ZS5AKV, (SA-AMSAT) presenting his lecture, 'Use of Phase 1 Satellites in the study of propagation of HF signals from above the ionosphere'.



# Microwaves

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**T**HE NOW CUSTOMARY November Round Table at Martlesham, courtesy of British Telecom management and the Martlesham Radio Society, is to be held on Sunday, 13 November at BTRL, Martlesham Heath near Ipswich. The entry arrangements are, as usual, by advance booked ticket only. More information and tickets are available, free, from Roy Smith, G0RRR, 'Lykkebo', The Street, Burstall, Ipswich IP8 3DN on receipt of an SASE.

It is necessary, for security reasons, to give all the names of the applicants if you are applying for more than one ticket. The event will commence at 1000 hours and will include Round Table sessions as well as test equipment and bring-and-buy facilities.

The provisional programme includes talks on 10GHz rain-scatter, 24GHz and 47GHz activity as well as an update on the 10GHz Phase IIID satellite transponder from Freddie, ON6UG.

## CURRENT OPERATING LADDERS

THE POSITION ON the ladders, as of mid-September, is as shown in **Table 1** (1994 Operating Ladder) and **Table 2** (All-Time Squares/DX Ladder, extended to cover both 10 and 24GHz). There have been a number of changes since the ladders were last published.

Remember, that for entry to the All-time table, all contacts must be made from one location, unlike the Operating Ladder where entries can be made from any location, fixed or portable (the only thing being, please keep the fixed and /P entries separate!).

If you are a beginner, don't be discouraged by all the talk of high technology: there is still a great deal of fun to be had from playing around with the 'outdated', simple, wideband modes which includes a high level of ATV activity - on 10GHz, 24GHz and 1.2GHz. See the next news items!

## WIDEBAND IS STILL ALIVE!

FIRST, NEWS FROM John, GW3JGA, that the ATV repeater GB3TM, located near Amlwch (Anglesey) is now operational on channel RT1-2: input 1249MHz, output 1316MHz (FM). The repeater accepts 625-line FM-TV with 6MHz inter-carrier sound and re-radiates the same mode.

Sited 154m ASL, there are clear sea-paths in virtually all directions, covering the coasts of Lancashire, North Wales, Ireland, the Isle of Man and possibly parts of Scotland - see

the sketch map, **Fig 1**. The repeater, built (software controlled) by the Arfon Repeater Group technical team (GW3JGA, GW3MEO, GW4KAZ, G1FEF, G8VAT, GW8PBX) runs 10W output to an Alford Slot. The receive antenna is a second Alford Slot machined into a common tube which serves also as the mast. The receiver is a modified satellite 'box' with a high performance GaAsFET preamplifier. When not in use, the repeater goes into beacon mode, transmitting a variety of captions, news pages and audio Morse ident. John mentioned already having worked EI6AS and EI2EM, near Dublin, under slight lift conditions. The repeater keeper, GW8PBX (QTHR) would welcome other reports!

A long and most interesting letter from Tony, G4CBW, describes his and Dave, G8VZT's exploits during several 'microwave expeditions' they undertook this summer. Their results, pieced together from Tony's letter are summarised in **Table 3** - please forgive any errors in interpretation! The first test on 10GHz, from GM4CBW/P to GW8VZT/P quickly yielded P5 pictures over a 171km path. Tony's signal was so strong that Dave took them on a 3dB horn/LNB combination and relayed them on 3cm over a 94km path to G3SMU at Bolton, whence they were "linked out on both 24cm and 3cm to an audience in the Wirral, Manchester, Stoke-on-Trent and Dublin"! After this, G8VZT moved to IO84GL and again exchanged P5 signals with Tony, then went on to join Tony in Scotland.

From the Scottish location, G3FNQ's personal beacon at 161km could be heard at

Band	Posn	Callsign	Stns Wkd	Best DX (km)	Multiplied Score
10GHz					
10	1	G3KEU/P	66	787	51942
	2	G4FCD	66	521	34386
	3	G4BRK	43	639	27477
	4	G4LDR	44	487	21428
	5	G3JMY	39	533	20787
	6	G4BRK/P	46	432	19872
	7	G8APZ	31	568	17608
	8	G3GRO	37	395	14615
	9	G3GNR	26	451	11726
	10	G8DKK	31	370	11470
	11	G8LSD/P	36	313	11268
	12	G3PHO/P	34	330	11220
	13	G3UYM/P	30	355	10650
	14	G3FNB/P	22	463	10186
	15	G3JMB/P	31	281	8711
	16	G3ZTR/P	20	417	8340
	17	G4KNZ	28	285	7980
	18	G3UKV/P	21	357	7497
	19	G1MPW/P	30	247	7410
	20	G3YKE	18	390	7020
	21	G4JNT	23	202	4646
	22	G8AYY/P	9	202	1818
	23	G8KMH	1	135	135
24	1	G4KNZ/P	16	137	2192
	2	G3FYX/P	13	143	1859
	3	G3PHO/P	11	126	1386
	4	G3UYM/P	5	121	605
	5	G3FNB/P	4	120	480
	6	G8AYY/P	3	86	258
	7	G3GNR/P	1	143	143
	8	G8KMH/P	1	126	126

Table 1: 1994 10/24GHz Operating Ladder (from 01/01/94).

Posn	Callsign	Locator	Sqrs Wkd	Best DX (km)
1	G3WDG	IO92RG	30	1008
2	G4FCD #	IO91KX	22	802
7	G3BNL	IO92KA	17	1027
3	G3KEU/P	IO91GI	22	787
4	G4KGC	IO92RG	21	793
5	G4DDK	JO02PA	20	684
6	G8APZ	JO01DO	18	1026
7	G3BNL	IO92KA	17	1027
8	G4BRK	IO91DP	17	639
9	G4LDR	IO91EC	16	775
10	G3JMY	IO81RM	16	533
11	G8KQW/P	IO91GA	15	390
12	G3PHO/P	IO93EH	15	338
13=	G8LSD/P	IO90TV	15	304
13=	G3JMB/P	IO90TV	15	304
15	G4RFR/P	IO80UU	14	414
16	G4KNZ	IO91PJ	14	285
17	G3GNR	IO70WT	13	451
18	G8DKK	IO91VX	13	370
19	G4JNT	IO91IV	13	334
20	G3UKV	IO82RR	12	357
21	G8AGN/P	IO93EH	12	338
22	G4FCD @	IO91JV	11	* 1039
23	GW4MAP/P	IO82JG	11	311
24	G4PMK	IO93GT	10	739
25	G3NWU	IO94JQ	10	433
26	G3ZME/P	IO82QL	10	270
27	G0API	IO80XS	9	405
28	G0API/P	IO80UU	8	277
29	G3JMB	IO91WA	4	48
31	G3NWU/P	IO94MJ	3	290
# Old QTH - @ New QTH - * UK Record				
24GHz				
1	G3PHO/P	IO93AD	3	126
2	G4KNZ/P	IO83RO	3	120

Table 2: 10GHz/24GHz All-Time Squares Worked, as at mid-September, 1994.



Date	Call	Locator	Wkd	Locator	QRB (km)	Remarks
26/05	GM4CBW/P	IO74UU	GW8VZT/P	IO83BI	171	"First"
26/05	GW8VZT/P	IO83BI	G3SMU	IO83SO	94	See text
26/05	GM4CBW/P	IO74UU	G8VZT/P	IO84GL	68	"First"
26/05	GM4CBW/P	IO74UU	G3FNQ	?	161	See text
26/05	GM4CBW/P	IO74UU	G7MMM	IO83LJ	183	One way from GM
26/05	GM4CBW/P	IO74UU	G4NCI	IO83KJ	178	One way from GM
27/05	GM8VZT/P	IO74UU	GI8GJX/P	IO74BR	102	10GHz
27/05	GM4CBW/P	IO74UU	GI8GJX/P	IO74BR	102	24GHz First"
22/06	GD4CBW/P	IO74PD	EI2DG	?	129	"First"
23/06	GD4CBW/P	IO74PD	GM8VZT/P	IO85IB	137	"First"
23/06	GD4CBW/P	IO74PD	G8VZT/P	IO84GL	89	"First"
24/06	GD4CBW/P	IO74PC	GW8VZT/P	IO83BI	103	"First"
24/06	GD4CBW/P	IO74PC	GI8GJX/P	IO74BR	102	"First"
24/06	GW8VZT/P	IO83BI	GI8GJX/P	IO74BR	204	One way from GI
24/06	GD4CBW/P	IO74PC	GW3FYX/P	IO73UJ	84	24GHz, speech
			GW3PPF/P			
24/06	GD4CBW/P	IO74PC	GW3FYX/P	IO73UJ	84	24GHz, one way TV
21/08	G4CBW/P	IO83TQ	GI8GJX/P	IO74BX	266	"First"
21/08	G8VZT/P	IO83TQ	GI8GJX/P	IO74BX	266	1W, two way

? indicates information incomplete.  
G4CBW: 60cm dish, 15W o/p, G3WDG HEMT preamp + modified LNB.  
G8VZT: 2ft dish, 1W o/p, modified LNB.  
GI8GJX: 4ft dish, 12W o/p, modified LNB.

Table 3: 10GHz/24GHz ATV paths worked during 1994.

most every day, weak and fading during daylight but up to S9+ in the evenings with only an occasional long fade. Two-way TV pictures were easily exchanged at these times, with G3FNQ running 1W to a modified 'Squarial'. Using narrowband, Tony and Dave were able to make several contacts with G3JVL at 506km, using a mixture of troposcatter enhanced with aircraft scatter - long bursts of S8 signal which Tony described as "quite amazing".

On 27 May Tony and Dave moved to IO74KU (near Port Patrick radio station) to work skeds with GI8GJX and G3FYX/G3PPF. The first two-way GM/GI 10GHz P5 TV signals were soon exchanged between GM8VZT/P and GI8GJX/P, followed immediately with the first two-way GM/GI 24GHz TV contact between GM4CBW/P and GI8GJX/P. The next sked, with G3FYX and G3PPF at Pendean Watch, Cornwall (QRB >500km) unfortunately didn't work. Had the path been open by super-refraction, the plan was to attempt a 24GHz wideband contact over the path. It didn't happen!

28 May was the 10GHz/24GHz Cumulative and saw a move back to IO74UU for the day. From here eleven two-way and one one-way 10GHz contacts were made. The shortest (GW3UKV/P) was 216km, the longest (G3JVL) 506km.

The next expedition was to GD, on 22 June, with the intention of trying to work GD to GW, G, GM, GI and EI 'firsts' on 10GHz ATV. From IO74PD, Tony (and Robert, GD4GNH) sent P5 pictures to Mike, EI2DG, (129km) within minutes of switch-on: sending pictures the other way took a little longer, since Mike's modulator was not completed and his antenna not in place! But, by 2310 hours the contact was completed for a notable first.

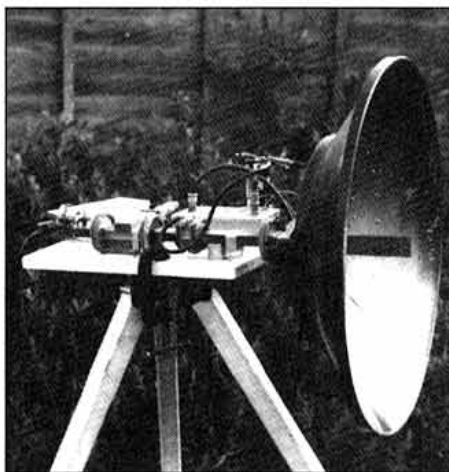
23 June saw successful ATV skeds with GM8VZT/P and G8VZT/P. On the same evening, the /P gear was set up in GD4GNH's back garden and, after some initial problems, worked G3JVL, G3WDG and G4FCD on CW/SSB. 24 June allowed Tony to complete

10GHz ATV 'firsts' with GW8VZT/P and GI8GJX/P.

I was no less pleased to receive news from a delighted Mike, G0JMI, to the effect that he and Ken, G4FOY had made a series of short contacts, from 4km up to 50km for their first attempts at 10GHz QRP working, using simple 10mW Gunn transceivers pictured in Mike's photo. All the waveguide components are home-made (looks like some of the basic equipment described in the *VHF/UHF Manual* and again in the *Microwave Handbook* - see pages 94 and 95 for details). This really was nostalgic and shows that the 'old' designs are still sound and suitable for first entry to microwaves - they work!

## A NEW BIBLIOGRAPHY

THE RSGB HQ LIBRARY at Lambda House is open to members on Thursdays [and other times by appointment - Ed]. The RSGB receives and files quite an extensive range of amateur publications and other books, in which there are numerous articles of micro-



10GHz wide band system. 10mW Gunn and 1N23 type mixer. Tunes 10.0 - 10.3GHz. The aerial feed also includes a 90° twist section.

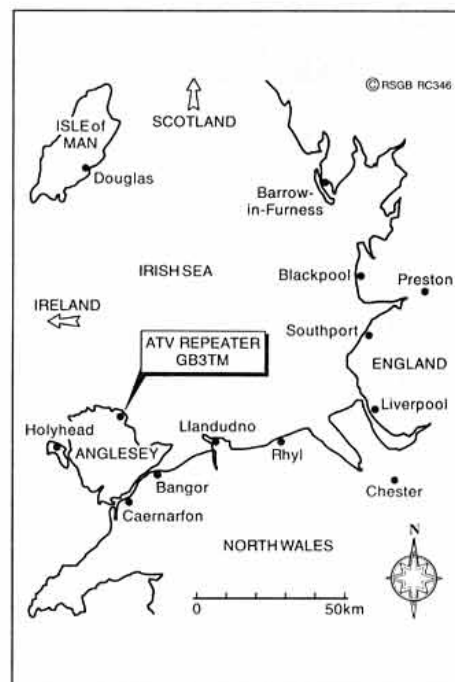


Fig 1: Coverage from GB3TM on Anglesey.

wave interest. A limited number of photocopies of specific articles can be obtained from the library on request - if you know what you want! To help microwave enthusiasts, the Microwave Committee has sponsored a 'bibliography' (database) of amateur microwave references dating back to 1970. Whilst this does not claim, at this point in time, to be comprehensive, it is the outcome of a lot of hard work, mainly by Martyn Kinder, G0CZD. If you would like a copy of the database and program, please send a formatted 3.5in floppy disk (720kb or 1.44Mb IBM format) and a SASE (strong enough to return your disk) to Martyn Kinder, 12 Jessop Way, Haslington, Crewe, Cheshire CW1 1FU, UK. The database (Version 1.1a), at the moment, contains over 800 references of microwave interest and requires an IBM compatible PC with, preferably, a hard disk, although I've been successfully running and adding to the database using only a floppy disk drive. The program allows the user to enter new references into a 'personal database' and allows searches by band (including light!), year, source and other sub-sets. We would like to be able to copy and distribute the database once a month - at the end of a month - to allow Martyn to receive copies of personal database entries to add to the main database. The aim is to expand the main database to more than 1000 entries by the end of September! At the moment it is intended to distribute the database on 3.5in floppies only. However, if there is sufficient demand, arrangements will be made to distribute the program and database on 5.25in floppies, as well as 3.5in.

## FINALE 1994

I'M AFRAID THAT'S it this month! Can I wish all microwave operators a very Happy Christmas and a prosperous and successful 1995? This time of the year definitely does come round quicker and quicker. Maybe I'll find room to summarise the main events of 1994 in the January column!



# CONTEST CLASSIFIED

All rules should be read in conjunction with the General Rules published in *Contest News* January 1993

## VHF RESULTS

### 3RD BACKPACKERS 144MHZ (JUL '94)

BOTH BAND and weather conditions were almost perfect for this third contest with just about all entrants commenting on how much they had enjoyed the event. There was a great deal of DX worked at some really excellent distances: "Couldn't believe first contact until further stations worked in same region - outstanding performance on 2.5W! (G0LJD/P); "Propagation excellent - the NFD QRM was something else!", (G4IDF/P); "Lovely WX and great fun", (G0GCI/P); "Some nice DX but too much sun this time (only joking!)" (G0SOO/P); "Excellent conduct during both VHF NFD and the Backpackers - congratulations to everyone!" (G0CLP/P). GW0TFU/P made an outstanding number of QSOs and multipliers from their airy QTH high in the Brecon Beacons. GW8ZRE/P likewise made a remarkable series of contacts given the small size of his antenna. Congratulations to all entrants, section winners and runners-up for a splendid set of results. Certificate winners \*.

G4DHF

#### 10W SINGLE OPERATOR

Pos	Call	Pts	QSO	Mult	Loc	Ant	Best DX	Km
1 *	G3ZDP/P	67580	86	62	IO84IH	10ele	F15VP/P	1083
2 *	G8JAY/P	66378	88	74	IO81AW	17ele	H89IAB/P	841
3	G0RMG/P	62342	121	73	IO82KJ	12.2L	F11BU	976
4	GW8ZRE/P	55918	92	73	IO83JA	H89CV	F15VF/P	958
5	G3FDW/P	51324	93	52	IO84UR	10LPP	F15VF/P	1094
6	G0CLP/P	42983	103	53	IO83AF	10ele	DLOWA	633
7	G0GCI/P	39600	74	60	JO01ED	13ele	F8IBU/P	768
8	G0SOO/P	24021	58	51	IO91SE	17ele	H89IAB/P	709
9	G7LDD/P	23471	47	49	JO02IL	9ele	F2EE/P	852
10	G7KOL/P	11656	44	47	IO92LO	4ele	GM4ZUK/P	492
11	GM0UVJ/P	10075	31	31	IO74UV	8ele	DK0SM/P	?

#### 10W MULTI-OPERATOR

1 *	GW0TFU/P	149664	149	88	IO81HV	2x9Y	F6HQP	970
2 *	G8PMV/P	95557	99	77	IO85CK	4x9Y	F6KMF/P	1197
3	GW3TAD/P	72124	110	73	IO81KW	17ele	H89IAB/P	905
4	G4FUR/P	16184	64	34	IO91VG	6QY	H89IAB/P	702

#### 3W SINGLE OPERATOR

1 *	G0HIC/P	49345	72	72	IO84KF	13ele	DK0SM/P	770
2 *	G7OZE/P	42944	79	64	IO93GA	52L	DL3EBM	869
3	G0LBO/P	34160	75	56	IO84KI	9ele	ON2KXJ	805
4	G4IDF/P	32282	76	67	IO82TC	8ele	H89IAB/P	874
5	G0LJD/P	22880	70	52	JO01FJ	122L	F2EE/P	745
6	G0HAX/P	18988	46	47	JO01ED	17ele	F2EE/P	720
7	G4FUR/P	10410	51	30	IO93SN	9ele	PA0FHG	387
8	GW0SYG/P	4030	15	26	IO71NR	H89CV	ON6CK/P	536

#### 3W MULTI-OPERATOR

1 *	G0HAC/P	42813	79	67	IO83XH	9ele	DLOWX	650
2 *	G6TTL/P	25920	60	54	JO01OI	14ele	F2EE/P	727

### 432MHZ TROPHY CONTEST (MAY 1994)

IT WAS GRATIFYING to receive more entries than in previous years, despite the numerous comments regarding the generally low level of activity from G. This was probably because a great deal of European DX was being consistently worked on the band, particularly from the East coast and by those stations further inland that were well-equipped. The Single Operator Fixed section saw the largest single increase in entries with many very positive comments, including: "Best contest DX to date on 70cm" (G7AZP), "New system worked well" (G0TDF) and "Good" (2E1CBI). G3FDW wins a certificate for being the leading station running 25W or less into a single antenna. The Trophy contest was quite close this year with the Northern Lights (G4GCM/P) just holding off a challenge from the Warrington Contest Group (G3CKR/P) even though they experienced a few problems: "Managed in total about 4.5 hours of operating. Got through two amplifiers and one rig. Every time we thought everything was OK something blew up!"

\* Certificate winners.

G4DHF

#### OPEN SECTION

Posn	Call	Pts	QSO	Loc	Pwr	Ant	Best DX	Km
1 *	G4GCM/P	2418	183	JO01GX	400	4x28+2x30	DL0NOT/M	819
2 *	G3CKR/P	2146	174	IO93AD	400	12x21ele	DF0RB	864
3	G4HRY/P	2107	179	JO01KJ	400	8x21+48	DL0UL/P	702
4	G4PUB/P	1798	140	JO01PJ	400	4x21ele	DF0YY	770
5	G4DSP/P	1783	142	JO03AE	400	4x28ele	DG9NBT	779
6	GW8AWM/P	727	75	IO81LT	100	21ele	DL4VAL/P	734
7	G6BRV/P	629	91	IO91PK	400	4x21ele	DL0FH	703
8	G8MNY/P	482	83	IO91XG	400	27QL	DL0LX/P	504

#### MULTI-OPERATOR

1 *	G4NOK	357	55	IO93FR	100	4x21ele	PA3BPC/P	427
2 *	G1WAC	138	30	IO92BJ	25	18ele	PA3BPC/P	412

#### SINGLE OPERATOR FIXED

1 *	G4PIQ	1655	141	JO01MU	250	4x17ele	DL0UL/P	714
2 *	G0TDF	339	60	IO92CM	100	21ele	DL9LBH	562
3	G7AZP	273	40	IO90AS	100	16ele	DL0KK/P	597
4	G3FDW	148	14	IO84ME	8	21ele	G8MNY/P	380
5	G3YHF	81	19	IO92BK	10	19ele	G4GCM/P	229
6	G4LRT	63	15	IO92LJ	400	2x18PB	G7AZP	191
7	G5UM	61	15	IO92MP	10	18ele	G3FDW	133
8	G0JDL	31	7	JO02UK	1	19ele	G3CKR/P	258
9	2E1CBI	25	7	JO01BI	1	72L	GW8AWM/P	224

#### SINGLE OPERATOR PORTABLE

1 *	GW4BVY/P	1151	125	IO81NV	400	4x21ele	DL1ECB	661
2	G8FBG/P	1021	85	JO02QD	400	4x28ele	DL0UL/P	735
3	GJ4ZUK/P	161	13	IN89WF	100	17ele	PAGPLY	609

## VHF RULES

### 144MHZ AFS & FIXED & SWL

Date: 4 Dec

Time: 0900-1700 UTC

General rules apply.

Sections: AFS

The contest is open to individual entrants (who must be members of the RSGB), or teams made up of a number of operators who must all be members of the same affiliated society, (but do not have to be RSGB members themselves). All members of a team must operate from within 50km of the normal meeting place of the society. No station may represent more than one society. No operator is allowed to use more than one call sign during the contest. In the case of National societies each team must define a separate meeting place and each team member must operate within 50km of that designated meeting place. Multiple teams are encouraged from both national and local societies. The best three scores of each team will be used to form the entry. ALL team members' logs must be included as the results may be downgraded if logging errors occur! eg the 4th placed member may well have higher points after adjudication, than those notionally above. Clubs or groups can submit as many Teams as they wish, please mark entries team A B C etc.

S Single operator; M Multi operator; L Listeners

Adjudicator: I Pawson, G0FCT, 3 Orion, Bracknell, Berks RG12 4YX.

### WINTER MICROWAVE CUMULATIVES

Dates: 27 November, 18 December, 29 January 1995, 26 February 1995, 26 March 1995.

Times: 0900-2100UTC

Bands: All bands from 2.3GHz up.

Awards: Whilst results will be tabulated there are no awards for the Winter Cumulatives.

