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Practical Wireless

The Radio Magazine

REVIEWED
The Standard C5200

An RF-Operated Relay

Introduction to Digital Communications

Practical Wireless
The Radio Magazine

FEBRUARY 1989 (ON SALE 12 JANUARY 1989) VOL. 65 NO. 2 ISSUE 983

THIS MONTH

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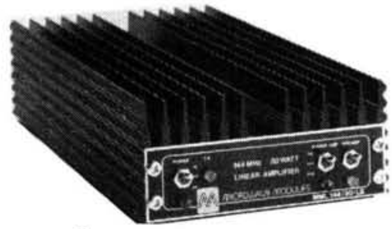

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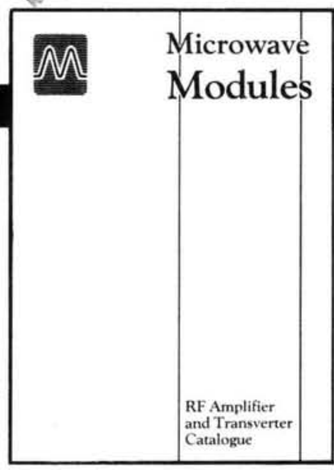

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Novice Licence

STAR £10 LETTER

I read with interest the letter from R. G. Wilson in *PW* Oct. 88. He asks: "Where are all the rumours coming from?" Well, I don't kow what rumours he may have heard, but I have seen and heard some that would make me drop amateur radio altogether if they came about.

If we need an easy route into amateur radio, and that is yet to be proved, then I think the following proposals are worth some thought.

1. Any person over the age of 14 who is interested in perhaps becoming a radio amateur, should register with the DTI as the licensing body.
2. Their registration details should include the callsign of the existing amateur whose station they intend to use under supervision.
3. The "Assistant" licence, as we would call it, would be valid for one year. By the end of that year the holder would have to have taken the full RAE. In the event of failure in the exam, the licence could be renewed for just one more year. A second failure would mean the end of the road.
4. The fully licensed amateur named under "2" would be responsible for the operating and behaviour of the assistant, and his licence could also be revoked should things go amiss.
5. The assistant would enjoy the full privileges of the "A" or "B" class licence held by the amateur supervising him.

Approaching the problem this way would not upset so many of the existing amateurs, it would be more controllable as regards abuse, and most of all the cost would be very little for the assistant.

In many ways, what I have suggested is similar to the privileges afforded to a GB special event callsign, and I have not heard of those being abused.

The main point that needs proving one way or another though, is whether there really is a need for another route into amateur radio.

Vince Bobin G1FBH
Kingsbridge, S. Devon.

For those readers who have not seen first-hand details of the RSGB proposals for the Student Licence and Project YEAR, we understand that copies of the Information and Consultive Document on the subject which appeared in September 1988 Radio Communication *are available from RSGB headquarters on request.—Ed.*

Morse

I must leap to the defence of D. J. Carr in his letter in *PW* Dec. 88. I am one of the people to whom he refers. For over 20 years I have pursued the hobbies of radio and electronic construction, and short wave listening.

I passed the RAE with distinctions about 4 years ago but have not yet obtained a licence, as I find the content of the 2m band only a marginally more entertaining way of wasting time than CB. However, the h.f. bands can provide the most rewarding and absorbing interest both in communication and in talking to someone sharing the same hobby on the other side of the world.

I have not been able to learn Morse, which I admit is partially laziness, but which I am sure is influenced by an underlying objection to having to pass a test which is not related to the form of communication I would like to pursue—s.s.b. on h.f. I find it is very difficult to explain this requirement to

PW COMMENT

Licence News

WHEN DETAILS OF THE NEW UK AMATEUR LICENCE were announced in August 1988, it was obvious that there would be quite a few questions to be asked about the precise meaning and implications of the new rules. Some of the queries would only become apparent after detailed reading and comparison with the provisions of the previous licence. Others were immediately obvious, and we raised these with the DTI's Radiocommunications Division straightaway.

The legality of receiving transmissions from stations in the Standard Frequency Service has caused some pretty heated discussions among radio enthusiasts in the past. Because the Amateur Licence authorised reception of such stations, it was argued by some that an s.w.l. wasn't allowed to listen to them. When I enquired of the DTI some years ago, just what the true situation was, I was told that Clause 1. (1) (d) in the old licence was there by mistake, and that because Standard Frequency Service stations were considered to be authorised broadcasting stations, anyone in the UK was allowed to listen to them without any need for a licence.

Then, lo and behold, the new amateur licence comes out with Clause 1. (12) repeating the old Clause 1. (1) (d). Just what is the situation?

Well, for once we're all winners, s.w.l.s and licensed amateurs alike. The UK s.w.l. is exempted from the need for a licence to receive sound signals from authorised broadcasting stations (and licensed amateur stations) under a Statutory Instrument last updated in 1984 (S.I. 1984 No. 1053), so he's in the clear. However, that exemption applies only to "receive-only" stations. When a licensed radio amateur installs a transmitter or transceiver, he no longer has a "receive-only" station, and the exemption doesn't apply. Hence Clause 1. (12) in the new licence, which puts him in the clear as well. Simple, isn't it, in a complicated sort of way!

In any Act of Parliament or Statutory Instrument, one of the most important sections is that labelled "Interpretation", which basically defines what various words and phrases in that piece of legislation mean. A trap for the unwary, this, as the same words or phrases may have a different meaning in everyday life, or even in another piece of legislation. In the 1949 Wireless Telegraphy Act, for example, the definition of "Wireless Telegraphy" tells us that it includes the transmission and reception not only of telegraphy, but also of telephony, visual images, and of signals for remote control and for direction or position finding.

On that question of definitions, an intriguing omission from the amateur licences both old and new, is any reference to "bicycle mobile" operation. The new amateur licence Clause 1. (9) (c) permits mobile operation, where "mobile" is defined as meaning in a vehicle, as a pedestrian or on a vessel, but what about the poor cyclist?

Now as I understand it, in the Road Traffic Acts, a bicycle is by definition not a vehicle. However, I am pleased to be able to tell bicycle mobile fanatics that the DTI says that for the purposes of Clause 1. (9) (c) of the Amateur Radio Licence a bicycle is considered to be a vehicle. So get pedalling—but no hand microphones, please!

Finally, to the infamous Clause (aa) of the Notes to Terms and Limitations Booklet BR68. This is causing some problems to a number of UK radio dealers and importers at the present time, and I think we shall be hearing much more of Clause (aa) and its associated *Wireless Telegraphy (Citizens' Band and Amateur Apparatus) (Various Provisions) Order 1988* otherwise known as Statutory Instrument 1988 No. 1215. Watch this space.

Geoff Arnold

potential converts to amateur radio, especially as radio communication is based on science, technology and logic.

I think that the Editor's comments to the published letter were unfair. It is true that c.w. is simpler, but surely the writer had in mind the major differences in construction for the widely differing frequencies of 144MHz and 1.8–14MHz. Having constructed many projects, particularly from *PW*, I would say that constructing h.f. band equipment, including s.s.b., is much simpler than 2m equipment for two specific reasons.

First, circuit layout and screening are far less important for 14MHz and below than for 144MHz and above. This makes a considerable difference for both basic construction and later modifications.

Secondly, the most important piece of test equipment available is the oscilloscope. A 20MHz bandwidth 'scope is within the range of equipment available to many keen constructors, and invaluable for testing and aligning h.f. equipment. The construction of any piece of radio gear must be significantly more difficult without being able to use a 'scope to look at the waveforms involved.

Since passing the RAE I have stood on the sidelines, wishing that the time, energy and magazine space devoted to the licensing arguments had been in other directions. When all this is resolved what a void there will be! Like our present tax system, if no rules existed and we were starting from scratch we would never include this requirement.