Entries: Logs should be submitted to Steve Davies, G4KNZ, 14 Herondale, Birch Hill, Bracknell, Berkshire RG12 7ZT, who will pass them to the adjudicator.

### NOTES FOR CONTESTERS:

All entries must be postmarked at the latest by the 16th day after the end of the contest, ie if contest ends on a Sunday (say 1 October) then the entry must be postmarked on or before the third Tuesday after that Sunday (17 October). For VHF Field Day an extra week is allowed, ie the fourth Tuesday. Any late entries can only be accepted at the discretion of the adjudicator.

No recorded delivery or registered post.

Entrants can obtain a proof of posting certificate from the Post Office which we will honour if an entry has been delayed in the post.

QTH information to be exchanged on 70MHz only. However not all 70MHz contests require this information, see individual rules and General Rule 24 (1994).

General rules: 1 through to 9, 11, 12, 13, 15 to 23, 25, 26, apply to all contests. Any changes will be noted in individual contest rules.

Adjudicators will not normally enter contests which they are adjudicating. However if the adjudicator does wish to enter then his entry will be vetted by a sub-committee before final adjudicated list is published.

Every contest is open to foreign entrants who will be listed separately from UK stations, certificates will be issued to section winners (and runners-up, if enough entries).

### CHRISTMAS FUN CONTEST

#### 70 144 AND 432MHZ FIXED STATION

Dates: 26/27/28/29 Dec

Time: 1400-1600 UTC

Rules: General rules apply

Rules 10 and 14c (Normalisation and Country/County/QTH Multipliers) also apply.

Each band serial starts 001

Each day carry on with sequential serial number (if on first day you worked 20 stations then on day two start with serial 021). Single band entries will be accepted.

Scoring: use radial ring for all distances.

County, Country and QTH Locator multipliers can be claimed for each band.

Example: on day 1 you work 5 stations on 2 metres for 30 radial points, and 4 counties and 3 countries, and 3 QTH Locators and on the same day work 11 stations on 70cm in 5 counties and 2 countries, and 5 squares with 50 radial ring points the days total will be (4+3+3) x 30 + (5+2+5) x 50

Totalling up you get 10 x 30 = 300 and 12 x 50 = 600 equals 900 points. It does not matter that on 4 or 70 you worked the same counties or countries, squares or even the same stations. On the next day you start again with the counties, countries or squares (you can work the same county or country on each day and on each band, all will count as multipliers).

Please include list of claimed county/country/QTH Locator multipliers for each day, and band.

Once you have totalled each day then just add all the daily totals together to get your final score! And the best of luck

Adjudicator: David Johnson, G4DHF, 65 West Street, Bourne, Lincs, PE10 9PA.

## HF RESULTS

### 1ST 1.8MHZ CONTEST 1994

CONDITIONS FOR inter British Isles working were extremely poor and maybe that explains the low turnout, however DX propagation was reasonable with G3KDB working 26 countries and G4BWP 23, some of the DX worked by entrants included VE, SV, 5N, W, UD, UA9 and UA0. Many entrants commented on the poor inter-G conditions and also how fortunate it was that the PA contest was on at the same time, indeed GW8GT worked some 33 Dutch stations, more than 20% of his total contacts. Fred Handscombe, G4BWP, leads the field in this year's event and is awarded the Somerset Trophy with Certificates of Merit going to G4BUO and G3KDB. Leader in the overseas section were EI4HM, otherwise known as G3HZL.

HFCC

#### BRITISH ISLES SECTION

Posn	Call sign	Points
1	G4BWP	847
2	G4BUO	797
3	G3KDB	763
4	G4BJM	727
5	G0VZ	724
6	GW8GT (G3SOX)	697
7	G3TBK	693
8	G3UPY	593
9	G3XTT	591
10	G4IFB	540
11	G0ORH	515
12	G0JNZ	514

## HF RULES

### 7MHZ CW CONTEST 1995

1. The General Rules for RSGB Contests, published in January 1995 issue of *RadCom* apply to UK participants.

2. Eligible entrants: Overseas (including EI) and British Isles. Single and Multi operator entries will be accepted.

3. When: 1500UTC Saturday 25 February to 0900UTC Sunday 26 February 1995.

4. Sections: (a) British Isles, (b) Europe including EI, (c) North America, (d) South America, (e) Africa, (f) Asia, (g) Oceania.

5. Frequency/Mode: 7.000 - 7.030MHz, CW only.

6. Exchange: RST and serial number, commencing with 001. UK stations must also send their County Code.

7. Scoring: British Isles stations contact only overseas stations for points. Each completed contact with a station in section (b) will count 5 points, in sections (c), (d), (e) and (f) 15 points and in section (g), 30 points. Multipliers as per General Rules. Overseas stations contact only British Isles stations. For each completed QSO, stations in section (b) score five points, in sections (c), (d), (e) and (f) score fifteen points, and in section (g) score thirty points. Multipliers: 1 for each British Isles County worked. The final score is the total of QSO points times the number of Multipliers worked.

8. Address for logs: RSGB HF Contests Committee, c/o S V Knowles G3UFX, 77 Bensham Manor Road, Thornton Heath, Surrey CR7 7AF, ENGLAND.

9. Closing Date for logs: British Isles entrants, 20 March 1995; Overseas entrants, 17 April 1995.

10. Awards: Single-operator: The Thomas (G6QB) Memorial Trophy to the leading British Isles station. Certificates of merit to the second and third placed British Isles stations, and to the leading entrants in each overseas section. Multi-operator: Certificates of merit to the leading groups in each section. Additional certificates may be awarded at the discretion of the HF Contests Committee.

## OVERSEAS SECTION

Posn	Call sign	Points
1	EI4HM	318
2	OM3TQZ	311
3	DJ9WH	263
4	OK2BJL/P	236
5	SP3PL	235
6	OK2BXR	207
7	OK2BMU	206
8	SP8FHM	179
9	OK1FMY	153
10	UR7VA	127
11	UV3DRU	110
12	RV1CC	101
13	UY0ZG	96
14	SP3WYI	33
15	RW3AI	24

Checklogs gratefully received from G3MCK, G3YAJ, SP5GKN.



## LF CUMULATIVES 1994

CONGRATULATIONS AND certificates of merit to the following: **G3HEJ** (overall winner), **G4TSL** (7MHz winner and 2nd overall), **G3RSD** (3rd overall), **G0IVZ** (1.8MHz winner) and **G5LP** (3.5MHz winner). Given the level of support across all 15 separate sessions comprising this contest, the HFCC has decided to award additional certificates of merit to the following session leaders: **G3SJJ** (3.5MHz session 1 and 7MHz sessions 1 & 2), **G4RCG** (3.5MHz sessions 3 & 4), **GM3POI** (7MHz session 3) and **G0JQN** (7MHz session 5). Well done everyone!

In order to conserve space in *RadCom*, the condensed results table below shows just the band and overall total scores. Detailed results packs have been sent individually to all the entrants: if anyone else would like a copy, please send an A5 or larger SASE to the adjudicator: Dr G. Hinson, G4IFB, 379 Quemerford, Calne, Wilts SN11 8LF.

Finally, please note that by popular demand the 1995 LF Cumulatives will consist of the best TWO out of THREE sessions per band rather than the best three of five: check the rules carefully!

Pos	Callsign	Grand total	1.8MHz	3.5MHz	7MHz
1	G3HEJ *	2,371	672	820	879
2	G4TSL *	2,211	561	735	915
3	G3RSD *	1,947	534	732	681
4	GM4SID	1,929	588	696	645
5	G4OGB	1,889	576	659	654
6	G0ORH	1,861	507	669	685
7	G2HLU	1,806	534	687	585
8	G3YAJ	1,772	429	698	645
9	G5LP *	1,725	0	846	879
10	G3KNU	1,677	471	618	588
11	G0ADH	1,676	423	647	606
12	G3LUK	1,674	390	699	585
13	G3WKL	1,632	441	597	594
14	G3ZGC	1,582	456	643	483
15	G3SJJ *	1,533	57	789	687
16	G3JSR	1,490	294	575	621
17	G4RCG *	1,434	666	768	0
18	G0LXX	1,401	360	519	522
19	G4BUQ	1,349	332	603	414
20	G3VNG	1,347	333	501	513
21	G3AWR	1,275	366	504	405
22	G3GMS	1,239	273	462	504
23=	GM3JUM	1,191	303	474	414
23=	GW3SB	1,191	354	480	357
25	GW3WWN	1,179	0	606	573
26	G3YLC	1,077	504	573	0
27	G3BPM	1,052	428	234	390
28	G3SQX	1,050	237	471	342
29	GWOKZW	1,006	274	360	372
30	G3ZDD	960	291	387	282
31	G0LZL	939	261	678	0
32	G0GKH	891	0	480	411
33	G4EBK	879	0	675	20
34	G3GMM	767	309	299	15
35	G0IVZ *	759	759	0	0
36	G6QQ	756	0	342	414
37	GM3POI *	753	0	0	753
38	G3JJG	717	0	0	717
39	G4SFO	657	657	0	0
40	G0NID	621	33	318	270
41	G3SHF	612	0	612	0
42	G4XPE	603	0	516	87
43	G4UXG	589	0	589	0
44	G4BLI	558	0	558	0
45	G4ENA	546	546	0	0
46	G0MRH	543	0	285	258
47	G4JSN	534	225	0	309
48	G0JQN *	438	153	135	150
49	GW4KVJ	402	222	90	90
50	GM0JUF	396	0	396	0
51	G4ZYF	323	0	0	32
52	PHCC	276	276	0	0
53	G4MVA	198	198	0	0
54	GU0SUP	108	0	108	0

\* Asterisks show certificate winners

## HF CONTESTS CALENDAR

<b>1994</b>		<b>14/15 Jan</b>	HA DX CW
<b>12 Nov</b>	Club Calls Contest (Oct)	<b>14/15 Jan</b>	AGCW-DL ORP
<b>11/13 Nov</b>	JARL International DX SSB	<b>17 Jan</b>	LF Cums 1.8MHz
<b>12/13 Nov</b>	WAE RTTY	<b>21 Jan</b>	LF Cums 7.0MHz
<b>13 Nov</b>	OK DX (Mixed)	<b>22 Jan</b>	LF Cums 3.5MHz
<b>19/20 Nov</b>	2nd 1.8MHz CW (Oct)	<b>25 Jan</b>	LF Cums 1.8MHz
<b>19/20 Nov</b>	Pan European 160 CW	<b>28 Jan</b>	LF Cums 3.5MHz
<b>26/27 Nov</b>	CQWW DX (CW)	<b>29 Jan</b>	LF Cums 7.0MHz
<b>3/4 Dec</b>	ARRL 160m	<b>28/29 Jan</b>	CQ WW 160m
<b>11 Dec</b>	ARRL 10m	<b>28/29 Jan</b>	UBA SSB
<b>1995</b>		<b>28/29 Jan</b>	REF CW
<b>8 Jan</b>	AFS (CW)	<b>2 Feb</b>	LF Cums 1.8MHz
<b>14 Jan</b>	AFS (SSB)	<b>4 Feb</b>	LF Cums 7.0MHz
		<b>5 Feb</b>	LF Cums 3.5MHz

## VHF/UHF CONTESTS CALENDAR

<b>4/19 Oct</b>	1.3 & 2.3GHz Cum (Jul 94)	<b>5/6 Nov</b>	144MHz CW Marconi/RSGB 24hr
<b>9 Oct</b>	24GHz Cums (Apr 94)	<b>6 Nov</b>	144MHz RSGB CW 6hr
<b>12/27 Oct</b>	432MHz Cum (Jul 94)	<b>11/28 Nov</b>	432MHz Cum
<b>14/31 Oct</b>	144MHz CW Cums	<b>4 Dec</b>	144MHz AFS/Fixed/SWL (Nov 94)
<b>30 Oct</b>	2nd 23cm & 13cm Fixed/SWL (Sep 94)	<b>5 Dec</b>	1.3 & 2.3GHz Cum
<b>30 Oct</b>	10GHz Cums	<b>13 Dec</b>	432MHz Cum
<b>3/17 Nov</b>	1.3 & 2.3GHz Cum	<b>26/27/28/29 Dec</b>	70, 144 & 432MHz Fixed CFC (Nov 94)

HF NATIONAL FIELD DAY  
JUNE 1994 RESULTS

## RESTRICTED SECTION

Posn	Group	Call	QSOs	1.8	3.5	7	14	21	28	Total
1	Gravesend RS	G3GRS/P	961	1414	772	990	661	123	318	4278
2	Mid Beds CA	G4MBC/P	900	1220	782	902	597	109	361	3971
3	Verulam ARC	G3VER/P	897	1324	709	900	581	139	284	3937
4	Three A's CG	G0AAA/P	886	1326	782	853	556	52	296	3865
5	Park Air Group	G3KHZ/P	912	1104	826	1031	600	41	216	3818
6	Sussex Downs CG	G4FNL/P	867	1232	678	884	571	138	265	3768
7	Red Dragon CG	GWBGT/P	881	1094	622	1063	577	121	108	3585
8	White Rose CG	G3PSM/P	844	1166	750	929	494	110	68	3517
9	Chilren DX Club	G3OZF/P	783	1146	654	767	549	149	237	3502
10	Lichfield ARS 'A'	G3KDB/P	796	1208	559	825	460	118	196	3366
11	East Riding CG	G3ZRS/P	813	1038	674	1142	400	2	40	3296
12	Caradon CG	G0VZ/P	751	1192	443	751	602	58	200	3246
13	South Cumbria CG	G3ZDP/P	774	1112	580	744	725	4	16	3181
14	Newbury & Dist ARS	G3WOL/P	730	836	655	893	391	64	272	3111
15	Reading & Dist ARC	G0RSR/P	748	962	554	800	512	42	193	3063
16	Cheltenham ARA	G5BK/P	731	920	577	759	529	93	176	3054
17	Bracknell ARC	G4BRA/P	697	901	663	874	275	121	184	3018
18	Crawley ARC	G3VSC/P	631	1236	454	826	262	0	144	2922
19	Medway Radio CG / R Eng	RS63XRE/P	683	1000	500	599	499	60	246	2904
20	Inverclyde ARG	GM0GMN/P	691	648	502	708	677	104	196	2835
21	Windmill CG	G0FAH/P	603	1014	658	378	377	87	316	2830
22	Sutton & Cheam RS	G2XP/P	629	746	660	526	527	56	180	2695
23	Hereford ARS	G3YDD/P	609	906	544	690	472	4	0	2616
24	Stratford on Avon & Dist	G0SOA/P	576	806	600	507	382	4	130	2429
25	Chelmsford ARS	G0MWT/P	542	798	716	416	195	46	218	2389
26	Bury RS	G3BRP/P	564	756	394	636	342	125	89	2342
27	Ting Tang Contesters	G4ODV/P	641	586	458	758	503	28	0	2333
28	Norfolk ARC	G4ARN/P	538	780	698	620	196	4	16	2314
29	Gloucester ARS	G4AYM/P	570	626	562	553	337	81	125	2284
30	Tollesbury CG	G3GLL/P	547	636	312	732	397	24	121	2222
31	Havering & Dist ARC	G4HRC/P	525	662	414	575	303	57	180	2191
32	Crowborough & District	G0CRW/P	441	946	477	371	141	40	180	2155
33	Chesham ARC	G3MDG/P	445	792	364	464	249	40	228	2137
34	S Hants Int Teleg Soc	G3DIT/P	453	860	120	807	231	0	12	2030
35	Reigate ATS	G5LKP/P	473	598	172	593	416	32	206	2019
36	North Wakefield RC	G4NOK/P	451	754	520	244	335	54	32	1939
37	Blackpool & Fylde RS	G8GG/P	429	768	284	483	324	0	0	1859
38	Thatcham ARG	G4RKO/P	470	478	485	587	227	12	26	1815
39	Easington ARS	G4APN/P	437	854	184	256	455	0	0	1749
40	Burton & Dist ARS	G3NFC/P	369	668	504	288	213	0	0	1673
41	Aberdeen ARS	GM3BSQ/P	368	440	106	580	395	12	0	1533
42	Exmoor RC	G4UFP/P	271	746	254	230	137	56	8	1431
43	Greenock & Dist ARC	GM3ZRC/P	409	0	293	512	465	0	100	1370
44	North Bristol ARC	G4GCT/P	306	72	460	594	80	0	0	1206
45	Taunton & Dist ARC	G3XZW/P	346	382	174	240	319	0	0	1115
46	Southdown ARS	G3WQK/P	181	100	142	314	86	18	0	660

## OPEN SECTION

Posn	Group	Call	QSOs	1.8	3.5	7	14	21	28	Total
1	Reading & District ARC	G3ULT/P	1124	1340	830	1033	824	170	541	4738
2	Lichfield ARS 'B'	G3VHB/P	937	1362	662	744	643	299	309	4019
3	Addiscombe ARC	G4ALE/P	877	1300	708	822	574	141	340	3885
4	East Notts CG	G3TBK/P	900	1506	850	831	473	59	157	3876
5	Strling & District ARS	GM6NX/P	859	990	530	865	776	266	176	3603
6	De Montfort Univ Leicester ARS	G3SDC/P	830	1074	717	575	687	168	370	3591
7	Kilmarnock & Loudon ARC	GM0ADX/P	761	910	452	731	625	140	456	3314
8	Southgate ARC	G3SFG/P	742	1144	654	680	361	123	275	3237
9	Torbay ARS	G3NUA/P	767	970	538	647	727	87	184	3153
10	Melton Mowbray ARS	G4FOX/P	690	1008	564	686	501	62	80	2901
11	Banff & District ARC	GM3GG/P	678	766	421	609	742	164	64	2768
12	Telford & Dist ARS	G3ZME/P	554	1048	517	532	178	147	174	2596
13	Iford Group RSGB	G3XRT/P	535	882	422	595	307	98	198	2502
14	Leicester RS	G2AA/P	642	736	612	486	629	12	16	2491
15	Offa's Dyke CG	GW2SJ/P	655	748	542	462	645	6	61	2464
16	Scunthorpe ARS	G4FUH/P	575	648	524	616	332	171	72	2363
17	Great Yarmouth ARC	G3YRC/P	573	730	450	642	473	24	0	2319
18	Maidenhead & District ARC	G3WKK/P	489	1000	596	337	279	8	93	2313
19	Edware ARC	G3ASR/P	519	664	334	501	443	81	234	2257
20	Shirehampton ARC	G4AHG/P	576	370	586	549	599	16	30	2150
21	Aylesbury Vale ARS	G4VRS/P	415	1076	334	556	56	25	100	2147
22	Harwich & R Group	G0RGH/P	499	600	580	470	234	35	32	1951
23	Scarborough ARS	G4BP/P	427	672	514	377	336	8	0	1907
24	South Essex ARS	G4RSE/P	442	586	408	429	342	74	0	1839
25	South Manchester RC	G3FVA/P	425	458	382	449	340	24	157	1810
26	Wirral ARS	G3NWR/P	479	180	433	554	506	8	0	1681
27	Hornsea ARC	G4EKT/P	455	406	590	255	355	24	16	1646
28	Orkney Radio Group	GM3POI/P	517	0	0	1613	0	0	0	1613
30	Crystal Palace & District ARC	G3VCP/P	371	528	100	359	357	75	194	1613
31	Guildford & District RS	G5RS/P	480	0	0	1516	0	0	0	1516
32	Grimsby ARS	G3CXX/P	445	0	0	1415	0	0	0	1415</



# RSGB HF National Field Day, June 1994

by the HF Contest Committee

**M**EMORIES OF FIELD Day 1994 will contain images of rain, rain-soaked teams and even more rain. It was wet! In fact, reportedly the wettest weekend the event has experienced for 30 years, so the groups who managed to get most of their equipment on site and assembled on the Friday evening in dry conditions started off with some advantage. Despite this 87 entries were received, slightly down on previous years, partly due to the appalling conditions. But also several groups were participating in D-day celebrations and some commented on the clash with HQ Open Day. A noticeable trend was the welcome increase in G0 callsigns listed, some 81 in total.

Propagation again focused on the lower frequencies with many groups complaining of virtually no traffic on the two higher bands. This was evident in the logs from the centre and north whilst southern groups once again benefited from the higher population in that part of the country.

Record Breakers, **Reading and District ARC, G3ULT/P**, secured their fourth consecutive **Overall and Open section** win very convincingly, once again showing the team work acquired by operators **G3XTT, G3WGV** and the rest of the group. Achieving a leading position means accumulating a consistently high score across as many bands as possible. The Reading group gained the fourth highest score on 1.8, third highest on 3.5, third highest on 7 (discounting single band entries) and were band leaders by a considerable margin on 14 and 28, plus intelligent use of 21MHz to catch the only major opening of the event. The figures speak for themselves.

Second place honours in the Open section go to **Lichfield B, G3VHB/P** using an impressive array of hardware both in the air and at the operating position. A TH7 and a 5 element mono-

This year's event was organised by David Hill, G4IQM, and adjudicated by G4HTD, G4BUO, G3SQX, G2HLU and G4IQM. Checking software was written by G3VHB with assistance from G4VXE. The report was compiled and edited by Chris Burbanks, G3SJJ, who thanks the team for their exceptional effort.

bander for 28MHz took care of the HF bands whilst a 180 ft double-extended Zepp and a 1.8MHz dipole were used on the lower bands. Two networked computers with CT v9 software ensured pencil and paper were a thing of the past! Operators **G3VHB** and **G3SJJ** are looking forward to taking top spot next year since they heard that G3ULT/P will probably join the Restricted crowd!

A special mention has to be made of fourth placed **East Notts CG, G3TBK/P**, operated for 22 of

the 24 hours by **G3TBK**. Whilst the group are less computer inclined, the experience gained through years of Field Day participation show through, particularly with the acceptance of achieving less than optimum performance on the HF bands and therefore concentrating on the lower frequencies.

In the **Restricted** section, once again **Gravesend RS, G3GRS/P** lead the field with operators **G4BUO, G4FAM** and **G4IFB** sharing the key/keyboard.



Hoisting the Reading & DARC 40m beam.



Don Field, G3XTT operating the winning portable station G3ULT/P.

Again experience shows through with a well-developed search and pounce technique and a thorough knowledge of the six bands. A close battle for second place with only three contacts separating the two was fought by **G4MBC/P** and **G3VER/P**, with the former just slipping through.

**Low Power** section was disappointing with only two entrants and will be re-considered if no growth occurs next year. **Echelford ARS, G3UES/P**, were clear leaders and win the Reading QRP Trophy for the second year running. The other group were Reading ARC C station, **G0LHZ/P**, operated by **G0LHZ, G0LIE, G0RPW** and **2E0ACY**.

## Band Reports

### 1.8MHz

CONDITIONS SEEM TO improve each year on the band. 1994 saw the leading station, **G3TBK/P**, net 215 contacts at a rate of 47 per hour. Of these, 80% were other portables and 50% were with the UK. These ratios were reflected by the top groups in both the Open and Restricted sections whilst **Low Power winners, G3UES/P**, achieved ratios of 95% and 65%. Probably due to more time spent searching. The leading four stations in the two main groups started on the band between 2012 and 2055, finishing between 0226 and 0354, with number of visits varying from 3 to 11. What distinguished the leaders from the rest of the pack was the efficiency with which they could make contacts. **G3GRS/P** achieved 192 contacts in 3 hours and 43 minutes from 8 visits, an average of 52Qs/hour. **G3ULT/P** made the same rate in 11 minutes less over 5 visits. **G3VER/P** and **G3VHB/P** spent 4h 48m and 5h 9m managing only 39/37 per hour respectively. The lower contact rate is probably the result of coming on the band too early, the optimum time this year appears to have been 2040 with opinions varying on the best time to stop!