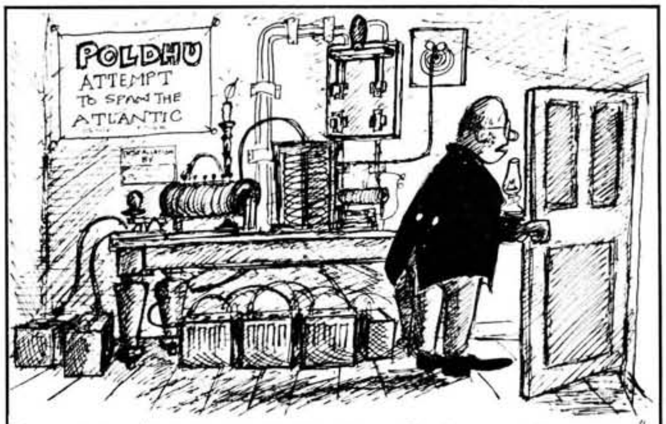
I'm sorry to spout on at such length, but I've followed the arguments for years as one of the silent majority, and I do feel that perhaps what the Editor referred to as an over-simple solution may well save amateur radio from disappearing into oblivion.

J. S. Hind, BSc, Nottingham.

Despite Mr Hind's arguments, I stand by my comments to Mr Carr's letter. The principal result of opening up the h.f. bands to Class B licensees in that way would, I am sure, be to boost the sale of "black box" s.s.b. rigs. Whilst this would naturally be welcomed by the importers and dealers, it would do little to increase home construction and experimenting, and the understanding of radio technology that goes with them, which ***must*** *be the aim if we are to hold on to the privileges and bands which we enjoy at the moment. A c.w. transmitter is uncomplicated and easily built by a novice. Just one look at the circuits and plans of an s.s.b. transmitter is likely to frighten off anyone who is not already at home with radio technology and construction.—Ed.*

Send your letter to the Editorial Offices in Poole, the address is on our Contents page. Writer of the Star Letter each month will receive a voucher worth £10, to spend on items from our PCB or Book Services, or on *PW* back numbers, binders, reprints or computer program cassettes. And there's a £5 voucher for every other letter published.

Letters must be original, and not duplicated to other magazines. We reserve the right to edit or shorten any letter. Brief letters may be filed via our Prestel Mailbox number 202671191. The views expressed in letters are not necessarily those of *Practical Wireless*.



"...MR M. THERE'S A CHAP COME UP ASKING IF THE FREQUENCY IS IN USE..."

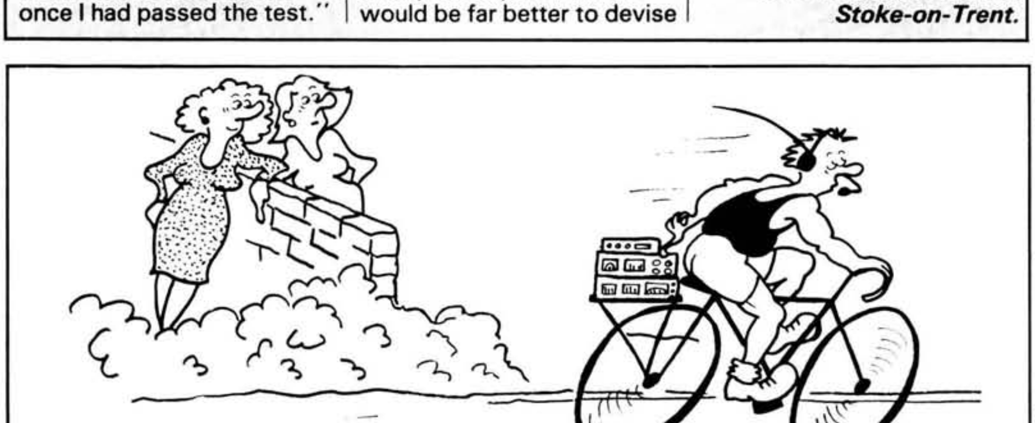
Morse

Having passed the RAE with relative ease in December 1987, I immediately began to study Morse code in order to get a Class A licence. As the weeks progressed my enthusiasm dwindled and the Morse tutor went back into the cupboard. After all, "I had no intention of using c.w. once I had passed the test."

This, it would appear, is the attitude adopted by many new licensees, Class A and B alike.

It is with this in mind that I agreed with some of the points made by D. J. Carr (*PW* Dec. 88). However, I do not expect h.f. to be opened to B licensees without a test of any description. I feel it would be far better to devise another test system, to be taken in addition to the existing RAE, purely for prospective Class A amateurs. It is my opinion that Morse, although still widely practised, has had its day and that far more good could come from examining amateurs to a higher level.

R. C. Moxham G7AXN, Stoke-on-Trent.



I FINALLY PERSUADED HIM TO TAKE SOME EXERCISE...

Morse

I read with great enjoyment the letter from Tom Harrison GM3NHQ in November *PW*, and heartily concur with what he said.

You will see from my callsign that I am new to amateur radio. I was, however, a Merchant Navy Radio Officer for a number of years, first with Marconi Marine and then freelance with Swedish, Finnish and Greek lines.

Far too many would-be c.w. operators fall by the wayside seduced by glowing accounts of decoders and Morse keyboards about which I shall say no more. Since leaving the sea, I have taught quite a few aspiring amateurs (a heart-breaking task), most of whom cover their inadequacies after passing the Morse test by stating casually that they intend to specialise in this, that and the next thing, expending large amounts of cash on expensive, high-power gear only to remain a bunch of up-market CB babblers.

As soon as I can get some gear together I shall use c.w. only, because good c.w. is music to the ears, and my minimum will be 20 w.p.m.

Keep your ears open, Tom, you will be hearing from me.

John Hillerby G0KDU St. Leonards-on-Sea.

NEWS DESK ... *compiled by G4LFM and G8VFH*

Forthcoming Rallies

January 29: The NARSA Norbreck Radio and Electronics Exhibition (formerly held at Belle Vue in Manchester) will be held in 1989 at the Norbreck Castle Exhibition Centre, Blackpool. Details can be obtained from: ***Peter Denton G6CGF. Tel: 051-630 5790.***
February 26: The 2nd Taw and Torridge Rally will be held in the BAAC Halls, The Pill, Bideford in North Devon. These premises are larger than last year. The doors open at 10.30am with talk-in available on S22. There will be trade stands, a bring and buy, refreshments and a bar as well as ample parking. More details are available from: ***G0AYM. Tel: 0805 23776.***
March 19: Wythall Radio Club will be holding their 4th Annual Radio Rally at Wythall Park, Silver Street, Wythall, Worcs. This is on the A345 south of Birmingham. Doors open at 11.30am. There will be three large halls, the usual trade stands, a flea market, a large Bring & Buy, snacks available and a bar. Talk-in on S22 with more free parking this year. Admission is 50p with more details from: ***Chris G0EYO on 021-430 7267.***
March 26: The Cunningham & District ARC are starting a new rally at the Magnum Leisure Centre in Irvine to combat the shortage of rallies for Scottish amateurs. Doors open at 10.30am. More details from: ***Bob Low on 0563 35738.***
May 7: The Southend & District Mobile Rally will be held at Roach Way Youth Centre, Rochford, Essex. Doors open at 10am. More details from: ***Ted G4TUO. Tel: 0702 202129.***
June 11: The Royal Naval Amateur Radio Society's annual rally is scheduled to be held at HMS Mercury again this year. More details nearer the date.

If you are organising a rally and would like it mentioned in *Practical Wireless*, then drop us a line at least 6 weeks in advance (marking your envelope Rally Calendar) and we'll do the rest.

24GHz DPDT Switch

Wavecom's standard d.p.d.t. transfer switch now has its upper frequency limit extended from 18GHz to 24GHz.

Fitted with SMA connectors, the switch can be specified with an extensive range of options including t.t.l. logic high or low, m.o.s.f.e.t. driver, indicator circuit, suppression diodes and self de-energising circuit. With a bandwidth of 3 to 24GHz, the switch has a maximum v.s.w.r. from 1.2:1 to 1.6:1 and maximum insertion loss of 0.2 to 0.6dB. Isolation (minimum) is quoted from 80 to 50dB. Switching time is lower than 15ms.

Anglia Microwaves Ltd., Radford Business Centre, Radford Way, Billericay, Essex CM12 0BZ. Tel: 0277 630000.

Morsum Magnificat

The Autumn 1988 issue of *Morsum Magnificat* proved interesting reading, as always. There is a really interesting article on Earth Current Telegraphy, some brilliant cartoons by GW3COI (whose work is sometimes seen in *PW*). There is obviously much more in the issue, but space isn't that available here.