## TROPHY WINNERS

NFD Shield	Reading & DARC	G3ULT/P
Bristol Trophy	Gravesend RS	G3GRS/P
G6ZR Memorial Trophy	Lichfield RS B	G3VHB/P
Gravesend Trophy	Mid Beds CA	G4MBC/P
Scottish Trophy	Stirling and DARC	GM6NX/P
G3YF Memorial Trophy	Reading & DARC	G3ULT/P
Reading QRP Shield	Echelford ARS	G3UES/P



### 3.5MHz

THE WORSENING HF conditions meant the trend towards greater use of 80m continued this year, and the band was occupied much earlier. Four of the top five finishers in the Restricted section made their first QSO within eight minutes of each other, at around 1720h. On average they made ten visits to the band, which underlines the need for rapid bandchange capability.

The top five in the Open section made their first contacts on the band almost exactly an hour later, and averaged only six and a half visits to the band. The trick is to get sufficient QSOs in the bag before daybreak. Most of the top ten had finished with 80m by about 0500h, although a few came back for one or two further 2-pointer contacts.

Some groups worked a handful of North American stations during the night but the bulk of contacts were with European portables. 80m single-band specialists Bredhurst G0BRC/P repeated their success in winning the band, but only by 6 points over G3TBK/P. In the restricted section G3KHZ/P came close with 824 points, some way ahead of G4MBC/P. 80m is perhaps less of a struggle than some other bands for the QRP entrants, and winners G3UES/P made 162 contacts. Comments on 80m band cover sheets: "Very active during the night but contacts lacking on Sunday" G3BRS/P; "Stayed awake throughout the contest and the 80m score is therefore three times that of last years. Who needs beauty sleep?" G3IZD/P; "Band open at least 18 hours" G3TBK/P; "Frequent checks needed to make sure you don't miss out" G3XRT/P; "Lots of activity to make up for the poor HF conditions, with just a couple of DX stations" G4ALE/P; "Pretty good during the evening and through the night to England but not very exciting into Europe" GM3GG/P.



Chris Burbanks, G3SJJ, operating the Lichfield ARS Station G3VHB/P.



The Reading & District ARC's 40m beam caught at sunset.

### 7MHz

OVERALL BAND WINNER was GM3POI/P with 517 contacts using a delta loop at 11m. Benefiting from their location in the Orkneys, they were able to work G stations at appropriate skip distance for most of the 24 hours, as well as the many German and other continental stations.

Close behind were G5RS/P with 2 dipoles and a delta loop and G3CNX/P being more adventurous with a V Beam and a Bobtail curtain, possibly too "DXey" for this event. All three were single band entries in the Open section.

G3ZRS/P topped the Restricted section with 345 contacts gained mostly in the first three hours and for long periods on Sunday. It is hard to know when to hit the band because it is open most of the time, G3ULT/P had a brilliant session from 1608 to 1751 making 135 contacts at the rate of 79 an hour, mainly into Europe but a also a few local G portables. There was very little DX to the east on Saturday evening just a couple of Asiatic Russians and VK6HD. Between 2300 and 0500 some North Americans can be worked with a sprinkling of South Americans and long path VK around sunrise.

The best time for inter-G contacts appears to be from 1100 on Sunday.

### 14MHz

THE BAND WAS much the same as last year with activity centred around the first three hours and from 0530 onwards. G3ULT/P collect yet another award in the form of the Frank Hoosen G3YF Memorial Trophy with a astute 266 contacts from four main sessions. Firstly from 1753 to 1838 netting 40 contacts, then from 0534 to 0907, 1046 to 1116 and 1341 to the end. Northern groups managed to recoup some loss of contacts on the two higher bands with GM6NX/P and GM3GG/P second and third in the Open section, and G3IZD/P based in Cumbria as Restricted section leader. More inter-G contacts were noticeable this year resulting in a better points per contact ratio for Restricted section groups although G3JKY/P in the Open section tried a dual band effort and found some Stateside activity later on the Saturday evening.

### 21/28MHz

THE COMMENTS ON these bands were about as scarce as sunspots and certainly unrepeatable in good company! On 21MHz, G3VHB/P was band winner in the Open section with 299 points gained from 85 contacts, whilst in the Restricted section G3OZF/P led with 149 points from 44 contacts. With few exceptions, stations who ventured on the band

(and there were those that didn't) found Sunday morning most productive. Much the same can be said about 28MHz although the x2 points bonus attracted more interest. Activity seemed evenly split over the two days with Restricted section leaders G4MBC/P making 49 contacts and Open section leaders G3ULT/P some 27 more, no doubt due to their location and more efficient antenna system. Southern stations definitely had the advantage where inter-G was concerned and on both bands, groups in the west and north found Gs hard to work and made their scores mainly from European portables.

## Comments

### Computer Logging

This is now well established with at least 60 entries being assisted in some way by computer technology. For those groups not able to have on-site facilities, the ability to enter contacts in to a logging programme afterwards is valuable in order to check for duplicates and to score the log. Probably the next stage is to site the computer in the operating area, but with a second person entering the contacts from a written log sheet filled in by the main operator. Super Duper and Log produced by EI5DI and G3WGV respectively are excellent in this respect particularly in that a rolling score updated after each contact is shown on screen. Most of the top groups are now using the K1EA's CT in realtime mode, ie the operator entering the contacts and using the memory keyer facilities as well to send reports and CQs. A conversion programme will score and produce paper logs after the event. Two aspects are important to remember, firstly computer logging does not take away the enjoyment of reading the CW in the first place and secondly, groups trying a programme for the first time



Chris Swallow, G3VHB, operating G3VHB/P.





The Manfield ARS's team came 28th using the callsign G4ARN/P.

should make sure all participants are familiar with the programme well before the contest. Computer logging is not infallible as it brings its own set of problems. Several groups complained of computer generated noise and GM3BSQ/P noted: "The time clock on our machine decided to

go slow taking four minutes to register one, we would have had a better score if we had kept with this although it would have been Wednesday afternoon before the 24 hours were up!" On a brighter note, G5RS/P commented: "A first for the Club was the use of computer logging on NFD. Further, and maybe a first in the UK, Dave, G3YXX, is blind and used a Braille output display from his PC, this worked well".

#### Till Next Year

For the leading groups, NFD is a serious, highly competitive event with extensive planning and meticulous attention to detail. For others, perhaps Scunthorpe ARC should have the last word: "Tom and Nick, produced endless tea, coffee and sandwiches, followed at midday by Goulash accompanied by white wine, with an after dinner drink of Vodka made from figs. Maybe this is the reason for our lower score this year!"



Novice licensee, 2E0ACY, operating the RADARC QRP station, G0LHZ/P.



Members of Banff & District ARC came 11th in the Open section.

## COMMONWEALTH CONTEST 1995

### COMMONWEALTH CONTEST CALL AREAS

The following call areas are recognised for the purpose of scoring in the 1995 event:

1. **General:** The Commonwealth Contest is intended to promote contacts between stations in the British Commonwealth and Mandated Territories. Intending UK entrants are advised to study the General Rules for RSGBH F Contests, published in the January edition of Radio Communication, which apply to this event. Overseas entrants especially are requested to note the address to which logs must be sent.

2. **Eligible entrants:** British Isles - Class A licence holders, who must be members of RSGB. Overseas - Licensed Radio Amateurs within the British Commonwealth or British Mandated Territories. Single-operator entries only will be accepted and entrants may not receive any assistance whatsoever during the contest, including the use of spotting nets, packet clusters or other assistance in finding new bonuses. Entries will not be accepted from Headquarters stations, nor from stations using GB or other special event call signs or operating maritime or aeronautical mobile.

3. **When:** 1200UTC Saturday 11 March to 1200UTC Sunday 12 March 1995.

4. **Sections:** (a) Multi-band (b) Single-band Single-band entrants should claim points for contacts made on one band only, but are requested to submit details of QSOs made on other bands, for adjudication purposes. Multi-band entries will not be eligible for single-band awards.

5. **Frequencies/Mode:** CW only in the 3.5, 7, 14, 21 & 28MHz bands. Entrants should operate in the lower 30kHz of each band, except when contacting Novice stations operating above 21030 and 28030kHz. Crossband contacts will not count for points or bonuses.

6. **Contest Exchange:** RST and serial number, commencing with 001.

7. **Scoring:** Contacts may be made for points with any station using a British Commonwealth prefix (see accompanying list) except those within the entrants own call area. Note that for this contest, the entire UK counts as ONE call area, and therefore UK stations may not work each other for points. Each completed contact scores 5 points, with a bonus of 20 points for each of the first three contacts with each Commonwealth Call Area, on each band.

8. **'Headquarters' Stations:** A number of Commonwealth Society HQ stations (although not eligible as entrants) are expected to be active during the contest and will send 'HQ' after their serial number, to identify themselves. Every HQ station counts as an additional call area (and therefore attracts the 20-point bonus) and entrants may contact their own HQ station for points and bonuses.

9. **Logs:** Overseas entrants are welcome to use log sheets to the format specified by their national society. UK entrants are referred to the General Rules. Separate logs and lists of bonuses claimed are required for each band. Duplicate contacts must be clearly marked and not claimed for points. Each unmarked duplicate contact found for which points have been claimed will result in the deduction of 55 points. Entries containing more than 5 such duplicates will be liable to disqualification. Entrants making more than 80 QSOs are requested to include a checklist of the call signs appearing in the log, sorted into alphabetical order and with either the serial number sent or the time of contact beside the call sign. Each entry must be accompanied by a summary sheet (HFC2 or equivalent) indicating the section entered and the scores claimed on each band (also don't forget details of equipment, your correspondence address and any interesting photographs for publication!).

10. **Address for logs:** RSGB HF Contests Committee, c/o S V KNOWLES G3UFY, 77 Bensham Manor Road, Thornton Heath, Surrey CR7 7AF, UK

11. **Closing Date for Logs:** Logs must be postmarked no later than 10 April 1995.

12. **Awards:** (a) Multi-band - The Senior Rose Bowl will be awarded to the overall leader, and the runner-up will be awarded the Junior Rose Bowl. The Col. Thomas Rose Bowl will be awarded to the highest-placed UK station. Certificates of Merit will be awarded to the third-placed entrant overall, and to the leading station in each Call Area. (b) Single-band - Certificates of Merit will be awarded to the leading Overseas and UK entrants on each band.

A2	Botswana
A3	Kingdom of Tonga
AP	Pakistan
C2	Nauru
C5	Gambia
C6	Bahamas
CY9	St Paul Island
CY0	Sable Island
G,GB,GD,GI,GJ,	
GM,GU,GW	United Kingdom (all one area)
H4	Solomon Is.
J3	Grenada
J6	St Lucia
J7	Dominica
J8	St Vincent
P2	Papua New Guinea
S2	Bangladesh
S7	Seychelles
T2	Tuvalu
T30	W Kiribati
T31	C Kiribati
T32	E Kiribati
T33	Banaba
V2	Antigua, Barbuda
V3	Belize
V4	St Kitts, Nevis
V5	Namibia
V8	Brunei
VE1	Nova Scotia
VE2	Quebec
VE3	Ontario
VE4	Manitoba
VE5	Saskatchewan
VE6	Alberta
VE7	British Columbia
VE8	North West Territories
VE9	New Brunswick
VK1	Australian Capital Territory
VK2	New South Wales
VK3	Victoria
VK4	Queensland
VK5	South Australia
VK6	Western Australia
VK7	Tasmania
VK8	Northern Territory
VK9C	Cocos (Keeling) Island
VK9L	Lord Howe Is.
VK9M	Melish Reef
VK9N	Norfolk Is.
VK9W	Wills Island
VK9X	Christmas Is.
VK0	Heard Is.
VK0	Macquarie Is.
VK0	Antarctica
VO1	Newfoundland
VO2	Labrador
VP2E	Anguilla
VP2M	Montserrat
VP2V	British Virgin Is.
VP5	Turks & Caicos
VP8	Falkland Is.
VP8	S Georgia
VP8	S Sandwich Is.
VP8	S Shetland Is.
VP8	S Orkney Is.
VP8	Antarctica (together with VK0, ZL5)
VP9	Bermuda
VQ9	Chagos
VR6	Pitcairn Is.
VS6/VR2	Hong Kong
VU	India
VU4	Andaman & Nicobar Is.
VU7	Laccadives
VY1	Yukon
VY2	Prince Edward Is.
VY3	Vanuatu
Z2	Zimbabwe
ZB2	Gibraltar
ZC4	Cyprus (Sovereign Bases)
ZD7	St. Helena
ZD8	Ascension Is.
ZD9	Tristan da Cunha, Gough Is.
ZF	Cayman Is.
ZK1	North Cook Is.
ZK1	South Cook Is.
ZK2	Niue
ZK3	Tokelau
ZL0 or ZL	New Zealand Reciprocal Calls
ZL1	New Zealand
ZL2	New Zealand
ZL3	New Zealand
ZL4	New Zealand
ZL7	Chatham Is.
ZL8	Kermadec Is.
ZL9	Auckland & Campbell Is.
ZS1	Cape District
ZS2	Cape Province
ZS4	Orange Free State
ZS5	Natal
ZS6	Transvaal
ZS8	Marion & Prince Edward Is.
3B6/7	Agalega & St Brandon
3B8	Mauritius
3B9	Rodrigues Is.
3DA	Swaziland
4S	Sri Lanka
5B	Cyprus
5H	Tanzania
5N	Nigeria
5W	Western Samoa
5X	Uganda
5Z	Kenya
6Y	Jamaica
7P	Lesotho
7Q	Malawi
8P	Barbados
8Q	Maldives
8R	Guyana
9G	Ghana
9H	Malta
9J	Zambia
9L	Sierra Leone
9M2	W Malaysia
9M6/9M8	E Malaysia
9M0	Spraty Is.
9V	Singapore
9Y	Trinidad & Tobago
GB5CC	RSGB HQ Station + Various other Commonwealth HQ Stations



# Members' Advertisements

RSGB Members wishing to place an advertisement in this section must use the official form incorporated on the label carrier of Radio Communication. This will prove membership and must be for the current month. No acknowledgment will be sent. Ads not clearly worded, or which do not comply with these conditions will be returned. If an ad is cancelled no refund will be due. An advertisement longer than 60 words will be charged pro rata. Trade or business ads, even from members, will not be accepted. Traders who wish to use this facility must send a signed declaration that the items for sale are part of, or intended for, their own personal amateur station. The RSGB reserves the right to refuse ads, and accepts no responsibility for errors or omissions, or for the quality of goods for sale or exchange. Ads for CB equipment will not be accepted. Each advertisement must be accompanied by the correct remittance, as a

credit card payment, cheque or postal order made payable to the Radio Society of Great Britain. Please note that because this is a subsidised service to members, no correspondence can be entered into. Licensed members are asked to use their call sign and QTH, provided their address in the current edition of the RSGB Amateur Callbook is correct. RS members will have to provide their name and address or telephone number. Please include your town and phone number in the free boxes provided to assist readers. Advertisements will be placed in the first available edition of *RadCom*.

**Warning:** Members are advised to ensure that the equipment they intend to purchase is not subject to a current hire purchase agreement. The 'purchase' of goods legally owned by a finance company could result in the 'purchaser' losing both the goods and the cash paid.

## FOR SALE

**6M TRANSVERTER**, Microwave Modules MMT50/28 25w o/p, 28MHz in, 50MHz out boxed, with book: £150 ovno. Contact Dave, days. (Northampton) 0604 37769.

**DRAKERAC, T4XC**, MN2000 2KW ATU: £550. Yaesu FL2100Z Linear, mint, boxed, little used: £475. FT470, spare battery, charger, boxed: £275. FT4700RH Remote Panel, boxed: £350. KW109 1KW ATU: £150. 60ft Versatower, Create 3 ele HF Beam, HAM2 Rotator, UHF/VHF Collinear, coax, etc: £450 takes ALL. Exchanges early wireless gear: Jim Taylor, G4ERU, 5 Luther Road, Winton, Bournemouth, BH9 1LH. (Bournemouth) 0202 510400.

**HAM 2 ROTATOR** in excel condx, newly inspected and lubricated: £95 plus carr. Hy-Gain Thunderbird 3 el Triband in gd condx: £95. GM3FRZ, QTHR. (Aberdeen) 0224 317398.

**ICOM IC735**, inc PSU, brand new condx: £650. Heath SB1000 Linear: £550 Other equipment going cheap. G4DRH. (Lancs) 0253 730033.

**JRC SEPARATES**. NSD 515 Tx with built in ATU, NRD 515 Rx + Handbooks, cables, Mic: £550. Yaesu FL2100Z: £450. Buyer collects. (Reading area) 0734 693284.

**KENWOOD TH78**, D/band, H/held, complete, boxed and as new, hardly used, still under guarantee: £350. Nick, GOVFO. (Oxford) 0865 379076.

**NOTEBOOK PC-286**, 3Mb Ram, 40Mb HDD, carry case: £300. S/ware: Designworks, Gem, Paccioli, Wordperfect: £25 each. Rare Heathkit HF-VHF Transverter SB500: £50. Modern for BBC Microp with Prestel Eprom: £20. All one. Phone anytime (answerphone). Adrian, G0THW. (Bicester, Oxon) 0869 345080.

**PYE A100 LINEAR** Amplifiers "M" Band, will convert 2/4/6 metres: £12 + Postage. Phone (Macclesfield) 0260 252287.

**RACAL LINEAR** Amplifier Type TA184, 10kW o/p, 2-30MHz, 400v 3-phase supply, completely Automatic tuning, all mode operation, under one watt i/p, for Full o/p. Only 60 hr use on fresh o/p valve: £4,995. - Serious enquiries only please. G4ZOW, No 4, Mimms Hall Cottages, Warrington Lane, Potters Bar, Herts, EN6 3NL. (Potters Bar) No Phone number.

**TEN-TEK ARGONAUT-2** QRP Tcvt, mint: £550. Butternut DX6V Antenna, incl 160m Coil: £100. Hansen twin Meter SWR Bridge: £50. Capco 300w Antenna Tuner: £100. Star Master Keyer: £30. Benchner Paddle with miniature electronic Keyer: £75. The LOT for: £825. G3YIQ. (Market Drayton) 0630 657887.

**TL922 LINEAR** 2kW, exc condx, with manual: £1,150. Tokyo HC-2000 2kW ATU, 5 i/p, RF/SWR Meters, manual, VGC: £275. PSU 12V & 35A, VGC: £125. G3ZTZ, QTHR. (Camberley) 0276 25430.

**TRIO TS530S**, mint condx, Mic, manual, box: £400. Yaesu FT101Z, mint condx, Mic, manual, box: £250. Yaesu FR100 Rx: £70. Yaesu Transverter FTV-901R: £160. Hansen SWR/Power Meter, automatic: £50. Phone anytime. Chris, G4BGM, QTHR. (Farnham) 0252 795105.

**VALVES**. Brand New, All £3 each: 5R4GY, 5Y3GT, 5Z4, 6BG6G, 6BK4, 6C5, 6DE4, 6DW4, 6F6, 6F13, 6F30, 6G6G, 6H6, 6J7, 6K25, 6P25, 6P28, 6F33, 12BH7, 5763, KT81, DM70, AC/P, AC/P1, ACSP3, AZ31, EL38, H63, HL41DD, KT263, OC3, PEN45, PEN46, PEN383, KT36, KT44, KT67, TT15, TZ40,

VV8 and TH41. Please Add £2 Postage. Cheques to: K Bailey, Flat 3, 177 College Road, Moseley, Birmingham B13 9LJ.

**VALVES**. Brand new. All £1 each. EB91, ECC84, ECC91, ECL80, EF80, EF85, EF89, EF91, EF92, EF95, EF183, EF184, EL32, EL85, EZ81, 6BJ6, 6CB6, 6CH6, 6X4, 6X5GT. Several available of each type, many still available from previous adverts and others too numerous to list. Please add £2 Postage. Cheques to: K. Bailey, Flat 3, 177 College Road, Moseley, Birmingham, B13 9LJ. (SAE with enquiries).

**1500VA PSU PARTS**: Transformer tapped every 3v, 0-53v 30A. Big Heatsinks, fans, electrolytics, Rectifiers, cabinet with Meters, Switches, etc. Call Dave, G3UNA, QTHR evenings and weekends. (Ruislip, Middx) 081 429 0716.

**4M HANDHELD**, 5w on 70.45, 70.475, c/w Battery Helical charger: £60. H/Brew HF/2m Rx Converter 1-30MHz: £35 ono. (Amphill, Beds) 0525 406043.

**6 METRE GEAR**. RN Electronics low noise Masthead Pre-Amp (transmit through) c/w cable and powering Unit and 6/10m Receive Converter: £70. PW "Otter" 6m Rx, useful Beacon Monitor: £25. All with data, post paid and open to offers. GM3LJU, QTHR. (Dunoon) 036 987 341.

**A1 CLEAROUT**. Lots Test Equipment, Amateur New Books. RING. Pye PF85 UHF + manuals. US Robotics Sportster 144 Fax Modem. 25 Set Green Par int Connector Dividers, Loads, Sniffers, cased. Levell TM8 DC Micro Volt 0-300V Bench Meter. Trio DM801 Dip Meter. HP3200B 10-500MHz Signal Generator Oscillator Manuals. Marconi TF2175 0-520MHz W/band 27dBm Power Amp. Nice for above. 1,000's of IBM PC Modern S/ware. Lots modern Astronomy Cosmology Books. (Suffolk) 0473 785203.

**ADVANCE OSCILLOSCOPE** Double Beam, wkg, buyer collects: £40. (Devon) 0884 841663.

**AEA PK232 MBX** M/mode Data Controller, CW/RTTY/Packet/ASCII/Fax/NavTex, boxed with leads, manual. Offers: G4YPN, QTHR. (Rainham, Essex) 0708 523487.

**AEA PK232 TNC**, leads, software. Icom U101 70cm 12 chan 20W Mobile, brand new. 70cm Colinear Aerial. Must sell. G6DMQ. (Birmingham) 021 707 7572.

**AKD 6 METRE FM** Tcvt, 5/25w: £125. Also MFJ207 HF SWR Analyser: £40. Both carriage paid. G3JJE, QTHR. (Cheshire) 0565 733530.

**ALINCO DJ180E** 2m H/held, case, charger, spare battery, DC adaptor: £175. Spectrum +48k with Wafadire, 11in B&W Monitor, InterfaceUnit, Wafers and cassettes; CW, RTTY, Amtor, games, manuals and books: £50. Buyer collects. Paul, G8KQD, QTHR. (Croydon) 081 645 0714.

**ALINCO DJF1-E** 2m Handy, CTCSS unit fitted, Spkr, Mic, DC leads, soft case and two dry cell cases, VGC: £200. Technical Software RX4 program with TIF 1 Interface on cassette for C64: £25. Other radio related S/ware available. Postage extra. Possible exchange for 2m Mobile Tcvt. G6MSRD, QTHR. (Dunfermline) 0383 735967.