Morsum Magnificat was first published in Holland in 1983 by Rinus Hellemons PA0BFN. Now published in London, it provides international coverage of all aspects of Morse telegraphy, past—present—and future. It's for all Morse enthusiasts and a year's subscription costs £6.50 (UK); £7 for Europe (including Eire); £7 surface mail and £8.50 air mail for other countries.

Tony Smith G4FAI, 1 Tash Place, London N11 1PA.

Expedition Group

The Scottish Tourist Board (Radio Amateur) Expedition Group has now been formed and will be active in 1989. The purpose of the group is: to activate amateur radio stations from locations in Scotland that are unusual, historic or pertaining to Scotland in any aspect; to make the public more aware of the hobby of amateur radio (all stations will be open to the public).

Members of this group will be taken from all over Scotland. They hope to activate two Malt Whisky Distilleries, an island, a world heritage site, a Robert Burns Station and a very rare castle. A full list of events will be available later.

College History

Are you an ex-student or ex-staff of the former Wireless College in Colwyn Bay? If so, Alan Twelves GW4ZWG would like to hear from you.

He is looking for historical, descriptive, reflective, illustrative, even nostalgic material. Apparently the Wireless College, overlooking the sea, displayed an amateur callsign—a G2 plus 2—Alan believes. All assistance will be acknowledged and followed up says Alan. So, if you can help Alan is QTHR.

Arrow and Ten-Tec

The Ten-Tec range of transceivers is now available from Arrow Electronics Ltd. The latest model, the Paragon, was recently on display at the Leicester show and is now available from stock.

The Ten-Tec range will be on display at the Arrow showrooms in Chelmsford & Glasgow, with sales service available from Arrow Agents in Anglesey, Wigan and Leicester. Apparently, due to the prompt availability of spares and service back-up in the UK from the previous sole agents, Arrow are able to guarantee their usual level of service support.

Illegal Radio Car Alarms

Quite apart from saving you from the worry and inconvenience of having your car stolen, fitting it with an alarm might seem a good way to help beat crime. But, the DTI warns, if the alarm you have chosen is one which uses radio, and it is not approved, you could be breaking the law yourself.

A large number of illegal devices are now being advertised and sold, most of them imported, and their use could land you with a prosecution and a fine on conviction of up to £2000, three months imprisonment—or both.

There are two types of car alarms which use radio: the "car theft paging alarm" and the "radio key". It's mainly the former which could cause the trouble. If your car is tampered with, they will alert you by transmitting a radio signal which is picked up by a small receiver you are wearing. But, for such alarms to be legal they have to be approved.

To be on the safe side the **only** alarm of this type at the moment that is legal is called the "Page-Alarm". This is made by C-COM International.

All approved alarms must be marked to show that they are type approved and conform to the DTI specification. The "radio key" types use infra-red and ultrasonics and so are not tied by the same restrictions.

NBTVA

The Narrow Band TeleVision Association was founded in 1975 and exists to promote the development, study and widespread use of low definition and mechanical television. Membership is open worldwide to anyone interested at a current subscription of £3 (concessionary rates for students, pensioners and the unemployed available).

There is an annual exhibition and conference held in April/May and members receive quarterly newsletters (about 12 pages) containing technical articles, details of constructional projects, etc. The association also offers a number of special services to its members.

Activities include the building of experimental cameras, monitors, etc., and closed circuit demonstrations, tape correspondence (using audio recorders) as well as transmissions on the amateur radio bands—28 and 144MHz being favoured.

Enquiries regarding membership should be addressed to:
N. Reynolds G8YXL,
6A Collingbourne Road,
London W12 0JQ.
For information on Amateur Band NBTV, write to:
D. J. Sumner G3PVH,
20 Woodlands Way,
Southwater,
Horsham RH13 7HZ.

Dragon ARC

On 1 November 1988, Ron Horrocks GW2FLP (right) was presented with a celebratory gift from Dewi Roberts GW0ABL, Chairman of the Dragon Amateur Radio Club. This was to celebrate the fact that Ron has held an amateur radio licence now for 50 years.

The Dragon ARC meets at the Four Crosses, Menai Bridge, Anglesey.

Photo by GW6PXF.

Old Service Manuals

Are you looking for service manuals for old or obscure equipment? Well, Mauritron Electronics think they may be able to help.

They have a library of over 100 000 different makes and models of equipment with an extensive section on amateur and vintage radio. They produce a catalogue that is being constantly updated, so for details of this and their other services, contact:
Mauritron Electronics Ltd.,
8 Cherry Tree Road,
Chinnor,
Oxfordshire OX9 4QY.
Tel: 0844 51694.

IRTS Yearbook

The Irish Radio Transmitters Society (IRTS) is the National Society of radio amateurs and experimenters in Ireland. It represents the interests of radio amateurs through the promotion of activities of interest to members and through the representation on amateur radio matters to the Department of Communication.

The IRTS Amateur Radio Yearbook contains all kinds of information: IRTS officials' names, a repeater map and the EI callbook listings for 1988. So if you regularly work EI land, this book will probably be of use to you. The cover price is £2, but contact IRTS about postage rates.
IRTS Book Sales Manager,
Mr D. Peyton,
123 Springhill Avenue,
Blackrock,
Co. Dublin.

Can You Help?

Recently, Les Caudell has obtained a Sony ICF6700L multiband receiver, unfortunately without the handbook. Does anyone have one of these with a handbook so that Les can either borrow or buy the handbook. He will answer all letters and says he'll repay postage. So, if you can help, contact: ***Les G. Caudell,***
Caudell's Cottage,
Strete,
Nr Dartmouth,
Devon TQ6 0RW.

CQ-TV Award

This award is available to both transmitting and receiving enthusiasts, in any part of the world, whether they are members of the British Amateur Television Club or not. The award is for contacts made using fast-scan high definition television systems only.

Transmitting Award
For pictures transmitted which have been successfully identified by another station, claim 2 points per kilometre. If the contact becomes a successful two-way exchange of pictures, then 10 bonus points may be claimed by each station regardless of distance. For contacts on the 1.3GHz band, or above, points are doubled.

Receiving Award
For any picture positively identified, claim for a one-way contact. Otherwise rules are as for transmitting.

Points
The award is divided into different grades. For the Bronze—1000 points, for the Silver—5000 points, for the Gold—10000 points, for the Diamond—100000 points. Points already gained for an existing award may be added in when applying for a higher grade.

Contacts
A station may be worked only once per day for the purpose of this award. It is quite possible for it to be gained by working the same station many times. Contacts through TV repeaters do not count.

The Award
Upon qualification for the Bronze award, a certificate will be issued together with a Bronze seal; the certificate may be up-graded later with Silver and Gold seals. The Diamond award is a specially crafted trophy.

Applications
Applications should include log details consisting of callsign, date of QSO, band, location of the station worked and points claimed. Contacts made from other than the home station should be clearly marked. QSL cards are not required, but the application should be checked and signed by either a licensed amateur or BATC member.

Certificate applications should include a large (12 × 8½in) s.a.e. For upgrade seals an ordinary s.a.e. should be enclosed.

Applications to:
Bob Webb G8VBA,
78 Station Road,
Rolleston-on-Dove,
Burton-on-Trent,
Staffs DE13 9AB.

Two Books from AMSAT

AMSAT-UK have two books written especially for the newcomer to amateur and weather satellites. *The Sheffield Project* deals with the very first principles of listening and taking data from UoSAT. The book starts by explaining what an antenna and a 2m receiver are, and follows on to the use of a simple computer and the programming needed.

The second book, *The SEUK, A Guide for Teachers* explains in layman's terms the use of all kinds of equipment that a school may acquire to teach pupils the basics of satellite watching, listening and data gathering.

Both books were written for the Education & School Establishments, so the contents could well assist others not in the teacher/pupil situation too.

Both books are available from AMSAT-UK and all profits go to help them fund future satellites. *The Sheffield Project* costs £2.20 and *The SEUK Teachers Guide* costs £2.60, both post and packing free in the UK—overseas £1.75 extra each book. If a club orders ten or more, then discounts are available.
AMSAT-UK,
94 Herongate Road,
Wanstead Park,
London E12 5EQ.