**ALINCO DJF1E** 2m Tcvt, H/Portable, mint condx, extend receive: £160 ono. GW8RNN, QTHR. (Swansea) 0639 730237.

**ALTRON** 30ft, 2 stage Tower, ground post, wind, rotor cage, Rotor, Altron 3 ele 4 band MiniBeam, buyer collects: £400. (Solihull) 021 603 2735.

**BBC COMPUTER** issue 7, fitted GX2 FAX/ SSTV Interword, High Resolution Monitor, Disc Drive: £55. G4KTX. (Chelmsford) 0245 233233.

**BBCMASTER** Compact Computer fitted Eprom Packet, D/Drive 3.5: £120. Also C64 Printer MPS801 as new: £55 + Carriage. Ted. (Malmesbury) 0666 822935.

**BOONTON** Model 92EA, RF Milli Volt Meter, current model as new condx. Measures Power from 10KHz-1.2GHz, -60dBm to +23dBm, c/w

Probe, 50 Ohm Adaptor and instruction manual: £475. Also Boonton 92B same spec. as above. Prefer buyer inspect and collect: £220. (Horsham) 0403 864222.

**COLLECTORS ITEMS!** Reflection Coefficient Meter 2-3MHz, made by MKA in 1958. Control Unit Test type 1114, made by G & E Bradley, Neasden Lane, London. Sangamo Weston Voltmeter Model S83, possible waterproof case. ILS Field Test Set 10S/16397 77/ LRU99A Test Set by STC. Small Volt meter in a superb wooden case, shows 15v-0.15v. Voltmeter in wooden case (needs repolishing) 0-150 volts, 400 and 1,200 to 2400Hz. Fuel tank Pressure Test Set for a Sea King Helicopter. Offers, list and/or further details from John, G4JKV, QTHR.

**COLLECTORS ITEMS**. Dubilier Standard Mica Condenser 0.2uF Mahogany Box: offers. WW2 German Officers, 6 x 30 Dienstglas Binoculars SAB & STYS in fibre case: £150. Valves, most original, boxed HL41, ACVP1, AC/SP3, MSPEN, LS7, LS8A, AC/S2/PEN, DA30. Many more, SAE for list please. G3KAG. (Ashbourne) 0335 324393.

**CUSHCRAFT R5** Vertical Antenna 10, 12, 15, 17 and 20 metres: £125. G0AFQ, QTHR. (Nr Wigan) 0695 632674.

**CUSHCRAFT R7** Vertical Antenna: £190. Westflex 103 Coax, 1 x 10m, 1 x 20m: £15 both. Tonna 9ele 2m Antenna: £10. Prefer buyers collect. G3ZJF, NOT QTHR. (St Albans) 0727 811851.

**DIPLO** Antenna 12m + 17m: £50. MFJ 207 HF SWR Analyser: £65. PSU 10A@13.8V: £25. 4:1 Balun, 1:1 Balun: £5 each. Bottom bracket for Alinco Rotator: £10. P & P extra on all items. G4UYI, QTHR. (Wkgton) 0900 67226.

**EDDYSTONE 730/4** Rx, gd wkg order, with circuit details. Buyer to collect. Offers invited. G3DRN, QTHR. (Wimbledon) 081 947 3914.

**EDDYSTONE RECEIVERS** 990S UHF 230-870MHz, 990R VHF 27-240MHz: £80 each plus carriage. Both recently aligned Ex PMR VHF Base PA's, Xtal drive for 2010, SD1019 Final: £15. Nintendo NES, six games, new unwanted gift: £50. Spectrum +2: £20 (GWO). Fastfit 99 RTL-4 Decoder: £30. Mutek SLNA141 Pre-Amp for FT290R: £20. Arco Digital Multimeter GT1000: £20. (Gateshead) 091 438 3500.

**EDDYSTONE Rx's**; 940 Gen Coverage, 888A Amateur bands only. Trio 599 Rx and 599 Tx. All in gd condx. ANY OFFERS! Datong FL2 Filter and SEM QRM Eliminator. Both brand new: £70 each. G3PKR, QTHR. Tel evenings. (Hayes) 081 897 7196.

**FERRANTI M/coil** meters 0-5 mA, 0-50mA, 0-100mA, (scaled 0-500V), all 3 inch Round Flush. 1937 vintage. Also unknown 0-50mA, 2.5in round Flush. Also ex-WD 0-5mA, 0-150mA, both 2.25 inch square flush. Also 0-2mA 2inch round flush. Following collectors items. Set of 4 boxed Igranic SW Coils, 10-100m. Also early screened grid valve MV type AC/S marked COSMOS short path. Offers? G5KM, QTHR. (Barnsley) 0226 790986.

**FL2100Z**: £500. FT470: £225. HQ1 MiniBeam: £45. G4APV. (Sheffield) 0742 363641.

**FL736R** with 6m and 23cm, mint, boxed: £1,495. FT747GX inc FM, used RX only: £550. IC24ET 2m/70cm HamCade: £295. FT480R gd but case worn: £275. Icom AG1200 23cm GasFet Pre-Amp: £95. Daiwa 7500R Rotator: £100. SEM Transmatch inc Ezitune: £95. Pair of Tonna 23el 23cm Antennae, inc Splitter: £55. Sale due to change of QTH. Steve, G6MLZO, NOT QTHR. (Hamilton) 0698 420662.

**FM RX MODULES**. Double conversion Superhet design, 0.5microvolt into 50 ohm for 10db S+N/N. 12V at 25mA. 2x BF981, 10.7MHz Crystal Filter, 455KHz Mechanical filter, 10.245MHz Crystal, MC3359 IC, 54.175MHz crystal. Failed manufacturer's testing. Easily converted and circuit diagram: £5 each plus 50p P&P. Several available. G8ZGK, QTHR. (High Wycombe) 0494 48030.

**FT101ZD** CW Filter, spare Valves: £295. FT7B 160-10m: £245. FTV-7 available. Phone G4ENA. (Stroud) 0453 759453.

**FT290** Mk1, nice condx, c/w Nicads and slide in Mobile Mount: £225. Ask for GOKSL. (Pinner) 081 868 6815.

**FT840 FM**, CW Filter: £675. Drake L75, Linear 1.2kW PEP: £695. (new) Vectronics ATU 2kW PEP: £299. Datong ASP RF Speechprocessor: £65. Sure 526T Mic: £85. PS EP925 1-15v, 30A: £65. MFJ 264 Dummy Load 1.5kW(new): £50. Cob Webb Antenna: £85. Flytrap Dipole 160, 80, 40: £75. Atari 520ST, HR Monitor, NEC P2200: £160. Baycom TNC, FOC with Atari. Dymar 2m FM 100ch: £45. PS 7/9A 13.8v (new): £25. 1939 Cossor valve Radio (works): OFFERS. (York) 0347 823017 (11am-6pm, Mon-Sat).

**GENERATOR** 24 Volts 24 Amps, 'Swan' Propane Converted, only run half hour last ten years: £45. G4RWL. (Carlisle) 0228 513227.

**GOING QRO?**. High Voltage, Xfers/cables/Caps. Cheap to clear, SAE list. Collectors items. Engine Generator 12/14V 750w DC +1300/2600Hz 500w: £15. Test Set 152 for TR1430/1143A (Spiralife Tx/Rx) 42 switches + 66 Lamps: £10. Aerial coupling Unit 39 + Cal chart/circuit: £5. Very rare T/R 3107, 2 Tx + 1 Rx in 6ft rack with coding Modulator, mains PSU, 188/195MHz. Offers around £100. Buyer collects ALL above. G3LMR, QTHR. (Leicester) 0533 871522.

**HEATHKIT HW9** TRX, WARC bands, manual, VGC: £200. Sangean ATS-803A Rx, VGC: £65. Weller PS2D Soldering Iron. Supply with Iron, stand and tips: £30. AVO8, VGC: £30. G4PSL, QTHR+ (Newcastle-U-Tyne) 091 263 0043.

**HEATHKIT SB104A** S/state Tcvt, fitted Narrow band CW Filter, SP604 Spkr, HP1144 PS, all VGC: £325 ono. Heathkit C3U CR Bridge, VGC: £25. All with documentation. GM3MQO, QTHR. (Prestwick) 0292 79245.

**HEATHKIT SB620** Panoramic Adaptor/Spectrum Analyser, suitable for any IF up to 6MHz, mint condx: £100. G3EIG. (Ringwood, Hants) 0425 477404.

**HF/VHF GEAR**. Kenwood TS930FM, boxed, CW Filter, FM: £850. Yaesu FT208R/FT708R, VHF/UHF H/helds, Base chargers, cases, Mics and accessories: £200 the Pair. MFJ Versatuner 2 ATU: £100. Panasonic ICXP1081 NLQ Dot Matrix Printer: £60. Naim Nap110/60S Pre/Power Amps: £200. (Bromsgrove) 01527 872890.

**HW101** Tcvt, mint condx with manual: £150 ono. G3ONL, QTHR. (Debenham, Stowmarket) 0728 860607.

**ICOM IC2A** 2m (144/148MHz) H/held, charger plus spare battery pack: £130. Kenwood LF30A L/P Filter: £20. Nevada MS-1000 Wideband mobile/base scanning Rx 550KHz - 1.9GHz, AM/NFM/WFM, 1000 memories: £195. G0HTJ. (West Mills) 021 550 6050.

**ICOM IC2GE** 2m Tx/Rx c/w charger, ICHM9 Spkr/Mic, IC-CPH Cigar lighter Lead, instruction manual: £180. Prefer Collected. G4MAQ. (Oxford) 0865 718430.

**ICOM IC725** HF Tcvt (AM, FM, L/USB), Mic, PSU 12v/20A, Yaesu FC700 ATU, all excl condx: £700. (Plymouth) 0752 363433.

**ICOM IC735** HF Tcvt with AT150 Auto ATU, PS55 PSU, Mic, Headphones, all items boxed, little used and in first class condx: £850. Buyer to inspect and collect. (Harrow) 081 204 4897.

**ICOM IC735** HF Tcvt, with SM8 Base Mic twin output: £675. No offers. Alan, G4XTZ, QTHR. (Slough) 0753 574463 (eves after 6pm).

**ICOM ICW2E** D/band, H/held, charger, immaculate, boxed: £295. BC72 Desktop charger, HM70 Spkr/Mic, CP13 DC cable. Available 30% off list. (London) 071 722 7040.

**ICOM R7000** VHF/UHF Scanning Rx with Icom approved HF Conversion: £695. Icom R1 H/held wideband Scanning Rx with additional Battery pack and Desktop Charger and other accessories: £325. Optoelectronics 2810 H/held Freq Counter (10Hz - 3GHz) with Antenna and Charger: £135. These items in gd original condx with manuals and boxes. G7RUJ, QTHR. (Cambridge) 0638 741104 evening and weekends preferred.

**KENWOOD 78E** H/Portable, pristine condx: £350 or offer. Cushcraft Antennas 70cm 10el Beam, 2m 5el Beam: £35 each. 2m Ringo



Colinear: £28. 2m Telescopic H/portable Antenna, gd gain: £15. Glass-fibre Non-metallic 6ft Poles, ideal mounting stacks etc: £20. Mobile Spkr: £15. Multi-meter, steel case: £20. Pioneer car door threeway Spkrs, excl condx: £28. LDF-450 heavy duty Coax. (Norwich) 0328 710641.

**KENWOOD 850** Tcwr with Auto ATU and Voice Symp and Voice Recorder: £1,300. Also SEM Transmatch with noise Bridge as new: £95. Sony Radio SW77 as new: £250. Phone any time before 10pm. (Brentwood) 0277 823434.

**KENWOOD** Auto ATU 250, boxed with manual, mint condx: £250. G4NGW, QTHR. (Leigh on Sea) 0702 710000.

**KENWOOD R1000** Rx: £250. Heathkit Grid-Dip Meter: £50. Also Volt meter: £50. Matsui MR4099: £80. Items to be collected. G3JBU. (Northampton) 0604 401800.

**KENWOOD TH28E** with extended receive, boxed, charger: £175. Yaesu FT470 D-band with extended receive, boxed, charger: £290. (Farnham) 0202 896088.

**KENWOOD TH77E** D-band H/held with charger: £250. ERA Microreader Mk 2: £90. Above items exc cond, boxed. Tatung TMR7602 World band Rx: £70. Mk328 ex-Govt 'Spy' Rx: £90. Morse Tapes: All 3 ARRL boxed sets and 5 G3LEQ Tapes: £18. (Birmingham) 021 475 7119.

**KENWOOD TL922 LINEAR** Amplifier, gd condx: £1,100 ono. Delcom 2m H/held with Base charger: £70 ono. (Camberley) 0276 65951.

**KENWOOD TS430S** with FM, mint condx: £550. AEA PK232: £150. Tuner TM1000: £125. Alinco DR110F 2m: £200. Clive, G4ODM. (Basingstoke) 0256 26050.

**KENWOOD TS440S**: £650. PS50: £75. Yaesu FT290: £200. AEA HF ATU: £70. M/M 2m Linear, 30w: £40. All ovno. (Leicester) 0509 214336.

**KENWOOD TS680S** HF plus 50MHz: £650. AT230 ATU: £150. SP230: £25. All boxed as new can deliver. (Gateshead) 091 420 4248.

**KENWOOD/TRIO TS940S** HF Tcwr: £850. Kenwood TM231E VHF Tcwr (boxed): £200. Trio TH21E VHF H/held Tcwr: £25. G4UTG. (Poole) 0202 674285.

**KW2000B** plus PSU, Mic, KW110 Q-Multiplier, KW103 SWR/PWR Meter, Speech Compressor, complete Set Spare valves incl 6146B's, excl condx: £150 ono. Yaesu FRG7700 Rx, 0.15-30MHz, 30 Bands, Digital readout, timer: £185 ono. All with handbooks. John, G3YVJ. (Leighton Buzzard) 0525 376269.

**LAPTOP ZENITH 286**, 40Mb H/D, 1Mb Ram, Mouse, charger, carry case, S/ware: £250. Cirrus Logic 16bit 1280x1024 Graphics Card: £40. Mutek TVVF144A: £200. FX2000 Joystick, game Port Card: £20. WANTED: TS790, PS31, UT10 and service manuals for TS790, TS940 and SM220. G4JUH. (Yeovil) 0935 28341.

**LINEAR AMP 2M**. Home made 4CX250 2m fully metered and protected Linear. New ITT valve. Works but old-fashioned so selling for spares value: £50. Also Morse and RTTY. Atari 520STE programme: £10. Write to: Mr V McClure, 43 Roman Way, Seaton, Devon. (Seaton) 0297 23421.

**MFJ 482B** Keyer: £50. Butternut HF5B, assembled but never used: £85. Vibroflex, original Std Bug, mint: £60. Eddystone original Bug Key: £50. MFJ 1274 Packet TNC, never used: £100. Buyer collects or carriage extra. G3KDB, QTHR. (Litchfield) 0543 253398.

**MICROWAVE MODULES** Trnsvrtr MMT144/28 and MMT432/28-S, ex condx: £90 each. Mobile bracket for FT757GX: £750. Mike, VK1AMF (visiting UK) (Dideford) 0237 479868.

**MORSE KEYS** H/Mound 808: £25. Signal Electric (Solid Brass): £25. CT300 Dummy Load: £30. G4UTG. (Poole) 0202 674285.

**MOSLEY TA33J** TriBand Yagi: £50. Vintage general radio Signal Gens, 10KHz-30MHz and 9MHz-330MHz: £25 each. Buyer collects. G3ZUE, QTHR. (Bridport) 0297 489239.

**ORIGINAL YAESU FT101** with Mic, mains lead, fan, manual, excl condx: £225 ono. Phone Simon, G0RFJ any time. (Leyland, Lancs) 0772 454874.

**PACKET STATION** Complete. PK232MBX with true DCD upgrade. FT720R 5/25W 2m Tcwr, PSU 7A, with 6Ah back-up Battery. All leads and manuals: £300. Will consider splitting. (Portsmouth) 0705 591964.

**PC XT**, two Floppy Drives, one H/Drive: £65. **Uniden 200 converted to 10FM**: £35. 2m Mobile Antenna: £15. All ono. (Gloucester) 0452 385911.

**PERICOM GRAPHIC** Terminal with K/board, Mouse, Digitising Table: £150. Two 18ft Whips with Bases: £20. HP8405A Vector Voltmeter with all Attachments and accessory Kits, 1MHz to 1GHz: £1,000. All items ono. Will trade for 486X. G3NEF. (Sandy) 0767 680268.

**PHILIPS PF85** 68-88MHz H/held, VGC: £49. BC34 Fast Charger: £20. Icom IC701 HF 12v Tncvr + PSU: £300. IC551 FM/AM/SSB: £300.

IC-RM3 Remote: £30. IC245E: £190. RNElectronics 144 to 70MHz Transverter, unused: £150. Bird Termaline Wattmeter: £45. Icom ICH10: £200. (March, Cambs) 0354 741168.

**PK232 MBX** still in box with manual, leads, some S/ware: £300. (Rotherfield) 0892 852144.

**POWERBANK UPS** 500VA, back up time full load 20 min: £150 ono. Two Leak Sandwich Speakers, 16 Ohm impedance, 66 x 38 x 31cm, very gd condx: £20 each. Philips Automatic M/meter PM2521, c/w manual and probes: £30. G0CKN, QTHR. Buyer collects. (Biggin Hill) 0959 573918.

**PYE PF85** UHF H/held: £25. Burndept BE600 UHF H/held: £25. PC minitower case and Keyboard (new): £50. G4VZO, NOT QTHR. (Kingswinford) 0384 287454.

**PYE WESTMINSTER W15AM** D (68-88MHz), Cambridge AM10BS6 (2) complete. Offers over £4. The lot collected G0MRH (Stratford-upon-Avon) 0789 267430.

**R7000 REMOTE CONTROL**, Speaks Frequency, c/w works manual and instruction book, mint: £550, plus carriage. (Spalding) 0775 722940.

**RACAL** Changeover Unit Type 3737R for switching between two Transmitters. Colin, G0NJM. (Dudley) 021 520 1161 (eves).

**RADCOM MAGS** Jan 1983 to Dec 1993 inclusive, VGC: £40. G3AJD, QTHR. (Barnet) 081 449 0877.

**RAMSEY** Packet Tnc: £35. Substitute Power supply for Amstrad 1512/1640: £20. Yaesu 707 PSU: £110. Butternut 'Butterfly' HF Beam: £100. 6m Colinear: £25. Wanted. Optoelectronic Counter, 3.5in D/Drive for Amstrad 1512/Doubldecker, Sinclair PC200 Computer, Kenwood SM220. Dave. Evenings. (Norwich) 0603 745512.

**SEM TRANZMATCH** Mk3: £110. Tono Theta 9100 Data Terminal, modes - RTTY, Amtror, Morse, ASCII and Light Pen: £250. AEA Morsematic MM-1: £100. All excl condx. G3VLO, QTHR. (Yeovil) 0935 22973.

**SILENT KEY SALE (G2ANX)**. Yaesu FT77 HF Tcwr, FC700 ATU, FP700 PSU: £495. Also FT77 Mobile: £340. FC700 ATU: £90. Icom IC725: £460. Lowe HF225 Rx, PSU, boxed, unused: £340. Tono-777 Comms Terminal, unused, c/w leads, manual: £85. Sony ICF2001D Rx with airband: £140. Bencher Chrome Iambic Paddle: £35. Claude Lyons AC-Volts Stabilizer 2KW, i/p 150-300V, o/p 230V(+/-1%), suit NFD: Offers. G8KWV, QTHR. (Sevenoaks) 0732 883637.

**SILENT KEY SALE** Trio TS830S Tcwr: £500. AT-230: £100. Station Monitor SM220: £250. Yaesu FRG7: £100. FRDX400 Tcwr: £250. FT480R 2m Tcwr M/mode: £250. FR100B Comms Rx: £200. FL200B Tx: £200. FL1000 Linear Amp: £200. YC-3550 Frequency Counter: £160. (Southampton) 0703 865086.

**SILENT KEY SALE** Trio TS830S Tcwr: £500. AT-230: £100. Station Monitor SM220: £250. Yaesu FRG7: £100. FRDX400 Tcwr: £250. FT480R 2m Tcwr M/mode: £250. FR100B Comms Rx: £200. FL200B Tx: £200. FL1000 Linear Amp: £200. YC-3550 Frequency Counter: £160. (Southampton) 0703 865086.

**SILENT KEY SALE**. Icom IC725 HF Tcwr: £550. Drae 24A PSU: £80. MFJ 941D ATU: £50. Icom IC R7000 Rx (SSB/FM/FM-N/AM) incl TV-FM Adpt: £650. Icom IC R71 Communication Rx, IC EX257 FM Unit fitted + Icom IC SP3 HP2 + H/phones inc: £650. MFJ 144/220MHz ATU: £20. Netset SWR/PWR Meter 20/200W: £15. All these items boxed, c/w instructions, VGC. 2 PSUs: 13.8v, 3A: £5 each. Shure 450 Mic: £25. SEM Active notch Filter: £15. Sem QRM Eliminator: £45. Maplin ATU, Notch Filter. Both £15 ea. Buyers collect or P/P extra. G4UYI, QTHR. (Wkgton) 0900 67226.

**SILENT KEY SALE**. TS830-S: £575. SWR-Meter: £10. HK707 Key: £15. Solder Gun: £10. Vernier Cord Drive, unmarked: £20. Other items: Lake 7MHz QRP Tx/Rx and ATU, built: £150. 160m AM/CW Rig: £35. Postage extra at cost on all items. (Bromley) 081 777 0420.

**SILENT KEY SALE**. Yaesu FT747GX, H/Mic, 25A PSU: £600. HC200 ATU: £90. SRW Loudspeaker HF Linear: £300. 40m Traps: £10. Howes ASL5 AF Filter: £15. SWR Meter: £5 each. 2m Pye Westminster: £25. GM3XQO, QTHR. (Shetland) 0950 2354.

**SOMMERKAMP FT277ZD** (European version of Yaesu FT101ZD) 10 - 160m, inc WARC, c/w fan, Yaesu Desk Mic, manual, box, also Capco SPC300 ATU, with manual: £600. The whole package. Tony, G0JND/G8YHX. (Buxton) 0298 26800.

**SONY CRF-V21** World Band Rx, mint condx, boxed, Antenna, chargeable batteries, cost £2,670. Bargain: £1,100. Eddystone 1837/2 Digital: £350. (Southall) 081 813 9193.

**SONY ICF2001** 0.15-30MHz, excl hardly used: £90. G0GQZ. (Bedford) 0234 781730.

**TELESCOPIC** Fishing Pole 9 metres long, new condx, used for one week /P on 40 metres with great success: £65 ono. G3ZZS. (Plymouth) 0752 707550.

**TELESCOPIC TILT-OVER** Mast, 2x 15ft Sections Galvanised steel, origin unknown but similar to Tennamast. C/w Baseplate mounting. All brand new unused. Property of late G4BCE: £100 ono. G2AFV, QTHR. (Barnsley) 0226 287301.

**TH2 HF Beam** Hy-Gain 10-15-20, fwd gain 5.5dB, turning radius 14.3ft, excl condx: £150. G3UAA. (Leicester) 0533 875241.

**TIMESAVE DSP-9** Digital Filter, brand new, but must go to pay for new HF Tcwr: £135. Hansen Peak reading Watt-meter: £40. Malcom, G4TJK. (Hook, Hants) 0256 766558.