NEWS DESK ... compiled by G4LFM and G8VFH

PW Reader Survey

Our thanks to all those readers who completed and returned the questionnaire which appeared in our October 1988 issue. The information and comments which you sent us will be of great help in shaping the future of the magazine.

Because of the effects of the postal strike in the UK, we extended the deadline for entry into the draw of returned questionnaires to the end of October. The ten lucky winners of a PW £10 voucher, drawn at random, were: Tom Valentine of Montrose, Keith Hewitt of Barnsley, W. G. Borland of Shipley, A. Digby of Southampton, Mr Hickman of Doncaster, Keith Robinson of Launceston, J. Brown of Falmouth, P. C. Cole of BFPO33, R. O. Ibbotson of Alford and B. Hitcham of Blackburn.

NiCad Hazard

With reference to the letter from Mr Ian Barnes, which appeared under the above heading on page 15 of the September 1988 issue of *Practical Wireless*, we have been asked by South Midlands Communications Ltd., importers of the Yaesu range of equipment, to point out the following:

1. The Yaesu FBA-10, which was the subject of the accident described in the letter, is a battery case rather than a battery pack, and is intended mainly for use with 1.5V dry cells, although it will of course accommodate NiCads of an equivalent size.
2. All current NiCad battery packs produced by Yaesu for use with their range of hand-portable equipment incorporated a self-resetting overload cutout.
3. All NiCad packs supplied by Yaesu for their current range of hand-portable equipment come with instruction sheets which include clear warnings to users that they should avoid short circuiting the battery terminals.

As mentioned in our response to Mr Barnes letter, it is of course good practice to protect the terminals of ***any*** power source against a short circuit. Secondary cells such as NiCads or lead-acid accumulators are particularly hazardous when short-circuited, because of their very low internal resistance, which will allow a very large current to flow. A strip of pvc insulating tape is adequate protection for a spare NiCad pack.

The next issue of *Practical Wireless* will include constructional details of a small unit which an enthusiast can build into a battery pack, and which will limit the current flow to a few micro-amps in the event of a short circuit across the output terminals.

Amiga SSTV

Following hot on the heels of the Amiga FAX software and interface package, ICS are now introducing AMIGA SSTV.

This has been written by the same author as AMIGA FAX and uses the same interface card. It implements all commonly used amateur slow-scan television protocols (colour and b/w) and permits images to be both sent and received. Transmitted images can be generated from Paint files or by inputting images from a TV camera via a digitiser.

AMIGA SSTV costs £99.95 including VAT plus £2.50 post and packing. For those who already have AMIGA FAX, the upgrade to AMIGA SSTV is available for £59.95.

ICS Electronics Ltd., PO Box 2, Arundel, West Sussex BN18 0NX.

Catalogues

West Hyde have recently published their 96-page catalogue. There's a quick reference section which allows the user to rapidly select the enclosure required for a particular job. All new products are illustrated together at the front for easy reference. The customising service is also fully described. The catalogue is available from:

West Hyde Developments Ltd.
Tel: 0296 20441.

Five Star Connectors have produced a new 446-page catalogue covering a comprehensive range of connectors from 16 of the world's leading manufacturers. It's fully illustrated and features many new products, also highlighted in the catalogue is Five Star Connectors' range of customer services including Customer Care, "Helpline" and Assembly. Copies are available, free of charge, from:

Five Star Connectors, Edinburgh Way, Harlow, Essex CM20 2DF.
Tel: 0279 442851.

STS Instrument Services has produced its first full-colour catalogue which features a vast selection of products from over 65 leading manufacturers. The 320-page publication highlights several new products, such as the Marconi 893B a.f. power meter, the Keithley 197 autoranging microvolt digital multimeter and the Hitachi VC6265 digital storage oscilloscope. Copies are available, free-of-charge, from:

STC Instrument Services, Dewar House, Central Road, Harlow, Essex CM20 2DF.
Tel: 0279 641641.

The 106-page Electrovalue catalogue (Oct 88–Sept 89) is now out and it's full of components, soldering irons, tools, multimeters and loads more.

Electrovalue Ltd., 28 St Judes Road, Engelfield Green, Egham, Surrey TW20 0HB.
Tel: 0784 33603.

Cirkit have their latest catalogue out now too. The 184-page catalogue not only contains details of their products but discount vouchers, a feature project (a programmable frequency generator) and a competition.

Cirkit, Park Lane, Broxbourne, Herts EN10 7NQ.
Tel: 0992 444111 (sales) 441306 (enquiries).

One unusual catalogue to arrive on my desk was The Modern Book Co. Computer Catalogue. There are 51 pages of books listed, catalogued by languages (there's 11 major ones plus the miscellaneous ones), by topic (e.g. graphics, word processing, etc.) and by machine (Apple, Amstrad, IBM, etc.). Books can be ordered by credit card, FAX or by post and most books are in stock so are sent by return, those that have to be ordered take 2–3 weeks. You can write or telephone for a free copy of the catalogue from:

The Modern Book Co., 19–21 Praed Street, London W2 1NP.
Tel: 01-402 9176.

The C.M. Howes Communications Catalogue for 1989 contains details of receiving equipment, transmitting equipment and station accessories. There are five new kits too: a marine band receiver, an h.f. air band receiver, an 80/160m "phone" and c.w. transmitter, a microphone amplifier and an active antenna amplifier. For more details, contact:

C. M. Howes, Communications, Eydon, Daventry, Northants NN11 6PT.
Tel: 0327 60178.

Unitel has recently undertaken a considerable expansion of its stocked range of pot cores, RM cores, E cores, toroids and accessories. The full range is now covered in an 8-page, 4-colour catalogue. Not only will you find the full technical details in the catalogue, but also useful applications guide.

Unitel Ltd., Unitel House, Fishers Green Road, Stevenage, Herts SG1 2PT.

A new technical leaflet from A. F. Bulgin & Co. features the company's extensive range of robust Buccaneer connectors. Twelve full illustrated pages detail the various options which are available. Copies of the leaflet are available, on request, from:

A. F. Bulgin & Co. PLC, Bypass Road, Barking, Essex IG11 0AZ.
Tel: 01-594 5588.

The Godiva Award

Coventry ARS have recently issued this new award that is available to all licensed operators and short wave listeners.

Contacts/stations heard must include: G2ASF or G7ASF or any special event callsign operated by Coventry ARS or at least two club members. Also a sufficient number of Coventry stations (i.e. located within the city boundary) to achieve the requisite number of points.

Each CARS callsign worked/heard = 5 points
Each CARS member worked/heard = 2 points
Each Coventry station worked/heard = 1 point.
Stations located within the British Isles require 20 points, stations within Europe require 15 points and stations outside Europe require 10 points.

All contacts must be made after 1 January **1988**, with contacts via repeaters not acceptable. QSL cards are not required, but a data list (signed and verified by two other amateurs) is required. There is no time limit for the award.

Endorsements are available for: single band, single mode, using QRP (<5W). The award costs £1.50 (payable to Coventry ARS) and you should send your data list and payment to:
J. Ward G4HHT,
3 Shirley Road,
Coventry CV2 2EL.

Can You Help?

M. Gist collects old receivers and transmitters and is looking for information on two pieces: a Labgear LG300 and the Murphy BR1565 transmitter. If you have details of this equipment, please let him know:
M. Gist G4KFX,
Sunnyside Cottage,
Hungus,
Threemilestone,
Truro TR3 6EQ.

Counter/Timer

The 6010 is a fully programmable counter timer based on Global Specialties 6020 instrument. As it is without some of the 6020's advanced features and options, a price of £795 has been achieved.

The 6010 gives optimum resolution throughout a frequency range of 0.1Hz to 125MHz and utilises both conventional and reciprocal techniques. Using three independent channels and nine full-size l.e.d.s, thirteen different measuring functions can be provided including time interval averaging, rise/fall time and peak voltage. Featured in the counter/timer are internally pre-selected intervals or external intervals ranging from 100s to 1000s.

A trigger level function is included for eliminating false triggering on unknown signals and a non-volatile memory is capable of storing up to ten complete front panel set-ups.
Global Specialties,
2nd Floor,
2–10 St. Johns Street,
Bedford MK42 0DH.

BNOS

In the BNOS advert in January PW, the headings and lists of BNOS 2m Linears, Filters and Transverters were mixed up.

Apologies to our readers and to BNOS for any confusion caused. The correct list appears on page 65 of this issue.

New 3.4GHz Transverter System

LMW Electronics Ltd. have recently added a 3.4GHz (9cm) transceiver system kit to their range of kits for the u.h.f./s.h.f. enthusiast. It has a 70mW output, a 144MHz i.f. and costs £200.

Other kits they produce are a 1296MHz transverter kit, 500mW output, 144MHz i.f. at £133.40 and a 2320MHz transverter kit, 250mW output, 144MHz i.f. at £159.39. GaAs-f.e.t. pre-amplifiers for all bands and Meteosat are available at £43.75.

They have now opened a shop for kits and components, specialising in u.h.f./s.h.f. bits. The shop is easy to find as it's close to the M1, with shop hours being 10am to 4pm weekdays.

For fuller details of all the kits and products, contact the shop at:
LMW Electronics Ltd.,
12 Bideford Road,
Braunstone,
Leicester LE3 3AE.
Tel: 0533 630038.

WRITE ON ... *the page where you have your say*

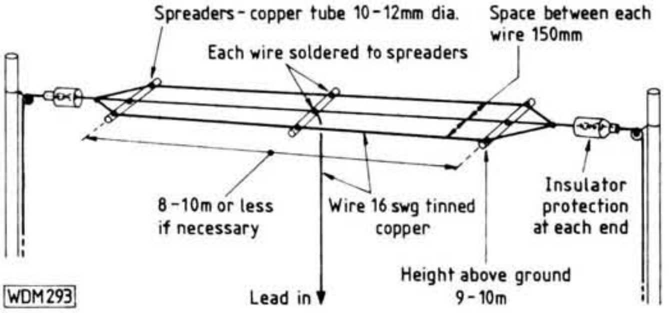
Antenna Electrometer

Having read the very informative article "Practical Antenna Electrometer" by Anthony Hopwood (*PW* Oct. 88), I decided to construct this instrument and at the same time erect a special antenna to operate with it. In my case the electrometer is coupled to a centre zero analogue meter, a positive/negative reading digital meter and a pen chart recorder with a sensitivity of 1mV or 10mV and an incorporated attenuator. It uses 10in wide graphed chart paper and the pen can be set at centre to read positive or negative voltages. Chart paper speeds from 5 seconds/in to 3 minutes/in are available.

The "electrometer" functions extremely well and although nothing dramatic has yet been observed, some interesting variations, mostly due to changing weather conditions, have been recorded. Another radio amateur, G3MYA, located a few miles from my own QTH has been carrying out similar observations using a very high impedance input d.c. meter employing f.e.t.s. We are able to compare observations.

However, aside from having very good insulation at the "ends" of the antenna, protected as recommended in the article, it has been found that the antenna itself is best made from bare copper wire or tinned copper wire. If the wire is enamelled or pvc-covered, then its static electricity pick-up efficiency is greatly reduced. Tests have been carried out by the writer with antennas of identical length, and which could be quickly hoisted to the same height above ground; one was made from tinned copper wire, the other from pvc-insulated wire.

Changing from one to the other (lowering one and hoisting the other) during periods when the static voltage reading has remained virtually constant, showed the tinned copper wire antenna to have a pick-up efficiency far, far greater than the one made from covered wire.



The antenna now being used and shown in the diagram, is one way of ensuring a large "pick-up" area in a small space, located as far as possible from other (h.f. and v.h.f.) antennas. Guy lines for the supporting masts and hoisting halyards are polypropylene rope.

F.C. Judd G2BCX
Cantley, Norfolk.

Some authorities recommend the use of insulated wire in preference to bare wire for receiving antennas in order to reduce the effects of "rain static". This is the hissing noise produced by the charged raindrops which can drown out signals in the low and medium frequency bands.

Some years ago when I was at sea, I did some tests of my own which proved that this idea does work. It was also effective against similar static noise problems experienced in sandstorms in the Suez Canal and Red Sea area.

—Ed.

OUR SERVICES

QUERIES

We will always try to help readers having difficulties with a *Practical Wireless* project, but please observe the following simple rules:

1. We cannot give advice on modifications to our designs, nor on commercial radio, TV or electronic equipment.
2. We cannot deal with technical queries over the telephone.
3. All letters asking for advice **must** be accompanied by a stamped, self-addressed envelope (or envelope plus International Reply Coupons for overseas readers).
4. Write to the **Editor, "Practical Wireless", Enefco House, The Quay, Poole, Dorset BH15 1PP,** giving a clear description of your problem.
5. Only one project per letter, please.

BACK NUMBERS AND BINDERS

Limited stocks of many issues of *PW* for the past 18 years (plus a few from earlier years) are available at £1.40 each, including post and packing to addresses at home and overseas (by surface mail).

Binders, each taking one volume of *PW* are available Price £3.50 plus £1 post and packing for one binder, £2 post and packing for two or more, UK or overseas. Prices include VAT where appropriate.

CONSTRUCTION RATING

Each constructional project is given a rating, to guide readers as to its complexity:

Beginner
A project that can be tackled by a beginner who is able to identify components and handle a soldering iron fairly competently.

Intermediate
A fair degree of experience in building electronic or radio projects is assumed, but only basic test equipment is needed to complete any tests and adjustments.

Advanced
A project likely to appeal to an experienced constructor, and often requiring access to workshop facilities and test equipment for construction, testing and alignment. Definitely not recommended for a beginner to tackle on his own.

COMPONENTS, KITS AND PCBS

Components for our projects are usually available from advertisers. For more difficult items, a source will be suggested in the article. **Kits** for our more recent projects are available from **CPL Electronics**, and from **FJP Kits** (see advertisements).The **printed circuit boards** are available from our **PCB SERVICE** (see page 47 of this issue).

CLUB NEWS

If you want news of radio club activities, please send a stamped, self-addressed envelope to **Club News, "Practical Wireless", Enefco House, The Quay, Poole, Dorset BH15 1PP,** stating the county or counties you're interested in.

ORDERING

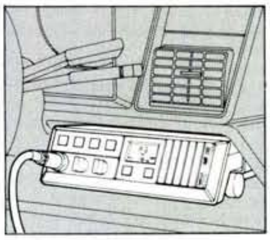
Orders for p.c.b.s, back numbers and binders, *PW* computer program cassettes and items from our Book Service, should be sent to **PW Publishing Ltd., FREEPOST, Post Sales Department, Enefco House, The Quay, Poole, Dorset BH15 1PP,** with details of your credit card or a cheque or postal order payable to PW Publishing Ltd. Cheques with overseas orders **must** be drawn on a London Clearing Bank.

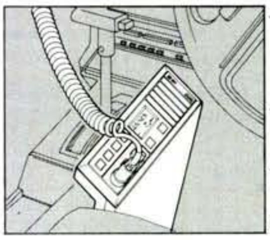
Credit card orders (Access, Mastercard, Eurocard or Visa) are also welcome by telephone to Poole (0202) 678558. An answering machine will accept your order out of office hours.

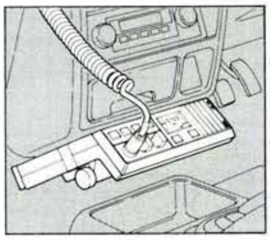
SUBSCRIPTIONS

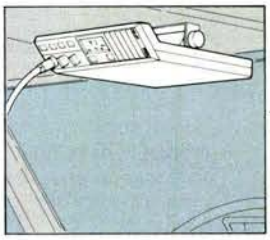
Subscriptions are available at £15.50 per annum to UK addresses, £18 to Europe, and £19 elsewhere (by Accelerated Surface Post). For further details, see the announcement on page 30 of this issue.

The new AMR1000/S
It checks out from every angle


Under dash mounted (side)


Central console mounted


Under dash (central)


Roof mounted

Whichever way you look at it, the Navico AMR1000/S sets new standards in 2m mobile transceivers.

The angled, reversible control panel, together with a range of inexpensive optional mounting brackets enables installation in any vehicle, whether under or on top of the dash, either side of a central console or even from the roof.