**TINY 2** Mk2, new, boxed: £105. Wallen 2m/70cm Mobile Whip: £18. PSU 13.8-24V 3A: £10. Datong Morse Tutor: £48. Howes Antenna Tuner 200W: £40. Howes 10-12-15m Rx: £25. Howes Audio Filter: £15. Half Size G5RV: £10. 'Oner' Complete kit: £12. Nova 242 for 4m FM: £8. Kent straight Key: £30. Velleman Morse Reader: £40. G8FRA. (Coventry) 0203 415815.

**TM741E**: £450. 2x KPC4: £225 each. Kantronics Weather station: £250. Tiny 2: £85. KAM + EB with GTOR: £300. Call after 6pm. (Chesterville) 0246 271514.

**TOWER**, single section Tiltover 25ft H/duty with Rotator mount: £50. Buyer collects. Also Icom IC RM3 Remote Controller with instruction book: £55. G4DFA, QTHR. (Banstead) 0737 354314.

**TR-9000** 2m M/mode Tcwr, boxed, manual, mobile bracket, with matching PSU, excl condx: £355 ono. 12 ele 2m Crossed Yagi: £30 ono. G7SEK. (Loughborough) 01509 212034.

**TRIO TS510** HF 80-10 + PSU: £200. 3el 10m Beam: £20. 9el 2m: £20. Wanted SB200 Linear, wkg or not, require 572B's. Adrian 6-8pm. (Telford) 0952 261959.

**TRIO TS530S** fitted narrow SSB/CW Filters, little use, mint condx, with Mic, box, h/books: £450. Delivery arranged. G0AWZ. (York) 0904 424817.

**TRIO TS830S**, SP230, AT230, MC50, Dip Meter, Hi-Mount Key, all leads, manuals, coax, orig packing, clean: £750 ono. G0KAT, QTHR. (South Humberdale).

**TS430 HF Tcwr**, c/w Mic, FM board and matching L/S, never used mobile, bxd, A1 condx: £495. G3VZV, QTHR. (Woburn) 0525 290343.

**TS520** five band HF Tcwr with CW Filter, one owner, looks and works like new, operator and workshop manuals: £260. SP250 Spkr: £25. Manson EP925 PSU brand new: £70. Complete Kit of parts to build G3TXO SSB Tcwr, half original price: £85. Datong RF Speech Proc, two available, one boxed: £30, one unboxed: £25. Carriage all items at cost. G3KNG. (Codsall) 0902 843134.

**TS711E** 144MHz All Mode Base Station: £350. Drake RA4 Rx, T4X Tx, M4 Spkr, AC4 PSU: £350. Drake R2C Rx with Xtals for 80/10m inc WARC Bands, Xtal Calibrator, Q-Multiplier, Spkr, 2m/6m Converters: £200. Bob, G3VXJ, QTHR. (Worthing) 0903 231466.

**TS940S** inbuilt Auto ATU, perfect order, boxed, manual, immac condx, QRT sale: £1,100 ono. (High Wycombe) 0494 534656.

**TWO CAPCO** Magnetic Loop Antennas c/w Controller, model AMA3 and AMA4, covering 10-160m Bands: £200. (Bournemouth) 0202 292068.

**TWO METRE LINEAR** Belcom LA106 +Preamp 80-100W: £80. Jaybeam 10xy/2, 12ft Mast 6ft Sub Mast, Rotator: £70. (Will split). Quad 33 Stereo Control Unit: £70. Philips Stereo Cassette Recorder L8312: £20. All perfect wkg order. Jack, G0ISY, QTHR. (Hayes, Middx) 081 561 0293.

**VARIAC** 240v AC i/p, 0-110 (percent) o/p, 2A: £10, collect or plus postage. Axial Blower 120mm Dia, 240v AC: £5. DIY Scope VCR139 Screen, socket, Trans'r etc: £10. O.A.S. by RCS suitable Mod 198KHz Ref RadCom Nov 1989: £5. Phone G3IJW, NOT QTHR. (Bexleyheath) 081 303 1879.

**VERSATOWER P60**, 3 piece 60 feet Post mounted. C/w two Winches and cables, excl condx, full wkg order: £350. G4UTG. (Poole) 0202 674285.

**VERSATOWER P60**, Power winch, CDE Ham-2 Controller, top bearing, GEM Quad, spare spreaders: £600. SB104A PA, u/s: £30. HP1144 20A PSU: £35. SB614 Monitor: £30. Buyer collects. Brian, G4EKO, QTHR. (Devon) 0822 853320.

**WIRELESS** Sets No 10, very rare, Senders Mk1, Mk2, Receiver and PSU in original Rack, Offers Invited: £70. PSU and Dishes etc: £70. A13 Radio, complete, manual, hand generator, RF Amp and Test Set: £375. Test Set No 74, Drive Unit Type 114, AN/APR47, APQ/T39, Offers Invited. Also see items for Exchange. G0JNT, QTHR. (Grimsby) 0472 752794.

**YAESU 757GX** Tx, Rx Gen coverage, very gd

condx, boxed with manual: £450. HF6V Butternut Vertical: £80. Both £520. Px/Swap Receiver. (Derby) 0332 372696.

**YAESU 767** Transceiver, good condx: £800. JVC 3inch Screen and Radio, mains/bttry, suitable caravan, gd condx: £35. G3XMA. (Coventry) 0203 410208.

**YAESU FT-480R** 2m M/mode, little used, never Mobile, with manual: £275. G3ZSL, QTHR. (Telford) 0952 588906.

**YAESU FT-736R** 2/70 + 6m. Purchased in December but must go to pay for new HF Tcwr. Bxd with Mic, will accept split payment: £1,200. Malcom, G4TJK. (Hook, Hants) 0256 766558.

**YAESU FT102** All mode HF Tcwr, VGC: £375. Yaesu FR/FL50B Tx/Rx, manual: £100. Heathkit SB102 Tcwr: £100. Lafayette Shortwave Rx: £50. KR400 Med/Hvy Rotator, cables: £90. Kenwood VB2200 10w 2m Linear: £25. G4JXX. (Fareham) 0329 220753.

**YAESU FT102** c/w Mic: £400. (Stoke-on-Trent) 0782 330613.

**YAESU FT200** Tcwr and Shure 444 Mic: £200. (Lechlade, Glos) 0367 253644.

**YAESU FT707** Mobile 100w 8 band HF Tx/RX fitted with 300Hz CW filter: £350. Yaesu FT690R Mk2 50MHz M/mode Portable with 30w Linear and new 5el Tonna: £290. TR2200GX with 12 channels fitted: £25. Stormo 10w Tx/Rx running on 144.650MHz: £25. Call John. (Horsham) 0403 253051.

**YAESU FT707**, FV707DM, FP707, FC707, MMB2 M/bracket, manuals & Work shop manual, all boxed: £625. Yaesu FRG7700 high performance Communications Rx, freq 0.15-30MHz, c/w FRT7700 Antenna Tuner and manual, mint condx: £325. Receiver Type 40A, freq 10Kz-17MHz, manufactured by Eddystone: £285. Yaesu FT480R 2m All mode Tcwr, w/shop manual, mint condx: £325. Calibration Rx type 35A2 with 5 Tuners: £95. (Bicester) 0869 244166.

**YAESU FT727**, D/brand Handie, spare bttry and chrg: £210. Transformer 3.5KV 250mA: £40. Hy-Gain 18AUT 10-80m Antenna: £50. (Rowlands Castle) 01705 412187.

**YAESU FT757GX** HF Tcwr, c/w Mic, power leads, manual and box. All in gd condx: £450. Phone Paul. (Walsall) 0922 685344.

**YAESU FT776GX** Tcwr: £875. SP767 Ext Spkr with Filters: £50. Kenwood DM81 Dip Meter, all coils: £50. All boxed, with manuals etc. Call Roy, G4LJN. (Farnham) 0202 877915.

**YAESU FT901DM** in VG condx with orig packing: £395 ono. Car extra. G3JAU, QTHR. (Bournemouth) 0202 514078.

**YAESU FT902DM** HF Tcwr, VGC, one careful owner since new with occasional use. Fitted CW/AM/FM Filters, boxed with manual: £450. Buyer inspects and collects. G3VRY, QTHR. (Chesham) 0494 785010.

**YAESU FT902DM**, All Filters plus memory Module: £570. FTV901 Transverter 2m, 70cm both repeater shifts: £370. FC902 ATU, SWR and PWR: £150. HF hardly used (still G6) all VGC, with boxes. Complete station: £1,000. (Birmingham) 021 472 8746.

**YAESU FT980** M/mode Gen Cov Tx/Rx, gd condx: £750 ono. FT480 x 2, one wkg, one not, pair: £250. FT901 FTV901 with 6m, 2m, 70cm: £600 NO SPLIT. 225RD 2m Base Station: £300. G4MXU, QTHR. (High Wycombe) 0494 520639.

## WANTED

**ANTIQUE WIRELESS** Equipment, Crystal Sets, Horn Speakers, Valves, Pre-war Television, Valve Hi-Fi, Books. G4ERU, 5 Luther Road, Winton, Bournemouth BH9 1LH. (Bournemouth) 0202 514000.

**AP1086 issue 1** (RAF-Radio Stores Ref No's) Also AP1186 All sections and AP's relating to Radio, Radar equipment. Would purchase current to Post-War Magnetrons, Klystrons, T/R cells, Ignitrons, Thyratrons, Microwave Planar Tubes, TWT's and special CV types. Required R1355 10D/13032, IFF Receivers R3002, R3067, R3121, Control Unit Type 17, All unmodified. Excl price offered. Please phone any time. (London) 071 511 4786 or 071 790 2846.

**PUNCHED PAPER** Tape Morse Transmitter and Keyboard Perforator. Units must be in gd wkg order. (Surbiton) 081 398 0939.

**6 METRE LINEAR** Amplifier, abt 150W o/p. Transistorised preferred. G3PTN, QTHR. (Leeds) 0532 654644.

**B28** 2nd Oscillator circuit can with unaltered contents or scrap chassis with same. G3WZ, QTHR. (Salisbury area) 0794 884488.

**CHART RECORDER** with spare charts. Gd condx only, unless very cheap! Making Magnetometer to study solar emissions.



## MEMBERS' ADS

Malcolm, G4TJK. (Hook, Hants) 0256 766558.  
**COLLINS LINEAR.** CW Filter for KWM380. (Telford) 0952 608060 (office), 550731 (home).  
**COLLINS.** KWM2A. Accessories, manuals etc. Anything in this Series considered, even faulty. Please WHY. Terry, 7 Cavendish Drive, Clowne, Chesterfield, Derby.

**COSSOR 343** Ganging Oscillator, circuit diagram and component layout required. Also RAF Receiver CR100 and R1475 for Restoration. Derek, G3KXB. (Whitstable) 0227 792340.

**CW FILTER** FL-45 for Icom IC730. G0MRH. (Stratford-up-Avon) 0789 267430.

**EDDYSTONE.** Lafayette, Heathkit - Always Wanted. EC10, EB35, 960. Some Doubles for sale. Enquire! Peter Lepino. Fax 0372 454381 or Phone anytime (Surrey) 0374 128170.

**FREQUENCY DISPLAY** Module FC177. 0-4MHz. These were available from Cirket and Electromail etc. But now obsolete. G4BWW (Southport) 0704 29036.

**FT790R** Mk1 70cm M-mode Tcwr, must be in good condx, c/w Mic, carry case, leads and manual. Phone evenings. (Birmingham) 021 422 8039.

**G3PDM RECEIVER.** uncompleted or failed Project or components. Call Tony after 6pm or weekends. (Worcester) 0905 641759.

**GEM QUAD** Antenna. Collect by arrangement. Fair price paid. G0JFU. (Gloucester) 0452 862773.

**ICOM ACCESSORIES.** ie PSU115, Matching Spkr or Auto ATU to suit Icom 740 Range. Sensible prices please. Phone after 6pm. (Co Down) 0232 797673.

**INTERESTED** Hams, join DXpedition to World's end, Sri Lanka. Details phone Paul, G0USK. (Hounslow) 081 572 7817 evenings or Fax 081 570 9322.

**KENWOOD AT250** Auto ATU. Also Kenwood SP120 Spkr. Must be VGC. Please phone after 6pm. Peter, G0JWV. (Truro) 0872 501656.

**MICROPHONES** A Static D104, Shure 444, Electro Voice 638 and 607L or Similar. GD3CKO, QTHR. (Douglas) 0624 629742.

**OAP** requires second hand CRT 3.5 inch, Type 3A2P2 for Solatron CD1014/3 D/bearom Scope. Or consider faulty CD1014/3. G8AYK, QTHR. (Burnham on Sea) 0278 784570.

**OLD VALVE SSB** Rx's and Tx's for rebuilding, especially KW or Collins S-Line, 75A-4, KWS-1, 312B5, 30S1, 30L1 and Accessories. This is a Hobby, not commercial. Units must be cheap and complete, but cheap wrecks welcome! Also Mod transformer T2A for 19 Set Mk2, or consider scrap Set. G3MFW, QTHR. (St Austell) 0726 736608.

**OUTBACKER JUNIOR** Antenna. Reasonable price, gd condx. Will help arrange handover. G3UJU, QTHR. (Hindon) 0477 820271.

**PHILIPS PR710** UHF or VHF H/hold. Must be complete and in gd wkg order. Also wanted BC40 or BC41 Charger. (March, Cambs) 0354 741168.

**QRP TRANSCIVER.** Ten Tec Century 22, Argosy, Argonaut or similar. Please ring (Northampton) 0604 401678.

**QUAD 22 AMPS.** Wanted with or without Control Unit. Also Radford Amp. (Edinburgh) 031 447 9979.

**QUAD.** Leak, Radford etc:- Valve Hi-Fi Equipment, wkg or NOT. Will pay cash and collect. (Chelmsford) 0245 266027.

**RACAL SPEEDRACE** Equipment; MA228 Exciter, RTA191 Rx, TA349 Linear. RA17L Receiver in as new condx. RA63 SSB Adaptor. Parts for TA127 Tx. Creed 75 Teletypewriter, Tape Reader and Perforator Attachments; Silence covers, Synchronous Motors 120/240V 50/60Hz. Marconi Instruments; Oscilloscopes TF2210, MF Oscillator TF2101, RF Millivoltmeter TF2603, AF Power Meter TF2500, Nigel, G0UGD, 2 Church Close, Eastbourne, East Sussex, BN20 9QY.

**TS450S KENWOOD** Tcwr, AT Auto ATU, immaculate. Phone evenings. G0UJB. (Kinver) 0384 872171.

**WIRELESS SET No 19.** KW Victor Tx. Keith, GW4AZI, QTHR. (Swansea) 0792 390244.

## EXCHANGE

**COLOUR GENIE** Computer. RTTY Tx/Rx CW RX. Terminal Unit. Exchange for 2m FM Rig, Comms Rx. WHY. G6STD, NOT QTHR. (Penzance) 0736 65748.

**EKCO M23.** Murphy A122, Marconiphone T11DA, Radio Television Servicing Molloy Poole Volumes 1-6. Offers?/Exchange 70cm H/hold, WHY. Bill, GW3DGT. (Narberth) 083 483 369.

**WS 10** Tx's Mk1, Mk2, Rx and PSU in original Rack. Exchange for HF Rig. Complete A13 Radio, RF Amp, Test Set, manual and Hand Generator, EXCHANGE for 2m M-mode etc, WHY. See also items for Sale. G0JNT, QTHR. (Grimsby) 0472 752794.

## EVENTS DIARY

### CLUB NEWS

**DEADLINE** - Items for inclusion in the January 1995 issue must be sent to HQ marked 'Club News - DIARY', to be received by 25 November 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

**NORTH BRISTOL ARC** - Tuition for RAE and Morse is available at every meeting. Details 0117 951 3573.

**RSGB CITY OF BRISTOL GROUP** - 29, Construction evening; Dec 13, Christmas Social. Now meets last Tuesday in every month at New Friends Hall, Purdown, Bell Hill, Stapleton, Bristol, BS16 1BG. Details 0117 967 2124.

**SOUTH BRISTOL ARC** - 2, Top Band Activity evening; 9, Your Opinions on club matters please; 16, Annual General Meeting; 23, Christmas Raffle. Details 01275 834282.

**WESTON-SUPER-MARE** - 7, A Club Discussion; 21, Workshop. Details 01934 415700.

### BEDFORDSHIRE

**SHEFFORD & DARS** - 3, Members Activity night; 10, Electrical Bygones, bring your own electrical bygones; 17, Members activity night and pre-challenge info; 24, A talk about Old radios by Les Jeeves. Details 01462 700618.

### BERKSHIRE

**BRACKNELL ARC** - 9, Junk Sale; Dec 14, Cheese and Wine Party. Details 01344 420577.

**NEWBURY & DARS** - 23, Talk 'Forensic Science' by Mike Fereday; Dec 14, Social plus lecture. Details 01635 863310.

**READING & DARC** - 10, Construction and alignment evening; 17, Visit to JET (Joint European Torus) 20 max, 7pm start, names to Tony, G0OPB; 24, final Grand Junk Sale for 93; Dec 8, AGM and G5KV award. Details 01734 698274 eve.

**READING & WEST BERKSHIRE RAYNET G** - The club is urgently seeking new members. Net every Monday evening on 144.775MHz at 7.30pm (local). All contacts welcome. Details Denis, G4KWT 01734 698526.

### BUCKINGHAMSHIRE

**AYLESBURY VALE RS** - 2, IBM Computers (Part 1) by G6CDV; 16, G6NB Construction Contest; Dec 7, IBM Computers (part 2). Details 01296 81097.

**CHESHAM & DARS** - All meetings take place in the Top Floor Meeting Room at The White Hill Centre, White Hill, Chesham, Bucks at 8.15pm. Details 01494 676391.

**MILTON KEYNES & DARS** - 14, All about WAB (at Drill Hall); 28, Bring and Buy night; Dec 12, Meeting (Drill Hall) Meets on 2nd Monday of each month at Drill Hall, Wolverton and 4th Monday each month at Blechley Park. Details 01908 672920.

### CENTRAL

**STIRLING & DARS** - Meets every Thursday at 7.30pm in the Clubrooms, Bandearth Industrial Estate, Throsk, Nr Stirling. Morse instruction available when requested. Club station GM4TMS/GS4TMS on air Club nights. Details 01324 636235.

**DOLLAR ACADEMY ARC** - Club meets most days at the Academy after 3.30pm. Details Geoff GM0LOD 01259 742126.

### CHESHIRE

**CHESTER & DARS** - 8, Experimenters Diary, No 5 by Dave, G2FVA; 15, Questions and Answers Session; 22, Video night - Part 1 'Getting started in Amateur Satellites' and Part 2 'Satellite Fuji JARL'; 29, Construction Contest; Dec 13, Christmas Social. Details 0151 608 3229.

**STOCKPORT RS** - 9, Construction Competition; 23, Ladies Evening; Dec 14, AGM. Details 0161 439 4952.

### CLWYD

**RHYL & DARC** - Meets every 2nd Monday in the month, Wellington Community Centre, Wellington Road, Rhyl at 8pm. Details (GW3UTG) 01745 351362.

**NORTH WALES R Rally C** - Activities include Novice courses, Morse instruction, Club Station on Air and a City & Guilds Approved Examination Centre. All radio enthusiasts are welcome to

visit. Practical Construction Course arranged for the Autumn and Winter periods. Meets each Thursday at 7.30pm, YMCA Building, Colwyn Bay, Clwyd. Details 01492 513246.

**WREXHAM AR** - 1, Video night; Dec 13, Christmas Buffet. Details from David, GW1MVL QTHR.

### CO ANTRIM

**CARRICKFERGUS ARC** - Club meets every Tuesday at 7pm in Downshire Secondary School. Details 01960 351807.

### CO ARMAGH

**ARMAGH & DARC** - Meets 2nd and 4th Wednesday of the month at County Armagh Golf Club, Newry Road, Armagh at 8pm. Details 01762 870423.

### CO DOWN

**BANGOR & DARS** - 4, Annual Surplus sale. Details 01247 883315.

### CORNWALL

**CORNISH RAC** - 4, Bring and buy sale. Details 01209 820118.

**PENZANCE RAC** - Meet Mondays, also 2nd Morse Test centre, via RSGB only. Details Brian, 01736 61427.

**POLDHU ARC GB2GM, GX0PZE** - Meet Tuesdays and Fridays, 7.30pm. Visitors welcome. HF net Wednesdays 7.30pm, around 3.75MHz. All welcome. Details 01326 290638.

**SALTASH & DARC** - 10, Club's 30th Anniversary Buffet night at the Rodney, Saltash. Members and past members are most welcome. Please support this memorable event in the club's history. Details Brian on 01752 844321.

**ST AUSTELL ARC** - Meet 1st & 3rd Mondays 7.30pm at Poltair School during term-time other wise at Skywave. Visitors most welcome. Details G4TRV 01726 72961 or G1DDK 01726 70220.

### DERBYSHIRE

**BUXTON RA** - 8, Annual General Meeting; 22, Practical plumbing. Details G4IHO 01298 25506.

**DERBY & DARS** - 2, Junk Sale; 7, Amateur TV Group meeting (Monday); 9, Video show; 23, 'An American Odyssey' an illustrated talk by Brian, G3BHT; 30, Talk about modern telecommunications 'Where have all the carbon granules gone?' by Martin, G7MKS; Dec 21, Christmas Party. Meet Wednesday evenings at 7.30pm at 119 Green Lane, Derby. Details 01773 856904.

**NUNSFIELD HOUSE ARG** - Meets every Friday at 8pm, at Nunsfield House Community Centre, Bolton Lane, Derby. Details 01332 518256.

### DEVON

**APPLEDORP & DARC** - 12, Club Radio Quiz. Meet 3rd Monday of each month at Appledore Football Clubroom at 7.30pm. Details 01237 477301.

**EXMOUTH ARC** - Meetings held at the Scout Hut, Marpool Road, Exmouth on Mondays at 7.30pm. Details 01395 279574.

**PLYMOUTH RC** - 1, business meeting; 15, 1st round Fun Quiz night; 22, Table Top Sale; 29, Fun Quiz Final. Details 01752 563222.

**SOUTH DEVON RC** - 9, Project night - power supplies; 16, Contest Planning; 23, Antenna night. Meets every Wednesday 7.30pm. Details 01803 522995.

**TORBAY ARS** - 18, 'DXpedition to ZD9' by Roger, G3SWX; Dec 16, Christmas Party. Club nights every Friday at the ECC Social Club, Highweek, Newton Abbot. Details 01803 526762.

### DORSET

**BLACKMORE VALE ARS** - 8, Talk by Rob, G3MYM; 22, On Air/Project Night. \*\*\*NEW VENUE\*\*\* Now meet at Shaftesbury School, Dorset on 2nd and 4th Tuesday of each month. Details Stuart, G7JIF 01963 362766.

**DORSET POLICE ARS** - 3, Club Project update; 17, Club project update. Club meets at Dorset Police HQ. Details from: c/o Pc 915 Richard Newton, Eastern Control Room, Bournemouth Central Police Station, Madera Road, Bournemouth, Dorset. Tel: 01202 552099 x2031.

**FLIGHT REFUELLING ARS** - 6, RSGB Video; 13, Debate - 'Should Morse survive?'; 20, How to progress with Class 'B' Licence by G0CDY; 27, AGM in the Table Tennis room, 8pm. Meets every Sunday evening at FRARS HQ, Merley, Wimborne at 8pm. Details 01425 653404.

**POOLE RS** - 11, Talk 'The 'Y' Service' by John, G4XGM; Dec 9, Social Evening. Usually meets on the 2nd Friday of each month at The College of FE, Lady Russell Cotes House, (just behind the Jellicoe Theatre), Constitution Hill Road, Parkstone, Poole. Details 01202 762110.

**SOUTH DORSET RS** - Meets 1st Tuesday of every month. New members and visitors welcome. Details 01305 773860.

### DYFED

**ABERYSTWYTH & DARS** - Club meets 2nd Thursday each month at 8pm, Scout Hut, Plascrug Avenue, Aberystwyth. Details 01545 580675.

### EAST SUSSEX

**CROWBOROUGH ARS** - 24-26, SES GB2CIN, Children in Need, sponsorship at Jarvis Brook Social Club, Crowborough Hill, 24, Quiz evening; 25/26, SES operating GB2CIN in caravan at club. Details 01892 653782.

**CROWBOROUGH & DARS** - 24, Talk 'Antenna design in miniature' by Eric, G3TXZ. Meets every 4th Thursday at the Plough & Horses, Crowborough at 8pm. Details 01892 661807.

**HASTINGS E & RC** - 16, Demonstration of the use of TV Detector Vans and the Implications; Dec meeting, Christmas Social. Details 01424 830454.

**SOUTHDOWN ARS** - Meets on 1st Monday of each month at Chaseley Home for Disabled Ex-Servicemen, Southcliff, Bolsover Road, Eastbourne. Please enquire about RAE and Morse Classes. Details 01323 484282 or G0UOI @ GB7HAS.

**MID-SUSSEX ARS** - Dec 16, Christmas Dinner, Sergisons Arms. Meets 1st and 3rd Fridays each month. Details 01444 831400.

**WORTHING & DARC** - 2, Video 'DX-Pedition to the North Pole'; 9, Junk Sale; 16, Discussion Evening; 23, Talk 'Global Positioning System' by G0SWH; 30, RSGB video 'Skywatching'; Dec 7, Christmas Party. Meets at 7.30 for 8pm at Parish Hall, South Street, Lancing. Details 01903 753893.

### ESSEX

**BRAINTREE & DARS** - 7, operating evening; 21, tba; Dec 5, Cheese and wine Party. Meets every 1st and 3rd Monday in the month, at Baintree Hockey Club at 8pm. Details 01376 327431.

**HODDESDON RC** - 10, talk 'Aerials (or Antennas)' by Dennis, G3TIK; 24, AGM, all members are urged to attend; Dec 8, Quiz. Details 01920 466639.

**SOUTHEND & DARS** - Details from: PO Box 88, Rayleigh, Essex SS6 8NZ.

**VANGE ARS** - 3, Junk Sale. Details 01268 552606.

### GLOUCESTERSHIRE

**CHELTENHAM ARA** - Meets 1st Friday of each month at Charlton Kings Library. Details 01242 242336.

### GRAMPIAN

**ABERDEEN ARS** - 4, Junk Sale; 14, The All Band Delta Loop Antenna by GM0LNO; 18, Video; 25, Annual General Meeting - provisional date. Meets at Queen Mother House, Claremont Place, Aberdeen. Details 01569 731177.

**MORAY FIRTH ARS** - Meets every Thursday at 7.30pm. Details 01343 86395.

### GREATER LONDON

**ACTON, BRENTFORD & CHISWICK RC** - 15, Surplus Radio bring and buy. Details 0181 749 9972.

**BROMLEY & DARS** - 15, Talk 'Radar' by Alastair Dunlop; Dec 13, Christmas Party (2nd Tuesday) Meets 3rd Tuesday of every month, 7.30 for 8pm at the Victory Social Club, Kechill Gardens, Hayes. Details Alan, G0TLK 0181 777 0420.

**COULSDON ATS** - 14, Talk 'Early Wireless Communications from Croydon Airport' by Tom Samson - Croydon Airport Society; Dec 9, AGM. Details 0181 684 0610.

**CRAY VALLEY RS** - 3, tba; 17, RSGB Video. Details 0181 850 1386.

**CRYSTAL PALACE & DRC** - 19, Surplus Equipment Sale; Dec 17, Christmas Party and video/ film show. Details 0181 699 5732 or 01737 552170.

**RADIO S of HARROW** - 4, Nostalgia Night to Celebrate 50 Years of the RS of Harrow History; 18, Construction Contest. Details 01895 632377 evening or 0171 251 2700 daytime.

**KINGSTON & DARS** - Meets on 3rd Wednesday of every month at 8pm, at 'Alfriston', 3 Berrylands Road, Surbiton, Surrey. Details Ray, G0KXX 0181 398 1128.

**SOUTHGATE ARC** - 10, Construction Judging for the G6QM Trophy; 24, Construction Competition, entrants demonstration; Dec 8, AGM. Details 0181 360 2453.

**SURREY RCC** - 7, Talk 'Noise Fundamental in Radio Systems' by Derek, G3GRO. Club meets at 'Terra Nova', The Walldons, Waddon, Croydon. Details 0181 660 7517.

**SUTTON & CHEAM RS** - 3, Informal meeting; Dec 15, Christmas Buffet. 7.30pm at Sutton United Football Club, Gander Green Lane, Sutton. Details 0181 644 9945.

**WIMBLEDON & DARS** - 25, Talk 'Microwaves' by G0OLX; Dec 9, Christmas Social. Details 0181 540 2180.

### GREATER MANCHESTER

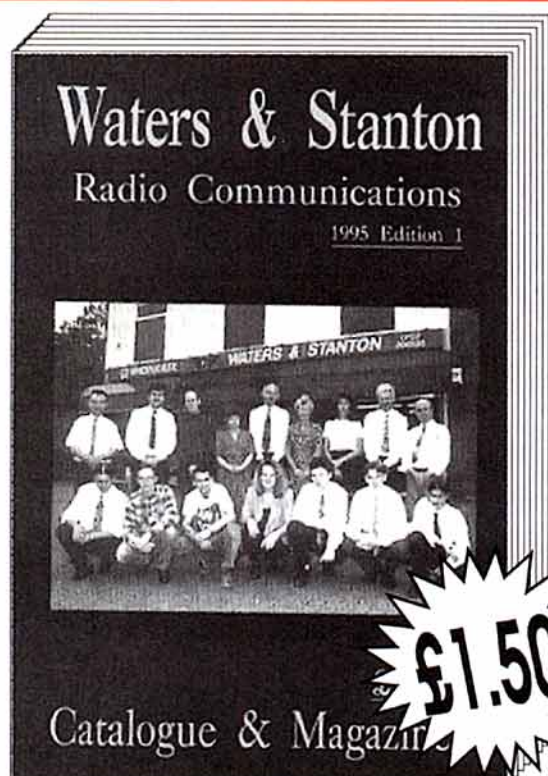
**ECCLES & DARS** - 1, Lecture 'Networking computers' by G6MEI; Dec 6, AGM. Informal meetings every Tuesday from 9.30pm. Lectures/dem-

**EVENTS DIARY  
CONTINUES ON PAGE 88**



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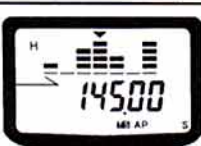
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ACCESS



EVENTS DIARY  
CONTINUES FROM PAGE 85

onstrations 1st Tuesday of each month. Details 0161 773 7899.

**SOUTH MANCHESTER RC** - 4, Talk 'Avionics' by Peter Bradbury; 11, Talk 'Cable Communications'; 18, Talk 'HMS Brongton' by G3XCE; 25, Talk 'Assembling PC's' by G6OCW. Details G7FOY 0161 969 1964.

**TAMESIDE ARS** - Now meets every Wednesday night at 7.30pm at the ATC Hut, Moorcroft Street, Droylsden, Tameside. Details from: A N Laughlan, 8 Kempton Close, Droylsden, Tameside, M43 7JL.

## GWYNNEDD

**DRAGON ARC** - 7, Talk by Dr Gwyn Roberts; 21, Sale of Surplus equipment. Details 01248 600963.

## HAMPSHIRE

**ANDOVER RAC** - RAE classes each meeting at 7pm. Meets at Wildhearn Village Hall, 1st and 3rd Tuesdays of each month. Details 01264 773547 evenings.

**BASINGSTOKE ARC** - 7, Talk; 27, 2m DF Competition - OS185; Fox, Dave, G7JZU; Dec 5, Christmas Social. Details 01256 25517.

**HORDEAN & DARC** - 3, Amateur Radio - an Old Man needing the Kiss of Life, by Stephen, G4JGS, Sony Broadcast; Dec 1, Video evening (from the RSGB library). Meets at Hordean Community School, room X5, Barton Cross, (off Catherington Lane), Hordean. Details 01705 472846.

**ITCHEN VALLEY ARC** - Oct 28, talk 'Radio Wave propagation, band by band' by Nigel, G7CAW. Details 01703 732997.

**WATERSIDE ARS** - 22, Junk Sale or Bring and Buy. Meets at 7.30pm, Hyde Community Centre. Details 01703 783170.

**WINCHESTER ARC** - 18, Talk 'The Barlow Wadley Loop - Restoring a RA17L' by Frank, G0RZK. Details John, G4AXO who is QTHR.

## HEREFORD AND WORCESTER

**BROMSGROVE ARS** - 8, Test Equipment evening; 22, Christmas Dinner; Dec 13, Technical Topics/talk. Meets at Lickley End Social Club, Alcester Road, Burcot. Details Barry, G0TPG 01527 542266.

**BROMSGROVE & DARC** - 11, Talk 'Getting started on Packet' by Peter, G4BBU. Visitors welcome. Club meets every Friday night at 8pm, Avoncroft Art Centre. Details G3MRC 01562 68782.

**HEREFORD ARS** - Club meets on 1st and 3rd Friday of each month. Details G4MET, QTHR.

**MALVERN HILLS RAC** - Meets 2nd Tuesday of every month, 8pm at Red Lion Annex, St Ann's Road, Great Malvern. Varied programme of speakers and events, all visitors welcome. Details G0TWT, 01684 560490.

**REDDITCH RC** - 13, An interesting evening with John, G4YZO of Badger Boards. Meets 2nd Thursday each month, WRVS Centre, Ludlow Road (opposite Liberal Club) at 8pm. Details 01789 762041.

**SOUTH BIRMINGHAM RS** - 2, Annual General Meeting, 8pm at HQ. Members are urged to try and attend; Dec 7, Christmas Party, club HQ 7.30pm. Details 0121 458 1603.

**VALE OF EVESHAM RAC** - 3, Brain of VERAC, run and organised by Ken, G4NIJ and Chris, G6CMP; Dec 8, Annual Dinner, The Angel Inn Pershore, 7.30 for 8pm. (Tickets from Dave, G3UEY 01386 553037) Details 01386 41508.

## HERTFORDSHIRE

**CHESHUNT & DARC** - 2, Members Forum; 9, Construction Contest; 23 Annual General Meeting. Meets at the Church Rooms, Church Lane, Wormley at 8pm. Details 01992 464795.

**DACORUM ARTS** - Now meets 1st and 3rd Tuesdays, 7.30pm at Girl Guide Meeting Rooms (next to British Legion), Queensway, Hemel Hempstead, Herts. Details 01582 766973.

**HODDESDON RC** - 10, Talk 'Aerials (Antennas)' by Dennis, G3TIK; 24, Annual General Meeting. Details G7OCI 01920 466639.

**STEVENAGE & DARS** - 1, CW practice/HF-VHF on Air Night; 8, General Get together to discuss projects etc; 15, Talk 'Operating from VPB-land' by Tony, VP8AQ/G7JAW; 22, General Get together to discuss projects etc; 29, Video night - see Ralph, G7HFD for the directory. Details Peter, G7HCL on 01438 724509.

## HUMBERSIDE

**BRIDLINGTON & DARS** - 3, talk by Rick, G1YVL; Dec 1, talk by Ernie, G4TKY. Now meets at the Links Golf Club, Flamborough in Function rm at 7.30pm. Details 01262 671268.

**GOOLE R & ES** - 4, A 70cm PMR Conversion night. Details G8VHL, QTHR or 01405 769130.

**GRIMSBY ARS** - 10, Talk 'Lightships and light-houses' by Brian, G4KAL; 24, Construction evening by Barry, G8RIW (or his substitute); Dec 8, Christmas Party. Details 01472 825899.

**HORNSEA ARC** - 16, Deviation Calculations,

3cm TV by G8EQZ and G4YTV; 23, Activity night; 30, AGM; Dec 21, Christmas Party. Details 01964 534283

## ISLE OF WIGHT

**BRICKFIELDS ARS** and Vintage Wireless Museum - 1st Monday of every month, Bring & buy nights; Every Tuesday of week Novice Training & Construction evenings by Mike, G0SEB - 7.30pm to 10pm. Morse classes to be run as and when required; The Clubs Isle of Wight County Award is now Available, details Dennis, 2E1BND. Details G1VGM at GB7IOW.

## KENT

**DARENTH VALLEY RS** - 9, Talk 'J V Fax' by Gerry, G7RFM; Dec 14, Christmas Dinner. Details 01689 826846.

**DOVER RC** - During term time, club meets Wednesday evenings 6.30-10pm. Novice, full RAE and Morse classes. All ages (over 8) welcome. Details 01304 825030.

**MAIDSTONE YMCA ARS** - 4, Junk Sale; Dec 9, Christmas Social. Novice tuition every Wednesday, contact Martyn, on 0622 744545. Details John, G0RHO 01622 832259.

**MEDWAY AR & TS** - 11, F & S supper. Meets every Friday, other evenings include construction and Morse as required plus Novice help. Details 01634 685585 or 201462.

**SEVENOAKS & DARS** - 21, tba; Dec 5, AGM and Social. Details from The Secretary, Sevenoaks & DARS, c/o Council Offices, Argyle Road, Sevenoaks, Kent TN13 1HG.

**WEST KENT ARS** - 18, Talk 'British Calsigns' by G3GWD; Dec 16, Christmas party. \*\*\*NEW VENUE\*\*\* Now meets at the Health Authority's Office, Sherwood Park, Pembury Road, Tunbridge Wells. Details 01892 664960.

## LANCASHIRE

**BURY RS** - 1, Committee meeting; 8, Junk Sale; 10, Inter-club Quiz; 15, Operating; 22, Operating; 29, Video evening; Dec 13, AGM. Details 0161 881 1850 (business hours).

**DARWEN ARC** - Meets every 3rd Wednesday of the month at Darwen Catholic Club at 8pm. Details Bill, G2AKK 01254 703767.

**FYLDE ARS** - 8, Construction Competition; 22, Informal; Dec 13, Christmas supper & Social evening. Meetings held 2nd & 4th Tuesday of each month. Details 01772 635464.

**OLDHAM ARC** - Meets every Thursday evening at Moorside Conservative Club, Ripponden Road, Moorside, Oldham at 8pm. RAE and Novice Licence courses now running, a City & Guilds Exam Centre for both. Details 061 652 4164 or 0161 627 1639.

**ROCHDALE & DARS** - Meetings held every Monday, at The Cemetery Hotel, Bury Road. Details 01706 376204.

**THORNTON CLEVELLES ARS** - 7, Club 70cm Project; 14, talk 'CO2 Engines' by Tony, G0SVQ; 21, More USA ATV Video; 28, Club on Air with G80XXV. Details G4BFH, QTHR.

## LEICESTERSHIRE

**LOUGHBOROUGH & DARC** - 1, Skittles evening, Brush club, Lobro, all welcome; 8, Quiz - radio, radio; 15, HF, VHF evening; 22, Video night; 29, talk 'Basic Circuits' by GOLCU. Details 01509 218259.

## LINCOLNSHIRE

**LINCOLN SHORTWAVE C** - Meets every Wednesday at the city Engineers Club, Water-side South at 8pm. Details 0427 788356.

**SPALDING & DARS** - Meetings every Friday, Clubroom, Old Fire Station, Spalding at 7.30pm. Details 01775 750382.

**SPILSBY ARS** - Oct 28, Junk Sale. The Pavilion, The Playing Field, Boston Rd, Spilsby. "Change of date of monthly meeting". Now held at The White Hart Hotel, Spilsby, 1st Thursday in month at 7.45pm. Details 01790 752712.

## LOTHIAN

**LOTHIANS RS** - Meets at Orwell Lodge Hotel, Polworth Terrace, Edinburgh at 7.30pm. Details Brian, GM4DJJ, 0131 337 7311.

## MERSEYSIDE

**LIVERPOOL & DARS** - 1, Visit by RSGB President Elect, Clive Trotman, GW4YKL; 8, GX3AHD On the Air; 15, Wavemeters (G4GHS); 22, Flying (G0MSO); 29, Surplus Sale; Dec 20, Christmas Social. Meets at Churchill Conservative Club, Church Rd, Wavertree every Tuesday. Now offer RAE Course, Novice RAE and Morse courses. Details Ian, G4WWX on 0151 722 1178.

**NORTH SEFTON ARC** - Meets 2nd Wednesday of each month. Details 01704 579017 or Fax 0704 570089.

## MID-GLAMORGAN

**MID-GLAMORGAN ARG** - (NEW) Details from Roger, GW3XJC on 01656 733729 or Tom, GWOTOM on 0656 736954.

## NORFOLK

**DEREHAM ARC** - 10, Converting PMR equipment by G1BBU; Dec. No Meeting - Happy

Christmas. Meets at St Johns Ambulance Station, Yaxham Road, near Tesco in Dereham at 8pm. Details 01362 691099.

**ARC FAKENHAM** - 1, Talk 'The work of the RIS'; Dec 6, Christmas social. Meets at Trinity Church Room, Hempton at 7.30pm. All welcome. Details 01485 528633.

**NORFOLK ARC** - 2, Construction QRP/NoA/Morse Practice; 9, talk 'Science for All' by Arnold, G3PTB; 16, Construction QRP/NoA/Morse Practice; 23, 'Christmas Surprise' by Mike, G4UUB; 30, Annual Dinner, Norman Centre. \*\*NEW CONTACT\*\* Now Mike, G4EOL on 01603 789792.

**YARMOUTH RC** - 3, Used Equipment Sale; 17, AGM's Club and Raynet; Dec 1, Talk 'PC Trends' by G4GLI. Details Tony, G3NHU on 01493 721173.

## NORTHAMPTONSHIRE

**KETTERING & DARS** - Club meets every Tuesday at Isle Lodge Community Centre, St Vincents Ave., Kettering at 7.30pm. New members especially welcome. Details John, G3ZSE 01536 511913.

**NORTHAMPTON RC** - 10, Lecture 'AMSAT' Prospective and visitors welcome. Meets every Thursday at RAFA Club, Grove Road, Northampton at 8pm. Details 01295 760640.

## NOTTINGHAMSHIRE

**ARC OF NOTTINGHAM** - 3, Forum & N on A; 10, Surplus equipment Sale; 17, 70cms Fox Hunt on foot; 24, Construction/activity night. Details 0115 950 1733.

**MANSFIELD ARS** - 14, Workshop Hints and Test Gear. Meets at the Polish Catholic Club, Off Windmill Lane, Woodhouse Road, Mansfield at 7.30pm. Visitors welcome. Details 0623 423697.

**SOUTH NOTTINGHAM ARC** - 4, On Air HF & VHF - (Construction); 11, Talk 'SWR Facts and Fiction' by Ron, G0HNZ; 18, Construction - (On Air HF & VHF); 25, Talk 'The Protection of British AC Power supply Systems' by Noel Midworth; Dec 16, Christmas Dinner. Details Julie, G0SOU 01509 672734.

## NORTH YORKSHIRE

**HAMBLETON ARS** - 3, RAE Course subject Solid state devices; 10, Practical/Operating night/ CW practice; 17, RAE Course subject - solid state devices; 24, Talk 'HF Airband and Selcalls' by Jeff Hall, BASF Seal Sands. Meets every Thursday at Allertonshire School, Brampton Rd at 7.30pm. Details 01642 710886.

## OXFORDSHIRE

**BANBURY ARC** - (NEW) Meets every 4th Wednesday of the month at the Unicorn Hotel, Market Sq., Deddington. Details 01295 253509.

**VALE OF WHITE HORSE ARS** - Meets 1st Tuesday of every month at The Fox, Stevenon at 8pm. Details from Ian. Tel: 01235 531559.

## SHROPSHIRE

**SALOP ARS** - Dec 8, Christmas dinner. Details 01743 361935.

**TELFORD & DARS** - 9, Visiting Speaker; 16, Videos; 23, Rally Group AGM; 30, Generators. Meetings take place Dawley Bank Community Centre, Telford at 7.30pm. Details 01952 588878.

## SOMERSET

**TAUNTON & DARC** - 4, Talk 'Packet Networks' by John Forward, G3HTA; 18, Discussion 'Packet Operating' by Graham, G4GUN. Other Fridays in the month informal meetings at 7.30pm in 'The Basement' County Hall, The Crescent, Taunton. Club Net Wednesdays at 2000 UTC 3.750MHz +/-, Details 01823 680778.

**WINCANTON ARC** - 7, Guest Speaker; 21, QSL Card Competition by Roger, G6TER. Details 01963 34360.

**YEOVIL ARC** - 3, Club Project - Coker Receiver Testing by G3PCJ; 10, The PC, your best friend in the Shack by G4JBH; 17, Receiving Weather Satellites by G7SD4; 24, Club station on Air & Comm meeting. The RAE Class is also held every Thursday for beginners. Meets every Thursday at The Red Cross HQ, Grove Avenue, Yeovil at 7.30pm. Details Cedric, G4JBL, 01258 473845.

## SOUTH GLAMORGAN

**CARDIFF RSGB Group** - 14, Talk 'Fibre Optics Transmission and CCTV' by Brian, GW3WBU. Reminder to all correspondents - Secretary is now GW4HWR. Details 01222 810368.

## SOUTH YORKSHIRE

**SHEFFIELD ARC** - 7, Bonfire night, fireworks and Bar-B-Que; 14, 'Old style Valves' by Roy, G0NRM; 21, Talk 'Raynet operations' by Rick, G7SDS; 28, Talk by Bill, G1YED on a 'mystery subject'. Details 0114 2446282.

## STRATHCLYDE

**CUNNINGHAME & DARC** - Come along for a natter or enrol in our RAE/Morse Classes. Meetings every Thursday at Woodlands Centre, Kilwinning Road, Irvine. Details 01563 40048.

**MID-LANARK ARS** - Every Friday at 7.30pm, Lecture and chat nights, RAE and Morse classes at Newarthill Community & Education Centre,

High Street, Newarthill, Motherwell. Details GM7FKX, QTHR.

**PAISLEY (YMCA) ARC** - RAE/Morse classes, run on Tuesdays. Details Stuart, GM0UKD 01505 335195.

## SUFFOLK

**FELIXSTOWE & DARS** - 14, Talk 'DXpeditions' by Andy, G4PIQ; 28, RSGB Video Night. Details Paul, G4YQC 01394 273507 (evenings).

**IPSWICH RC** - 2, Talk 'Amateur Television' by Sam Jewell, G4DDK; 16, Annual Junk Sale; 30, CW evening. Details Sheila, G8HYE 01473 742072.