This means the display will always face you giving total access to the controls which are spaced to allow simple, safe, mobile operation. The front mounted loudspeaker will also face you, projecting the sound toward you and not at your feet or into the dashboard.

Combine this with the most sensitive and selective receiver, an audio response tailored for today's busy band and the unique, fully automatic repeater/simplex operating facilities and you have a truly remarkable mobile radio.

There is also a choice of models to suit your exact needs. In the words of Chris Lorek of HRT about the Navico AMR1000/S "Not only does it out-perform its competition on technical grounds but it offers many very useful operating features not found on other rigs, and sells at what appears to be a very competitive price".

Check it out for yourself, prices start at just £247.25 (incl. VAT). For more details and to arrange a personal demonstration clip the coupon today.

PRIORITY INFORMATION REQUEST
For full details send to:
Navico, Star Lane, Margate, Kent CT9 4NP, United Kingdom. Telephone: 0843 290007.

Name ______________________________

Address ______________________________

____

______________ Tel ______________

PW1-89

The professionals in amateur radio

NAVICO®

Crops and Coils Part 6

Super-regenerative and Superheterodyne

Before the war, the ultra high frequencies were largely an unknown part of the radio spectrum. Amateurs used to world wide communication on lower frequencies were not enamoured with the line-of-sight range of u.h.f. transmissions. It was also extremely difficult to construct stable oscillators because the crystals available at that time were unsuitable for generating such high harmonics, says George Pickworth.

Experimental transmitters for use above 100MHz were usually self excited and used resonant lines instead of tuning coils but as these were invariably made of copper, temperature variations caused significant changes to the resonant frequency making communication difficult. So, this band was largely neglected.

Nonetheless, the super-regenerative receiver, invented by Major Armstrong in the early 1920s had opened up the ultra high frequencies to those experimenters and amateurs interested in exploring and utilising this hitherto virtually unused part of the radio frequency spectrum. It was the most sensitive receiver available at that time and having broad band characteristics was ideal for use with transmitters where the frequency was somewhat unstable. In fact the American "National 1-10" super-regenerative receiver was the only commercial ultra short wave receiver manufacturered in quantity before the war. It used plug-in coils and tuned from 28–300MHz.

The remarkable success of super-regenerative receivers was based on positive feed-back which dramatically raised the Q of tuning coils to such a level that early types of battery valves and small conventional tuning systems would work at frequencies as high as 100MHz. Many experimenters were able to tune to much higher frequencies by removing the bases from physically small triodes and soldering the leads directly into the circuit. High Q resonant lines, instead of tuning coils, further enhanced performance.

With regard to transmitters, resonant lines made it possible to generate appreciable r.f. with self excited designs using normal output valves. The major problem, however, was to determine wavelengths with sufficient accuracy to make communication possible, and the only practical method was to measure the distance between nodes along a pair of parallel wires.

Quenching

The super-regenerative receiver differs from a normal regenerative receiver in that feed-back is increased to the point where the detector oscillates continuously. To resolve signals, the valve is quenched, which means that it is switched on and off at a supersonic frequency. The self-quenching design was the most popular as it only required a capacitor and resistor arrangement to deliver h.t. to the detector valve in supersonic pulses. The alternative design was to use a separate oscillator using a quench coil but this was more complicated and gave no improvement.

However, without an r.f. stage, super-regenerative receivers radiate considerable energy and while this was not serious before the war when I first made a breadboard "super-regenerator" the situation had changed rapidly and it was now most important that radiation be limited to an extremely low level. Ordinary pentodes were useless in r.f. stages but valves designed specially for very high frequencies were now being made and I was fortunate enough to acquire a pair of "acorn" valves. Unlike ordinary valves, their pins radiated from the side and fitted into a special circular holder.

As I wanted to explore the very highest frequencies I considered using a concentric resonant line instead of conventional tuning coils but as the slider would have to be in the shape of a washer I opted for a pair of parallel copper tubes 15mm diameter and 500mm long. Coarse tuning was by a slider which reduced their electrical length while a small variable capacitor connected across the opposite ends provided the fine tuning.

The actual wavelengths were determined by measuring the distance between nodes along a pair of wires stretched over a long board. In its simplest form, one end of the pair was loosely connected to the detector and a shorting wire was moved along until a point was found where the loading at resonance stopped the detector oscillating. A better method was to use a separate signal generator.

I accept that this might have caused a minute amount of radiation, but measurements were a very important part of being a serious experimenter.

The actual coverage was found to extend from about 600mm to 1600mm using the tuning capacitor alone and to 5m with additional padding capacitors clamped across the ends of the tubes. By replacing the shorting bar with a centre tapped loading coil, the range could be extended to 28MHz.

Coaxial cable was almost unknown to experimenters before the war. They normally used open feed lines, but these were unsuitable for very high frequencies. So, a steel tape measure, attached directly to the panel, was used as an antenna. By inclining the tape at a small angle so that it was self-supporting, it was extended to the optimum length.

I found this receiver in an attic many years later and motivated by nostalgia got it working again. Somewhat surprised, I found that it was not only very sensitive but capable of resolving f.m. transmissions which were only a

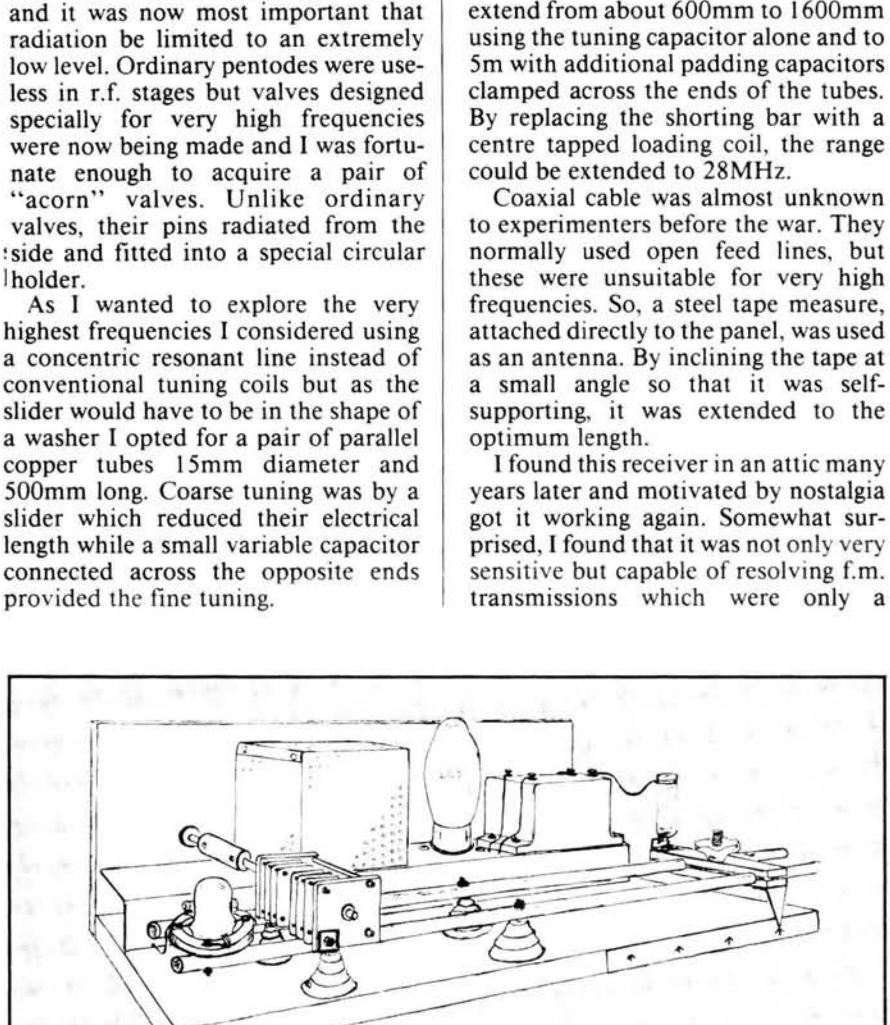


Fig. 6.1: The Super-regenerative receiver

dream when this receiver was made. Even more significant, radiation from the detector was extremely low, no doubt the result of good screening, and I could have used it without trepidation, but I had no way of knowing this. Notwithstanding the resonant lines making it cumbersome, it was ideal for scanning the u.h.f. bands before the arrival of sophisticated scanning receivers.