**SUDBURY & DRA** - 1, Talk and Demonstration on First Aid by St Johns Ambulance; 15, N & N, 5 Bells; Dec 6, Open Forum - Questions & Answers on anything related to Amateur Radio. Details 01787 313212 (before 10pm).

## SURREY

**DORKING & DRS** - Club meets at 'Friends Meeting House', South Street, Dorking at 7.45pm. Details John, G3AEZ, 01306 613236.

**ECHELFORD ARS** - 10, Sale of equipment superfluous to user's requirements (Junk); 24, Talk 'Satellite Technology' by Robin, G3TDR; Dec 8, Christmas Party. Details 01344 843472.

## TAYSIDE

**DUNDEE ARC** - 1, Lecture 'Beginners thoughts on Antennas' by Leslie, GM0TGG; 8, Construction night; 15, Talk/demo 'Surround Sound' by Gordon Deans; 22, Construction Night; 29, Illustrated Lecture 'ATC Area Control' by Mike, GM4SUC. Morse Code is taught every Tuesday evening. The College offers tuition for RAE (Thursday evening). The Club radio shack and technical library is available to members. A Club newsletter is published bi monthly. Meets at 7pm on Tuesday in College of FE, Graham Street, Dundee. Details from GM4FSB, QTHR.

**STRATHMORE & DARC** - Now meets at 2231 (Forfar) Squadron, Air Training Corps, 1 Lochside Road, Forfar, Angus every Wednesday at 7.30pm. Details Alan, GM4JCM, QTHR.

## TYNE AND WEAR

**HAZELLRIGG ARC** - Meets every Monday, Hazellrigg Community Centre at 7pm. Classes for Morse, Novice and talks on various subjects held on last Monday in the month. Details 0191 264 4608 after 6pm.

## WARWICKSHIRE

**MID-WARWICKSHIRE ARS** - Meeting on 2nd & 4th Tuesdays at St Johns Ambulance HQ, 61 Ermscote Road, Warwick at 8pm. Details 01926 424465.

**RUGBY ATS** - 1, RSGB Video and trailer film; 15, Test Gear evening. Please request equipment in advance; 22, 2m AFIS Contest 'Practice night'; Dec 10, Annual Christmas Dinner. Meets every Tuesday at 7.30pm at Cricket Pavilion outside Rugby Maritime Radio Station. Morse class also runs from 7.40pm onwards. Details from Peter, G0JEW 01455 552449.

**STRATFORD U AVON & DARS** - 14, Talk 'Operation Raleigh' by John, G4AAL; 28, Talk 'Microphones' by Jack, G4YIG. Meets at the Home Guard Club, Main Street, Tiddington, Stratford upon Avon at 7.30pm. Details 01789 740073.

## WEST GLAMORGAN

**PORTR TALBOT ARS** - Re: 50 years Clubs Anniversary. Calling all ex-members of Neath - Briton Ferry, now called Port Talbot ARS, formed in 1946. Please contact ASAP the Secretary GWONKF, QTHR or Tel: 01639 892311.

**SWANSEA ARS** - 12, Club Calls Contest. Details GW3SIY 01792 403527

## WEST MIDLANDS

**ALDRIDGE & BARR BEACON ARC** - 21, Talk & Video 'Wrought Iron' by G0NOL. Meets 1st & 3rd Mondays in the month. Details 01922 36162.

**RS OF BLOXWICH** - 1, Society Net 20.00 on 432.725MHz; 8, Annual Quiz for the G0BSM Trophy; 13, Trip to Stockland Green Radio Rally; 15, Society Net 20.00 on 432.725MHz; 22, talk 'Worked All Britain' by G4JZF; 29, Society Net 20.00 on 432.725MHz; Dec 20, Christmas Social & Awards night. Members are reminded No Smoking is allowed at society meetings. Details 01922 683877.

**COVENTRY ARS** - Usually meets every Friday at 8pm at Baden Powell House, 121 St Nicholas St., Radford, Coventry. Visitors are always welcome. Details (G1ORG at GB7COV) or Tel: 01203 311468.

**MIDLAND ARS** - Every Wednesday, RAE & Morse classes; Every Thursday 'Night on the Air'; 2nd and 4th Monday in month, PC night; Last Friday in month Atari night. Details John, G0LAI 0121 628 7632.

**SOUTH BIRMINGHAM RS** - 2, AGM, 8pm at HQ. All Members please try to attend. Details 0121 458 1603.

**STOURBRIDGE & DARS** - 7, On Air; 21, Annual Surplus Sale; Dec 19, Family Christmas Social Gathering. Meets at The Robin Woods Centre, Scotts Rd, Stourbridge. Details James French,



## EVENTS DIARY

G7HEZ, 2 Pepper Hill, Stourbridge, DY8 1BJ or packet @ GB7PZT.

**SUTTON COLDFIELD ARS** - 14, Surplus Sale; 28, Annual General Meeting. Meets 2nd & 4th Mondays of each month at 8pm at Sutton Coldfield Rugby Club, Walmley Road, Walmley. Details 01827 874010.

**WEST BROMWICH CENTRAL RC** - Dec 4, Talk: 'The work of the County Air Ambulance by Ian Nichols, County Air Ambulance; Dec 11, AGM. Details Ian, G0PAI 0121 561 2884(home) or 01902 353522 x 2093 (office).

### WEST SUSSEX

**CHICHESTER & DARC** - Club meetings at St Pancras Hall, St Pancras, Chichester at 7.30pm. Details on 01243 573541.

**HORSHAM ARC** - 3, Talk by Haydon Jones; Dec 1, AGM. Details Peter, G8SUI 01737 842150.

**WORTHING & DARC** - 2, Video 'DX-pedition to the North Pole'; 9, Junk Sale; 16, Discussion Evening; 23, talk 'Global Positioning System' by G0SWH; 30, An RSGB video 'Skywatching'; Dec 7, Christmas Party. Meets at 7.30 for 8pm at Parish Hall, South Street, Lancing. Details 01903 753893.

### WEST YORKSHIRE

**HALIFAX & DARS** - 15, Talk 'Morse Testing' by Roy, G4SSH; Dec 20, Social at 7.30pm, XYL's and YL's welcome. Meets at the Royal Oak Pub, Wards End, Halifax (private 1st floor room). Details 01422 202306.

**KEIGHLEY ARS** - 10, Talk 'Packet on the Air' by G0KRS and G7KRC; 24, Films/Videos; Dec 22, Christmas Buffet. Meets every Thursday at the Ingrow Cricket Club, Keighley at 8pm. Details 01274 496222.

**PONTEFRAC & DARS** - Meets every Thursday, 7.30pm at Carleton Community Centre, Carleton, Pontefract. Visitors and new members are always welcome. Morse classes Monday nights (Reg. G4KMW) and Voice classes Tuesday nights (Colin, G0NQE). Details 01977 677006.

**SPEN VALLEY ARS** - 3, Talk 'A complete QRP Station' by Rev George Dobbs, G3RJY; 17, Ten Pin Bowling, LA Bowl Leeds; Dec 1, Talk 'ET Repeater update and a Simple TV Receiver' by the GB3ET Group. Details 01924 497767.

### WILTSHIRE

**CHIPPENHAM & DARC** - Meets Tuesdays 7.45pm, Sea Cadet HQ, Chippenham. Details Jon, G4LGZ 01225 743352.

**SALISBURY R & ES** - 1, Talk by two engineers from Lascar Electronics; 8, Open forum; 15, Fast Scan TV by Neil, G4LDR; 22, Construction evening - using Greenwell 10 in one kit; 29, Planning for Winter sports; Dec 13, Christmas Party. Details 01722 330971 (weekends).

**TROWBRIDGE & DARC** - 2, Constructors Cup Judging night; 16, Social. Details 01225 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'.

### 4 NOVEMBER (FRIDAY)

**BANGOR & DARS Annual Surplus Sale** - Hamilton House, Hamilton Road, Bangor, Co Down. Doors open at 7pm. Features the usual traders and QSL Bureau. Refreshments will be available. Easy access and parking. Details from Keith, G10SSA, QTHR. or Tel: 01247 883315.

### 5 NOVEMBER (SATURDAY)

**BRITISH AMATEUR RADIO TELEDATA GROUP (BARTG)** - Annual General Meeting, at London House, Mecklenburgh Square, London. It is conveniently sited for the Kings Cross and Russell Square underground stations. The venue is the hall of residence for overseas post-grad students and AGM attendees are welcome to use the dining facilities. Details Peter, G6LZB Tel: 01582 36094 or Packet G6LZB at GB7BST.

### 5/6 NOVEMBER (SATURDAY/ SUNDAY)

**NORTH WALES Radio Rally** - Aberconwy Centre, Llandudno. Also for this year, the new North Wales Theatre will be available. Features over 60 trade stands, covering radio, electronics and computers interests, a bring and buy stall and refreshments. Admission £1.50 adults, under 14 free. Talk-in on S22. If requiring accommodation or other details contact Tony, GWNSR on 01492 513246.

### 6 NOVEMBER

14th NORTH DEVON Rally - Holsworthy Memo-

rial Hall, Holsworthy. Features a bring and buy stand, etc. Details G8MXI, QTHR.

**TYNE AND WEAR Repeater Group Auction** - Fence Houses & District Community Centre, Fencehouse, nr Chester-le-Street, County Durham. Doors open 10.30am for booking goods in. Auction starts at 12 noon. Details Brian, G8FBQ, QTHR 0191 388 2913.

### 12 NOVEMBER (SATURDAY)

**THE ALL MICRO Show, Radio Rally and Electronics Fair** - Bingly Hall, Staffordshire Showground, Weston Road, Stafford. (Off the A518 Stafford/Utteter Road) Signposted from Jn 14, M6. Doors open 10am. Features many trade stands, many computer formats supported, inc: IBM PC, Amiga, Atari ST/8 bit, Einstein, Acorn, Apple etc. Hardware, software, accessories, books, components and shareware. Radio, satellite, printers, media supplies, systems and a bring & buy stall. Refreshments. Details 01473 272002 or Fax 01473 272008.

### 13 NOVEMBER

**BARNSELY & DARC 4th Amateur Radio Rally - "NEW VENUE"** The Metrodome Complex, Barnsley Town Centre, next to the bus and railway interchange. The complex is less than 2 miles from M1, jun 37, the A628 and A61 roads. Follow the 'Metrodome' signs and rally signs. New venue is all on one level, with excellent disabled facilities. Event features the usual amateur radio and computer dealers, radio clubs, specialist groups and a bring and buy. Ample car parking at the metrodome, with a separate car park for disabled visitors. Details G4LUE on 01226 716339, 6-8pm, except Monday 6-7pm only.

**MARS-STOCKLAND Radio/Computer Rally** - Stockland Green Leisure Centre, Slade Road, Erdington, Birmingham. Doors open 10am. Features the usual traders, local clubs, special interest group stands and a bring and sell tables. Refreshments. Admission £1, free car parking. Details Norman, G8BHE, 0121 422 9787 or Peter, G6DRN 0121 443 1189 evenings.

### 19 NOVEMBER

**CARRICKFERGUS Amateur Radio Group Rally** - Downshire Secondary School, Carrickfergus, Co Antrim. Doors open at 12 noon. Event features stalls, bring and buy, refreshments and more. Details G10JOF 01960 351807.

### 20 NOVEMBER

**BISHOP AUCKLAND Radio & Computer Annual Rally** - Newton Aycliffe Leisure Centre, Beveridge Arcade, Newton Aycliffe, County Durham. Doors open 11am. Details Mike, G0PRQ, 01388 766264.

### 27 NOVEMBER

**BRIDGEND & DARC Radio Rally** - Bridgend Recreation Centre, Bridgend, Mid-Glamorgan. Access off the M4 is via jun 35 or 36. Doors open 11am, 10.30 for disabled visitors. Event features a large bring and buy. Also RSGB Morse Tests available on demand, but remember to bring two passport size photographs. Refreshments will be available. Bring along the family, recreation facilities available, swimming etc. Talk-in on S22 and GB3MG RB7 (433.175MHz). Details Mike, GW7NIS 01656 722199 or Don, GW3RVG 01656 860434.

**WEST MANCHESTER Radio Clubs 'WINTER RALLY'** - Bolton Sports & Exhibition Centre, Bolton, (town centre). Details G1IOO 01204 24104(evenings only).

### 4 DECEMBER

**LEEDS & DARS Christmas Radio Electronic and Computer Rally** - Allerton High School, Kings Lane, Leeds 17. Doors open at 11am, 10.30 for disabled visitors. Admission by programme. Details Phil, G6HGT 0113 268 0006.

### 11 DECEMBER

**VERULAMARC Rally - "NEW VENUE"** Watford Leisure Centre, Horseshoe Lane, Garston, Watford, Herts. Doors open 10am. Details from Walter, G3PMF on 01923 262180.

### 22 JANUARY

**OLDHAM AR Club Mobile Rally** - Queen Elizabeth Hall, Civic Centre, West Street, Oldham, Lancs. Doors open 11am, 10.30 for disabled visitors. Event features many traders with variety of items and a bring and buy. Talk-in on S22 via GB4ORC, commencing at 7.30am. Refreshments will be available from 11.30 in the Fallsouth Suite, balcony overlooking the main hall. Again this year a Mobile contact prize and certificate for the furthest mobile contact with an operator on his way to attend the rally, up to 2pm. Free programme draw prize and parking. Details 0161 652 4164 or 01706 846143.

### 5 FEBRUARY 1995

**SOUTHESEXARS Radio Rally** - Details 01268 693786 or 01268 755350.

### 12 FEBRUARY

**NORTHERN CROSS Rally** - Rodillian School, A61. Details Dave Tel: 0113 282 7883.

### 19 FEBRUARY

**RSGB VHF CONVENTION** - Details G3MVG 01277 225563.

### 25 FEBRUARY

9th **TYNESIDE ARS Rally** - Details Stuart G0BEV 0191 281 0999.

### 26 FEBRUARY

**BARRY MOBILE Rally** - Trader details from Mike, GW8CMU 01446 711426 and General enquiries from Margaret, GW4GSH 01446 738756.

### 11-12 MARCH (SATURDAY- SUNDAY)

**LONDON Amateur Radio & Computer Show** - Details Steve, G3ZVW 0181 882 5125.

### 19 MARCH

**NORBRECK Amateur Radio Electronic and Computing Exhibition** - Details Peter, G6CGF 0151 630 5790.

### 26 MARCH

**THE MAGNUM Radio & Computer Rally** - Details Bob, GM0DEQ on 01563 40048.

**PONTEFRAC & DARS, 15th Annual Components Fair & Spring Rally** - Details Colin, G0NQE on 01977 677006.

### 22 APRIL (SATURDAY)

**INTERNATIONAL MARCONI DAY H/Q** - Details Norman, G4USB 01209 212314.

### 23 APRIL

**BURY RS Annual Rally** - Details G4KLT 0161 762 9308.

### 14 MAY

**MARS/DRAYTON MANOR Radio and Computer Rally** - Details Norman, G8BHE 0121 422 9787(evenings).

### 21 MAY

11th **YEOVIL QRP & Construction Convention** - Details G3CQR, 01935 813054.

### 28 MAY

**TRAFFORD Rally (The Great Northern Rally)** at G-Mex - Trade and further enquiries Graham, G1UJK on 0161 748 9804.

### 4 JUNE

**SPALDING Annual Exhibition and Rally** - Details G4OO, 01775 750382.

### 11 JUNE

**THE 26th ELVASTON CASTLE National Radio Rally** - Details from Ken, G3OCA, 01332 662818. Trade enquiries, Keith, G1ZLO 01332 662896.

### 18 JUNE

**THE GORDON Rally (The North of Scotland AR Convention)** - Details GM6TAN QTHR.

### 2 JULY

**YORK Radio Rally** - Details Dave, G7FGA 01904 790079.

### 8 JULY (SATURDAY)

**CORNISH Radio Rally and Computer Fair** - Information & booking Ken, G0FIC 01209 821073.

### 9 JULY

**SUSSEX Amateur Radio & Computer Fair** -

## SILENT KEYS



**WE HAVE BEEN** advised of the deaths of the following radio amateurs:

G0TOA	Mr S E Gent	20.07.94
G3BA	Mr T Douglas	Sep 94
G3BNI	Mr D L K Coppendale	Mar 94
G3BTU	Mr H White	04.09.94
G3KWU	Mr T Emery	01.09.94
G3NOZ	Mr W Bailin	19.06.94
G3UND	Mr A Williamson	Aug 94
G4CEZ	Mr W Kitchen	20.05.94
G4YVV	Mr I Leatham	
GU8HT	Mr R H Taylor	20.08.94
ON4CC	Mr A de Smet	18.08.94
VE8816	Mr J V Zoest	

Information and booking Ron, G8VEH 01903 763978 or 0273 417756 office hours.

### 23 JULY

**COLCHESTER Radio & Computer Rally** - Details Richard, G7BIV, 01376 571239.

**THE 2nd HUMBER BRIDGE Amateur Radio Rally** - Details or bookings Roly, G0UKS 01482 837042.

### 30 JULY

**SCARBOROUGH Amateur Radio Society Radio Electronics and Computer Fair** - Details Ross, G4ZNZ 01723 514767.

### 6 AUGUST

**RSGB WOBURN Rally** - Woburn Abbey, Bedfordshire. Details from Norman Miller, G3MVG, 01277 225563.

## GB CALLS

The list below shows special event stations licensed for operation during November. It was taken from the HQ computer on 28 September. These callsigns are valid for use from the date given but the period of operation may vary from 1-28 days.

### NOVEMBER

1	GB150YM	150 Years YMCA
4	GB2RCC	Radio and Caravan Club
	GB4SRL	Royal Signals Llandudno
7	GB4SRL	Royal Signals Llandudno
12	GB2SR	Stellar Radio
18	GB2CIN	Children in Need
21	GB4CW	Cats Whisker
24	GB4CW	Cats Whisker
25	GB5WM	CQWW CW Contest
26	GB2LMS	Lynhurst Middle School
	GB5SR	Stellar Radio Net

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Readers should note that prices advertised may not be accurate due to currency exchange rate fluctuations.

While the publishers will give whatever assistance they can to readers having complaints, under no circumstances will the magazine accept liability for non-receipt of goods ordered, or for late delivery, or for faults in manufacture. Legal remedies are available in respect of some of these circumstances, and readers who have complaints should address them to the advertiser or should consult a local Trading Standards Office, or a Citizens' Advice Bureau, or their own solicitor.

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# RSGB – at Your Service



SOME OF THE RSGB'S TEAM OF VOLUNTEER EXPERTS — AVAILABLE TO HELP YOU

## Zonal Council members

**Zone A (North of England):** Peter Sheppard, G4EJP, 89 St Catherines Drive, Leconfield, Beverley, North Humberside HU17 7NY. Tel: 01964 550397.

**Zone B (Midlands):** Dave Gourley, G0MJY, 86 Upton Road, Broadwaters, Kidderminster, Worcs DY10 2YB. Tel: 0562 753101.

**Zone C (SE England and East Anglia):** Neil Lasher, G6HIU, 8 Highwood Grove, Mill Hill, London NW7 3LY. Tel: 0181 201 1578.

**Zone D (SW England):** Julian Gannaway, G3YGF, Dean Hill Barn, East Dean, Salisbury, Wiltshire SP5 1HJ. Tel: 01794 40008.

**Zone E (Wales):** Clive N Trotman, GW4YKL, 19 Park View, Dolau, Llanharen, Pontyclun, Mid Glamorgan CF7 9RZ. Tel: 01443 226198.

**Zone F (Northern Ireland):** Ian Kyle, G18AYZ, 1 Portulla Drive, Pond Park Road, Lisburn, Co Antrim BT28 3JS. Tel: 01846 665034.

**Zone G (Scotland):** Frank Hall, GM8BZX, 45 Priory Cottages, Lunanhead, Forfar, Angus DD8 3NR. Tel: 01307 467565.

## For general advice and details on local clubs, or if you don't know who to contact:

Your **RSGB Liaison Officer** see September and October *RadComs*, page 91.

## Specialists

**Antenna Planning:** Booklet free to members from RSGB HQ. Planning application refused – RSGB Planning Panel, via RSGB HQ. Planning Advisory Committee Chairman – Geoff Bond, G4GJB, QTHR.

**Audio Visual:** Library Coordinator – David Simmonds, G3JKB.

**Awards:** For contest awards, refer to the appropriate contest committee. For other awards, enquiries and applications go to either the: HF Awards Manager – Fred Handscombe, G4BWP; IOTA (Islands on the Air) Awards Manager – Roger Ballister, G3KMA or VHF (and Microwave) Awards Manager – Ian L Cornes, G4OUT. Trophies Manager – Post vacant

**Band Plans and operating practices:** See the *RSGB Call Book* or January 94 *RadCom* for latest bandplans. For policy, contact the appropriate spectrum manager or committee chairman: HF Committee Chairman – David Evans, G3OUF, QTHR; VHF Committee Chairman – Peter Burden, G3UBX, QTHR; Microwave Committee Chairman – Steve Davies, G4KNZ; HF Manager – Post vacant; VHF Manager – Dave Butler, G4ASR; Microwave Manager – Mike Dixon, G3PFR.

**Beacons:** HF Beacon Coordinator – Prof Martin Harrison, G3USF, QTHR. VHF Beacon Coordinator – John Wilson,

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 QSL Bureau Sub-Managers

### Part 1: G0AAA – G4EZZ

Callsign Series	Sub-Manager	Callsign Series	Sub-Manager
G0AAA-AZZ	Mr K Plumridge, GW4BYU, Swn-y-Gwynt, High Street, Llanberis, Caernarfon, Gwynedd LL55 4EN	G0TAA-TZZ	Mr J Taylor, G0RFN, 19 Fairview, Burnhope, Durham DH7 0AW
G0BAA-BZZ	Mr T Bruin, G0PRN, Seaford, 38 Kirkley Cliff Road, Lowestoft, Suffolk NR33 0DB	G0UAA-UZZ	Mr A J Adams, G3DXQ, 'Brooklands', Chestnut Garth, Roos, Hull, E Yorkshire HU12 0LE
G0CAA-CZZ	Mr P Jobson, G3HLF, 52 Old Road West, Gravesend, Kent DA11 0LN	G0VAA-VZZ	Mr R C Powell, G4VAA, 11 North Park, Fakenham, Norfolk NR21 9RG
G0DAA-DZZ	Mr J F Purvess, G0FWP, 14 Hunger Hills Drive, Horsforth, Leeds LS18 5JU	G1 Series	Mr R Kingstone, G4HHB, 36 Hunter's Oak, Hemel Hempstead HP2 7SW
G0EAA-EZZ	Mr G W Jenner, G3KIW, Pogles Wood Cottage, Paradise Lane, Chapel Row, Bucklebury, Berkshire RG7 6NU	G2 Series	Mr C H Adams, RS10906, 4 Park Gate Gardens, London SW14 8BQ
G0FAA-FZZ	Mrs A Burchmore, G0ARQ, 49 School Lane, Horton Kirby, Dartford, Kent DA4 9DQ	G3AA - ZZ	Mr R Pasquet, G4RRA, 64 Bricks Bury Hill, Upper Hale, Farnham, Surrey GU9 0LY
G0GAA-GZZ	Mr N P Roberts, G4KZZ, 6 Park End, Forsbrook, Staffs ST11 9DR	G3AAA-DZZ	Mr E G Allen, G3DRN, 30 Bodnant Gardens, Wembleton, London SW20 0UP
G0HAA-HZZ	Mr J T Macrae, G4DXI, Park House, 1 Highsted Road, Sittingbourne, Kent ME10 4PS	G3EAA-HZZ	Mr E L Simpson, G3GRX, 'Everdene', Fell Lane, Penrith, Cumbria CA11 8AW
G0IAA-IZZ	Mr C J Webb, G4JFF, 68 Higgs Field Crescent, Cradley Heath, Warley, West Midlands B64 6RB	G3IAA-KZZ	Mr N J Entwistle, G0BRM, 4 Stirling Close, West Row, Bury St Edmunds, Suffolk IP28 8QD
G0JAA-JZZ	Mr J A Towle, G4PJZ, 63 Digby Avenue, Mapperley, Nottingham NG3 6DS	G3LAA-NZZ	Mr D Keely, GW00GI, Pensarn Cottage, Bryn Du, Ty Croes, Anglesey LL63 5SH
G0KAA-KZZ	Mr K Draycott, G3UQT, 28 Ladywood Road, Kirk Hallam, Ilkeston, Derbyshire DE7 4NE	G3OAA-PZZ	Mr J H Brazzill, G3WP, 43 Forest Dr, Chelmsford, Essex CM1 2TT
G0LAA-LZZ	Mr C Lennox, G4LXU, Blazefield Hse Fm, Blazefield, Pateley Bridge, Harrogate, N Yorks HG3 5DR	G3RAA-TZZ	Mr D Buckley, G3VLX, 'Little Oaks', Park Road, Marden, Tonbridge, Kent TN12 9LG
G0MAA-MZZ	Mr H C Foster, G4EZZ, 23 Chyllroyd Drive, Birkenshaw, Bradford, W Yorks BD11 2ET	G3UAA-VZZ	Mr Mark Newton, G3UKW, 11 Chestnut Close, Rushmere St Andrew, Ipswich IP5 7ED
G0NAA-NZZ	Mr E G Allen, G3DRN, 30 Bodnant Gardens, Wembleton, London SW20 0UP	G3WAA-XZZ	Mr I Batley, G0IID, 3 Follidon Ave, Fulwell, Sunderland, Tyne & Wear SR6 9HP
G0OAA-OZZ	Mr D Bloomfield, G0KUC, 8 Sunningdale Drive, Boston, Lincs PE21 8HZ	G3YAA-ZZZ	Mr I Batley, G0IID, 3 Follidon Ave, Fulwell, Sunderland, Tyne & Wear SR6 9HP
G0PAA-PZZ	Mr A Spence, 2M1AGP, 6 Woodend Terrace, Aberdeen, Scotland AB2 6YG	G4AA - ZZ	Mr R Pasquet, G4RRA (address under G3AA)
G0RAA-RZZ	Mr G P Greatrix, G7HNM, 80 Liquorpond Street, Boston, Lincs PE21 8UJ	G4AAA-AZZ	Mr D Roebuck, G0LJM, 44 Parkside Grove, Bradford, W Yorks BD9 5LL
G0SAA-SZZ	Mr S G Bryan, G0SCB, 99 Greystones Road, Whiston, Rotherham, South Yorkshire S60 4BH	G4BAA-BZZ	Ms L Harper, G4FNC, 'Three Oaks', Braydon, Swindon, Wilts SN5 0AD
		G4CAA-CZZ	Mr P Jobson, G3HLF (address under G0CAA)
		G4DAA-DZZ	Mr D Buckley, G3VLX (address under G3RAA)
		G4EAA-EZZ	Mr G W Jenner (address under G0EAA-EZZ)

G3UUT, QTHR. Microwave Beacon Coordinator – Graham Murchie, G4FSG, QTHR.

**RSGB Contests:** First contact the appropriate contest adjudicator (see the contest rules). For policy, contact the respective Committee Chairman: HF Contest Committee – Chris Burbanks, G3SJJ, QTHR; VHF Contest Committee – David Johnson, G4DHF, 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.

**Emergency:** Emergency Communications Officer – Greg Reilly-Cooper, G0MAM.

**Exhibition & Rally Committee:** Chairman – Norman Miller, G3MVB, QTHR.

**History:** Society Historian – George Jessop, G6JP.

**IEE:** Liaison Officer – Peter Saul, G8EUX.

**Licensing:** LAC Vice-Chairman – Julian Gannaway, G3YGF, QTHR. Licence Renewals – SSL, PO Box 885, Bristol BS2 8RH. New Licence Applications – SSL, PO Box 884, Bristol BS2 8RH. SSL Help Desk – 0272 258333.

**Membership Liaison:** MLC Chairman – Peter Sheppard, G4EJP, see Zone A (above).

**Morse:** Morse Practice Transmissions Coordinator – David Pratt, G4DMP. Chief Morse Test Examiner – Roy Clayton, G4SSH.

**Packet Radio:** Datacomms Committee Chairman – Tom Lilley, G1YAA, QTHR.

**President:** Ian Suart, GM4AUP, QTHR. Executive Vice President: Clive Trotman, GW4YKL, (see Zone E above).

**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 sub-manager (see *RSGB Call Book* or November *RadCom*, p91 for a list). QSL Bureau Liaison Officer – John Hall, G3KVA.

**Repeaters:** Repeater Management Group Chairman – Geoff Dover, G4AFJ, 31 Newbold Rd, Kirkby Mallory, Leicestershire, LE9 7QG.

**Spectrum Abuse:** Packet – Via Datacomms Committee. Repeaters – Via the Repeater Management group. Other – Via Licensing Advisory Committee. Intruder Watch Coordinator – Chris Cummings, G4BOH.

**Technical & Publications:** Committee Chairman – Dick Biddulph, G8DPS, QTHR.

**Training and Education:** Committee Chairman – John Case, GW4HWR, QTHR. Radio Amateur's Examination – George Benbow, G3HB, QTHR. Novice RAE – Hilary Claytonsmitth, G4JKS, QTHR. Project YEAR Coordinator – G4JKS.



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# The LAST WORD

## PERSONAL DELIVERY

This morning I received by *direct mail* from the RSGB Bureau a QSL card from New Zealand for Special Event Station GB2QE of which I am the Station Manager. This card had been mailed direct to the Bureau with an IRC enclosed for a return card.

I wish to express my thanks to whoever forwarded the card to my address as there was an RSGB slip enclosed but no indication as to who the very kind and thoughtful sender was. As a relatively 'lukewarm' member of the Society in that I do not hold (or air) strong opinions either against or in favour of our Society, it is extremely gratifying to experience this kind of service first hand so to speak.

Once again on behalf of Wirral & District ARC may I thank you very much indeed and hope that you may pass on the contents of this letter to the person(s) concerned.

Victor Allen, G4UDR, Hon Sec Wirral & DARC

[A copy of your letter has been passed to the QSL Bureau supervisor - Ed]

## THAT'S MY AERIAL!

Here in Hong Kong, my September copy of *RadCom*, arrived as usual, reliably, and on time.

After a quick scan of the various articles I started looking at the ads towards the rear of the magazine. On arrival at page 95 closely associated to a book entitled *Practical Antennas for Novices* I found a beautiful colour photograph with a setting sun background of a monster 144MHz Array.

Now, far be it for me to discourage Novices from antenna experiments, in fact quite the opposite, but before any Novices start getting excited about the prospects for this 'Practical Antenna', perhaps a few vital statistics should be clarified.

This antenna is about half as wide again as a normal sized house, and high enough to exit through the second floor window and still climb another 15 feet vertically. Weight - well, if you pile up the washing machine, spin dryer, cooker, microwave oven, followed by a three element tri-band Yagi, the FT1000, HF amplifier, antenna tuner, followed by the living room TV set, VCR, Hi-Fi (including speakers), followed by all the tools from the garage, then you will be getting close.

To simulate the support structure you will need to place your car on top of your partner's car and then put both under the above pile that you just made.

To construct the elements and open wire feeds you need about 900 ft of aluminium. There are 224 elements to be made and 48 open wire feeds for a total of 272. The coax feeds are a bit more tricky, you need 100ft of RG-213 or better, 2 x 4-way power dividers, 1 x two-way power divider and 80ft of LDF450 for transmit, you can get away with only LDF250 on receive if you put your 4 port 70dB isolation at 0.1dB loss relay at the top of the tower. Then it must be rotated within 2° accuracy and elevated to within 1° accuracy.

So that's it - you're done. Now what can you do with it? Well, on a good day you can get moon echoes on only 10 watts or work WSUN with 20 watts. You can hear single Yagi stations on 100 watts or maybe just be a good signal at the local repeater.

How do I know all this? Because it's my antenna of course, with more than a little help from G8KBY, G4PCS and G1EGC and guidance during the design phase from VE7BQH and K6MYC. I completed this project over the two-year period from 1988 to 1990 and operated it together with G4PCS for the next 18 months before I moved to Hong Kong. Next year I'm coming back to Europe and the next 'Practical Antenna' is already mostly designed. I will start fabrication during 1995. However, it is not in any of these books, just like the current one isn't either (and, yes, it is bigger).

Graham Daubney, G8MBI, VR2IH, G0VBA.

## TOROID AGAIN

For the second time in more years than I care to remember, I have had an irresistible urge to comment upon a letter in the correspondence column of *RadCom*.

Whilst everyone is entitled to his opinion, I could not disagree more with that expressed by G3TMA, whose personal criticism of G2AJV is both immoderate and unjustified. I for one find the toroidal antenna subject well documented and extremely interesting - and have had a lot of satisfaction from experimenting with VHF models thereof.

QST is, of course, an excellent publication; but on balance over the years, the content of *RadCom* bears favourable comparison with its American counterpart. But then, which Editor has ever succeeded in pleasing all of the people all of the time?

H M Humphreys, G13EVU.

## THANKS TO TRISTAN!

I was interested to read about the recent DXpedition to Tristan Da Cunha, as that island was instrumental in helping me become a radio amateur!

As a schoolboy in the mid-1960s I purchased a faulty domestic valve receiver from a jumble sale. The fault meant that it received 'strange transmissions' on the dial at 200 metres. I spent many happy hours listening to locals on top Band, courtesy of partially shorted tuning coils, but I was unable to find out more info!

Months later, the BBC Home Service mentioned that the GPO were having difficulty maintaining a radio telephone line with Tristan Da Cunha, but that the amateur radio station at the Science Museum in London was in regular contact with the island. This was the break I'd been looking for - I went to London the next day!

I was allowed to say hello to a Greek station live on 20 metres - and I was hooked. I came home armed with several old *RSGB Bulletins* and a *Guide to Amateur Radio*. I sincerely hope that GB2SM will be reprieved to encourage more into our hobby.

Edwin Laing, G0OAI

[Turn to page 4 for some good news about GB2SM - Ed]

## COMPROMISES

In recent editions of *RadCom* there have been a number of letters relating to the content, which have contained accusations of being too full of/not enough technical articles, too many/too few simple articles or that the focus of the content is not sharply on the hobby.

Everything in life involves compromise. If there are not enough simple articles, newcomers will not be encouraged to attempt and succeed and thereby gain the confidence to tackle the more technical articles. Too many technical articles and *RadCom* will adopt a format more suited to industry.

The means and methods of operation are as diverse as the backgrounds of those who enjoy the hobby. *RadCom* at least tries, and on the whole manages, to reflect this and while it is impossible to please everyone with everything, there should be something in the magazine for everyone. Realistically, if *RadCom* achieves this much, it is a success.

M C Smith, G0DPT

## PIES AND PASTIES

In the August *RadCom* Rev George Dobbs in his QRP column refers to the famous Rochdale Pie and Peas lunch at the QRP mini-convention.

We at Yeovil ARC at our next year's QRP and Construction Convention on 21 May 1995 can claim equal fame for our refreshments and in particular, the renowned Yeovil pasties. So, technical 'gourmets' please put this date in your diaries.

Cedric White, G4JBL, Hon Sec Yeovil ARC  
[See our 'QRP Gatherings' feature on page 5 - Ed]

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.

## FAULTY FERRET

As the owner of a Racal RA17L receiver I was much attracted by the 'Ferret Audio Filter' by Paul Lovell, G3YMP (*RadCom*, August). I sent off for the kit which arrived promptly from JAB Electronics. I was a bit dismayed to find that although the kit contained all I needed for construction of the filter, there were no instructions! I phoned the firm, who were very helpful, but they explained that there was no accompanying literature.

They suggested I spoke to the *RadCom* Technical Editor. Peter Dodd, G3LDO, listened patiently to my explanations of lack of technical prowess and inability to translate a circuit diagram on to Veroboard. Searching his files he confirmed that he didn't have a component layout diagram but kindly gave me Paul Lovell's address. I wrote to Paul, explaining my lack of technical expertise and asked if he had a component layout diagram which also showed where to drill the board. I enclosed a SAE.

A few days later the postman delivered a jiffy-bag which contained a delightful letter from Paul, my SAE and the original Ferret board with the components mounted. I have made a component layout diagram and marked out the places where the track is drilled. Paul's generosity was a heartening reminder of one of the many reasons why I and many others get so much pleasure and satisfaction from our hobby. Thank you Paul, this is what amateur radio is all about!

Chris Chambers, G8MVJ

## THE REAL ARTICLES

Congratulations to Ian Buffham, G3TMA (*The Last Word*, September). At last someone has had the guts to come out and say "no-one is allowed to hold high office in the Society unless they have worked 300 countries" but why stop there? When are we going to see decent technical articles? How about some large HF/VHF antenna arrays? (not the usual Mickey-Mouse dipoles/ground-hugging loops etc).

Or what about a full construction item for an HF amp (160-10m) with a pair of proper DXers valves (ie 3-500Z), or a VHF amp with a pair of 4CX250Bs. Let's face it, the only thing worth building these days with valves is an amplifier. Move with the times RSGB! It's now 1994 in case you hadn't noticed, inside radios we now use ICs (you know - those funny black things with lots of legs).

And don't you think you should take a few tips from *CQ* magazine and the *ARRL* on how to run contests? Think about it, why is the *CQWW* the big one of the year and the RSGB ones only minor events?

I wonder what other members think of these few topics which are at the top of a very long list?

Andrew Williamson, G10NWG.

## CATALOGUE OF ERRORS

There is nothing wrong with the technical quality of the G2AJV toroid antenna articles; if G3TMA wants a high technical content he should perhaps read *R&EW* or a professional publication.

We are amateurs, and the degree of technical complexity in *RadCom* has to reflect that, which it does quite well. It isn't just Novices who construct the devices featured in Novice Notebook, and I totally fail to see how the magazine of the RSGB could possibly benefit from a tourist plug for New York.

I do take issue with the lack of editorial control over the accuracy of circuit diagrams. The MSF Frequency Reference had an extraordinary catalogue of errors; the TT Homebrew Burglar Alarm (August) cannot possibly function as explained in the text with TR1's base floating. And who stocks NPN ACY18s? The Swallow UHF Prescaler (September) has two C6s and two C7s which should probably be C8 and C9, although C8 isn't mentioned in the parts list.

J M Dunnett, G4RGA

## WEAK LINK

We still seem to be getting incomplete circuits being printed in *RadCom*. A circuit is as good as its weakest link, rather like a chain - if bits are incomplete or missing, then the whole circuit is useless.

I wonder if someone at HQ could vet these circuits before they are printed - for obvious errors and omissions.

R C Arnold, G8ZDU

[The re-drawn circuit diagrams usually are checked by the authors after checking by technical staff in *RadCom*. However errors do creep in, and we are striving to minimise these - Ed]



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SELECTION

## ADVERTISERS INDEX

Altron Comms. Equip. Ltd ... 10	J. & P. Electronics Ltd ..... 49
Amateur Radio Shop, The ... 97	Kanga Products ..... 97
AMDAT ..... 53	Kenwood ..... 98 & IFC
AKD ..... 29	Klingentuss Publications ... 90
Barton Communications .... 30	Lake Electronics ..... 30
Christopher Bartram RF Design ..... 97	Martin Lynch G4HKS .... 9, 40, ..... 50, 51 & 96
J. Birkett ..... 96	Motorola ..... 98
British Wireless for the Blind 67	Mutek Limited ..... 98
Canberra ..... 97	Nevada Communications ... 20
Castle Electronics ..... 90	Public Domain Software Library ..... 97
Chevet Supplies Limited .... 92	PW Publishing Ltd ..... 49
Cirkit Distribution Ltd ..... 30	QSL Communications ..... 97
Coastal Communications ... 44	Radio Bygones ..... 92
Communications Centre .... 10	Radio Hamstores ..... 23
Datong Electronics Ltd ..... 49	R.A.S. (Nottingham) ..... 49
Dee Comm Amat. Radio .... 92	R & D Electronics ..... 12
Eastern Communications 65,67	R N Electronics ..... 97
Electromail ..... 11	Peter Rodmell Communications ..... 12
Essex Amat. Radio Services 97	RS Components ..... 11
F.B.S. Ltd ..... 12	S.E.M. .... 12
Grosvenor Software (G4BMK) ..... 53	SGC ..... 65
G.W.M. Radio Ltd ..... 53	Siskin Electronics Ltd ..... 9
Halcyon Electronics ..... 97	South Midlands Comms. Ltd ..... 58, 59
Ham Band Music ..... 10	Suredata ..... 30
Ham Radio Today ..... 90	Tuner Systems ..... 30
Hands Electronics ..... 97	Waters & Stanton ..... ..... 16, 57, 86 & 87
Hateley Antenna Technology ..... 97	W. H. Westlake ..... 92
Heatherlite Microphones ... 67	Wilson Valves ..... 97
C.M. Howes Communications ..... 29	Yaesu ..... OBC
ICOM (UK) Ltd ..... IBC	3TH Ltd ..... 92
IFW Technical Services .... 97	

## NEXT COPY DATE

The display advertisement copy date for our January 1995 issue will be **9th November, 1994**



# ADVANCED

# HANDHELD

# TECHNOLOGY



IC-2GXE 2m FM  
Handheld Transceiver

IC-T21 2m FM handheld  
plus 70cm receive  
IC-T41 70cm FM Handheld  
plus 2m receive



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SEE REVIEW THIS MONTH

# Compact HF Transceiver FT-900AT

## Introducing an HF that's going places.

"With the small snap-off remote front panel design, it's an HF mobile."



"It's a great base, too. Direct keypad entry, built-in antenna tuner, CW keyer with adjustable speed, 100 Watts, Omni-Glow display... Wow!"

"Yaesu did it again!"

Uncompromising HF quality that will change your lifestyle. It's the first transceiver with true HF technology to go mobile in any vehicle or stay at home as a compact base station.

With its revolutionary, small, snap-off remote panel, the controls of the FT-900AT can be installed almost anywhere in your car, truck or camper. Since the 100 Watt RF deck can be installed under a seat or in your car trunk, it's away from critical automotive electronic wizardry. And, for ultimate convenience, the built-in antenna tuner simplifies in-car operation.

As a base station, the compact full function FT-900AT includes direct keypad entry for pinpoint accuracy during quick band/frequency changes. Other features you'll like include CW keyer with front panel speed adjustment,



Remote front panel control head measures only 2-1/4"H x 9-1/8"W x 1-1/4"D.

speech processor, twin stacking VFOs, IF Shift and Notch. No competitor offers this! Bonuses, such as signal



The FT-900AT controls mount almost anywhere in your car, truck or camper. 100 Watt RF deck can mount in trunk, or under seat.

strength, power output, SWR and ALC digital meters, add value to the FT-900AT, and the proven duct-flow cooling system provides excellent long-term transmit power output reliability and frequency stability. For ease of use, Yaesu's exclusive Omni-Glow display enhances viewing in any light condition. And, since the high speed antenna tuner is built-in, it means less clutter in your shack.

For sheer high-performance, anywhere, the FT-900AT is incomparable and ranks with the FT-1000 to further underline Yaesu as the choice of the world's top DX'ers.

Trust Yaesu to know what you want. True HF you can take with you or leave at home! Available now at your Yaesu dealer.

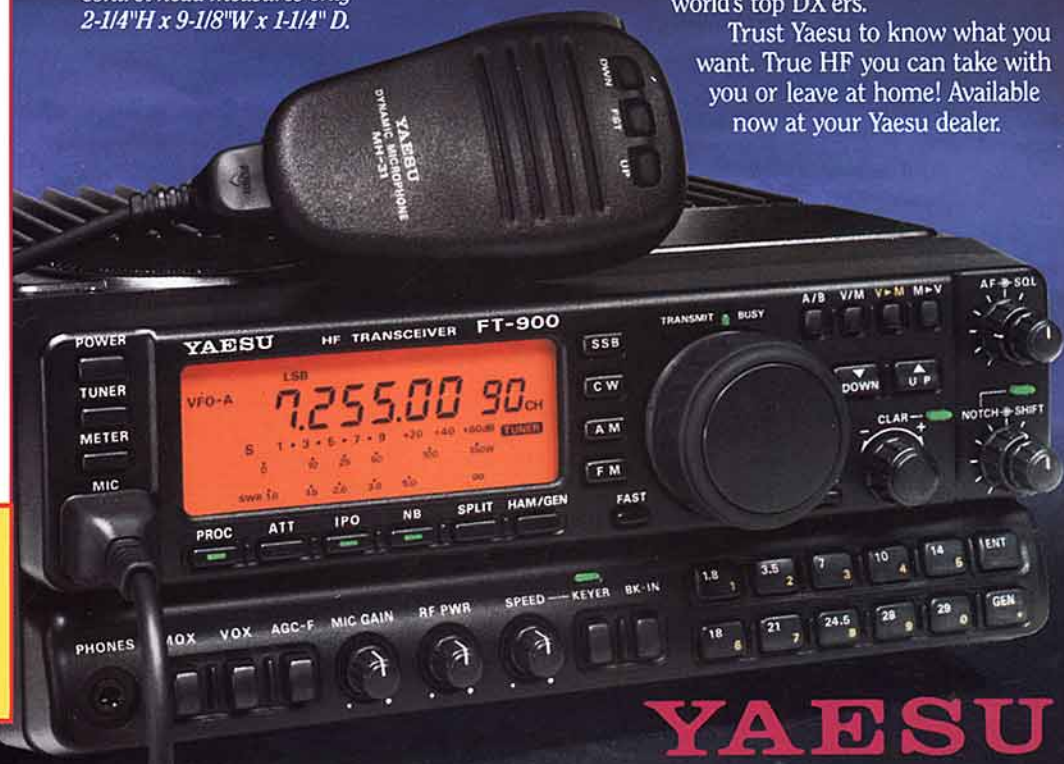
### Specifications

- Remote Front Panel Design
- Built-In Auto Antenna Tuner
- Direct Keypad Entry when used as a Base Station
- Large, Bright Omni-Glow™ LCD Display
- 100W on SSB, CW, FM modes; 25W on AM
- IF Shift and 30db Notch Filter
- Digital S/R, SWR & ALC Meters
- Programmable CTCSS Encode w/Repeater Offset
- Direct Digital Synthesis (DDS)
- 100 Memory Channels
- Frequency Range  
RX: 100 kHz-30 MHz  
TX: 160-10 meters
- CW Full Break-in Keying w/Adjustable Speed
- Fast/Slow AGC Circuit
- Intercept Point Optimization
- Duct Flow Cooling System
- Twin Band Stacking VFOs
- Built-in Noise Blanker
- Built-in Adjustable Speech Processor

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