Supersonic Heterodynes

Many early experimenters appreciated the advantages of heterodyne direct conversion a.m. receivers but at that time it was extremely difficult though not impossible to keep the local oscillator in phase with the transmitter.

Although our simple receivers could be made to work they produced the most alarming shrieks, and possibly interference, during tuning so that they were not a practical method of reception. So direct conversion was virtually abandoned as a viable means of reception until it was re-discovered in more recent years.

Meanwhile, experiments with a supersonic beat note were being made. This was amplified and rectified to produce an audio signal but the design suffered greatly from images of other stations and lacked the elegance of direct conversion. Moreover, they were no better than straight t.r.f. receivers which did not have these vices.

Nonetheless it was soon discovered that by making the beat frequency high enough for tuned stages to be practical, originally about 50kHz, great amplification and selectivity was possible. Unfortunately, receivers using these low i.f.s also suffered severely from images, so a frequency of around 450kHz was adopted. This gave the best compromise when gain, selectivity and image rejection was taken into account. The word "sonic" was dropped and the term superheterodyne coined.

Before highly selective i.f. devices were available, experimenters and amateurs often made dual conversion receivers using a fairly high first i.f. stage to minimise images, followed by a very low i.f. stage to take advantage of their high selectivity. However, unless extremely well screened, which was not necessary in domestic receivers, i.f. stages radiate considerable power and to avoid interference with other stations were allocated their own frequency band.

Radiation was often so strong that it was used for detecting unlicensed receivers by using a directional antenna. Receivers used surreptitiously had well screened i.f. systems.

Last Year at School

Most of the Christmas holidays were spent alone ploughing windswept fields with a magnificent Cast tractor and I was now in my final year at school. As it would almost certainly be my last year at home I planned to devote the Easter holidays to building a high performance communications type superheterodyne.

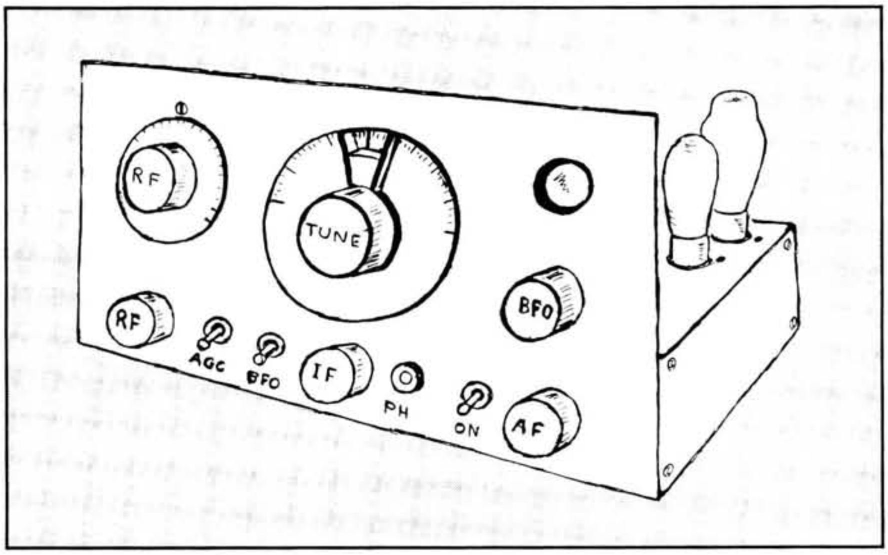


Fig. 6.2: The Superheterodyne receiver

Bandswitching was generally too complex for amateur-made receivers. Moreover, the switches and leads introduced losses that were avoided with plug-in coils. However, the problem with plug-in coils was to maintain correct alignment (depending upon the i.f. frequency chosen) of the oscillator and r.f. stages over the whole of the frequency range covered by each coil.

A popular design had separate tuning controls for the oscillator and the r.f. stages. These were used as bandset controls in conjunction with ganged bandspread capacitors. It was developed primarily for amateurs where the bandspread was just sufficient to cover individual bands, thus any error in the alignment of the r.f. and mixer stages over this very narrow frequency range was insignificant.

A different approach was to use crystal controlled oscillators in conjunction with tuned i.f. stages. This, too, was ideally suited to amateur bands as the crystals gave precise frequency markers and generated very pure waveforms and I doubt if this technique can be improved upon for covering limited sectors of the band. However, it was unsuitable for general short wave coverage. A more suitable design used the oscillator as the main tuning control, while the ganged r.f. and mixer stage was tuned independently, much the same as with the r.f. stage on my first regenerative receiver. I opted for this design.

Tuning

The main tuning control was an Eddystone 0.00016μF tuning capacitor mated to a Premier Radio 100:1 slow motion drive. I did not wish to dismantle the regenerative receiver and was unable to buy another Raymart dial. The r.f. stage used a pair of ganged Raymart capacitors together with four sets of Raymart tuning coils. The i.f. transformers were also Eddystone. They had air-spaced trimmers and were of extremely high quality.

Fourteen Valves

The two tuned r.f. stages, separate oscillator and mixer valves, three i.f. stages, detector, a.g.c., b.f.o. low power a.f. stage for headphones and high power output stage, accounted for 12 valves. Taking the "magic eye" tuning indicator and rectifier valve into account, it made a total of 14 valves.

Notwithstanding the rather inelegant tuning arrangement, performance was almost certainly equal to any commercial receiver made at that time.

It reminded me of that magnificent Cast tractor—massive, powerful, reliable and did everything it was designed to do without question or complaint. On the other hand, the regenerative receiver was more like a spirited horse we used to have—she had a mind of her own and needed to be coaxed and understood so that a relationship could be established, then she would give her very best. That receiver remained my favourite.

The superheterodyne was my last major construction project but unfortunately I had little time to use it for it was now a critical period before my final exams and I had to devote my time to studying. It was too big to take with me when I left home so building this magnificent receiver had really been an end in itself.

Having said that, I had been lucky to have lived in an environment that allowed me to develop my interest in radio and science in general, and even more fortunate to be encouraged by farm workers and many other craftsmen to use tools, and develop practical skills. These skills not only made it possible for me to construct these receivers but were of immense value during my career as an agricultural adviser in many parts of the world. **PW**

Chicken-wire Discone

The discone wide-band antenna has been around for many years, but unfortunately it's been portrayed too often as a complex mechanical design. This is rather sad as the antenna is a good performer and has lots of latitude for mechanical variation, as Tony Gilbey G4YTG shows in the following article.

An experimenter friend of the author wrote to him recently asking if he had a discone design which could be built for installation in the loft.

Eventually a copy of an article that appeared in an American magazine was dispatched, showing a skeleton type discone using aluminium rods to form the antenna elements. The author pointed out that if the antenna was to be installed in the loft, the design need not be so mechanically rigid, this is when the G4YTG cheap chicken-wire discone was born.

The antenna's performance so suprised the author that he felt he had to pass on the design to his fellow amateurs. The design is ideal for those people that prefer to put their antennas in the loft and who also have an aversion to spending lots of money on antennas.

All that is required to build the project is approximately £6 for materials, a large soldering iron, pliers and a pair of tin snips.

The author's loft mounted, chicken-wire discone provides wide-band omnidirectional coverage of frequencies from 75MHz to 800MHz, as well as showing a v.s.w.r. of better than 1.2:1 when used in conjunction with 144MHz and 430MHz transmitters.

Construction

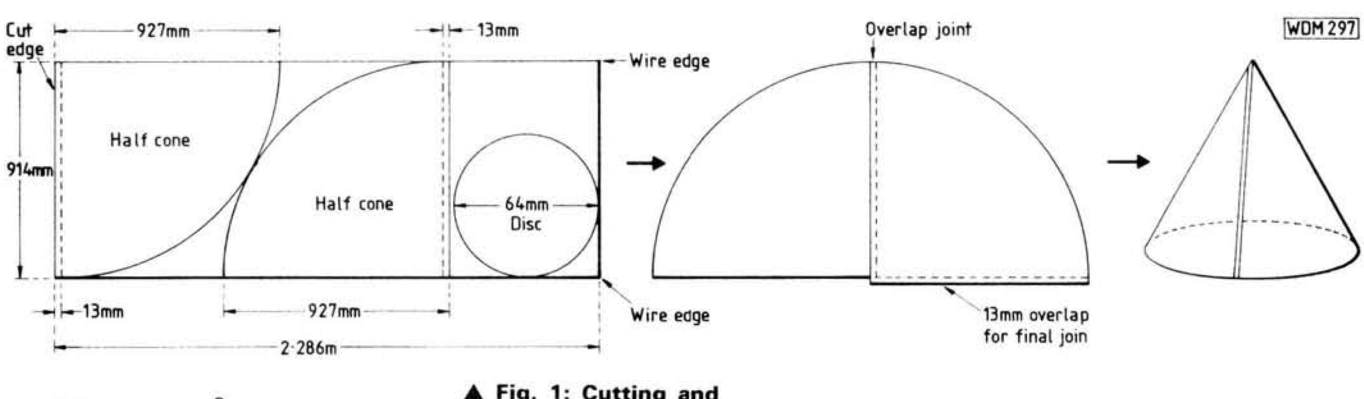
First unroll the wire mesh and cut out the shapes to the dimensions given in Fig. 1. Next lay the "cut edge" of one of the large pieces over the wire edge of the other to make a semicircle shape, and "blob-solder" together at every other loop crossing. Then form the semicircle of wire mesh up into a cone shape and solder down the other overlapped joint in a similar way.

Cut five 150mm lengths of 16 s.w.g. tinned copper wire, and solder four of them, one to each corner of a four-hole fixing SO239 socket, as shown in Fig. 2. Then bend the four wires out to form a four-sided 60° skeleton pyramid and solder the fifth piece of wire on to the centre connection of the socket. Next take the pyramid-shaped socket assembly and insert it into the apex of the wire mesh cone, then solder the wire mesh to the four lengths of tinned copper wire. Finally form the open ends of the wire mesh neatly around the back of the socket, making sure that none of them shorts to the centre conductor.

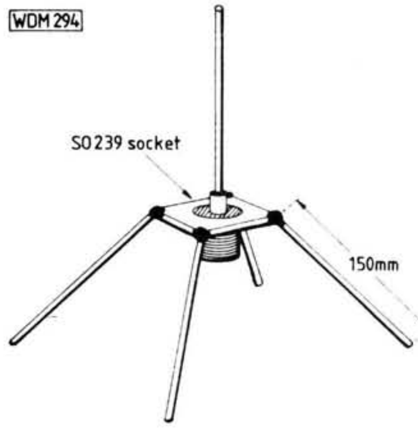
Having completed the cone assembly, now construct the disc. The disc consists of a 250mm diameter circle of tin plated steel, the top of an old biscuit tin, soldered to the underside of a 642mm dia. circle of wire mesh. The wire mesh need only be soldered around the edge of the tin plated steel disc. Next drill a 4mm dia hole in the centre of the disc assembly and then solder over the hole the brass insert from a 5 amp "chocblock" terminal strip (Fig. 3). This will provide fixing and distance adjustment between the disc and cone assemblies.

Assembly and Installation

Place the centre of the completed disc over the vertical wire of the cone assembly, leaving a 12mm gap between the disc and cone. Tighten up the two screws in the connector insert and there you have it, a completed chicken-wire discone.



▲ Fig. 1: Cutting and assembling the wire mesh



◀ Fig. 2: Connection pattern for SO239 socket

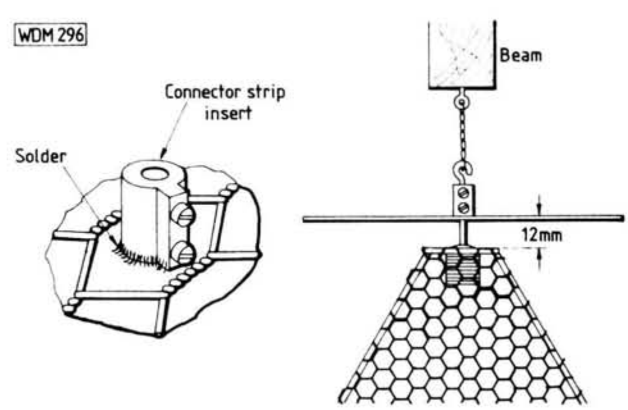


Fig. 3: Final assembly of discone antenna showing connector block installation ▶

Materials

2.3m of small mesh chicken wire; approximately 250mm diameter tin plated steel; 1 4-hole fixing SO239 u.h.f. socket (silver plated brass type); 750mm of 16 s.w.g. tinned copper wire; heavy gauge cored solder; 1 block of 5 amp "chocblock" terminal strip.

The shape of the discone lends itself to being installed in the apex of a roof, this is in fact where the author has installed his. A small hook was screwed into the roof's ridge timber and the centre vertical wire of the antenna was formed into a small loop, enabling the antenna to be suspended by a length of nylon cord (Fig. 4). The length of the cord should be adjusted so that the disc section of the antenna just clears the rafters. The antenna will work just resting on the roof joists, however if it is to be used for both transmit and receive it should be kept well away from mains wiring.

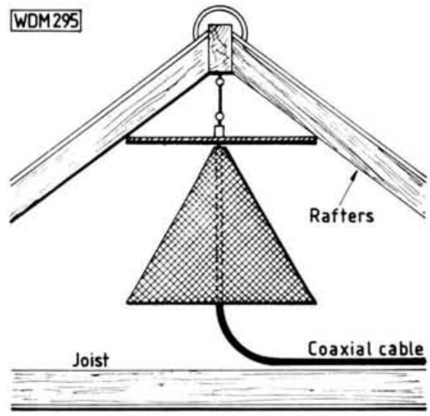


Fig. 4: Typical roof installation of antenna

Because the antenna covers frequencies well into the u.h.f. region it should be fed with good-quality coaxial cable, UR67 or better.

There is one more advantage to be emphasised about this design; if your loft hatch is too small to take the ready-built antenna, it can at least be folded up to fit. **PW**

Feature

Practically Yours

By Glen Ross G8MWR

This month we are going to look at a useful technique which is, to say the least, a little off the beaten track. The requirement to bypass r.f. from various points in a circuit is fairly common. As long as the operating frequencies are fairly low (h.f.), the normal method of using a disc ceramic capacitor usually does the trick.

On v.h.f. bands the problem becomes more severe, especially when dealing with transistorised equipment. The difficulty here is that these circuits are inherently of very low impedance. Whereas a residual impedance in the decoupling circuit of a few ohms may work well in high impedance valve circuitry, it will certainly cause problems in solid state equipment.

Inductance

Most of the problems we run into are actually caused by the inductance of the leads of the capacitor. The nice point is that if we take this one step further we can actually use this inductance in combination with the capacitance to form a series tuned circuit. You may remember that at resonance a series tuned circuit has virtually zero impedance, except for the small resistive element involved. Using short lead lengths, this effect can be ignored.

Limitations

There is a price to pay when using this technique. If you try to use it on the h.f. bands the value of capacitance and the lead lengths involved are too great to be practical. If you try and use it much above 150MHz then the opposite applies. This leaves us, then, with a useful range from about 50 to 200MHz and in this area the technique is supreme.

Bandwidth

The frequency of resonance will depend somewhat on how the leads are placed with reference to other components, etc. Due to the fact that series resonance of this type is fairly broadband, it is unlikely that special tuning will be required. One thing to bear in mind is that to reduce unwanted coupling effects it is always better to use a large value capacitor with short lead lengths.

Table 1

	Total lead length		
MHz	13mm	25mm	50mm
50	800pF	400pF	200pF
70	400pF	200pF	100pF
100	200pF	100pF	50pF
144	100pF	50pF	25pF

Where an exact value is not available, try the nearest preferred value. The above values only hold true for "dog bone" type tubular ceramics and 7mm dia disc ceramics.

Comparison

To demonstrate how well the system can work, let us take a common example of a 1nF capacitor with leads 6.5mm long. This would have an impedance on 144MHz of about 10 ohms, which is hardly a short circuit. Using a 25pF capacitor with leads 25mm long would result in an impedance of virtually zero ohms.

The lead lengths and capacitance values given in Table 1 are for use with popular v.h.f. frequency bands. The dimensions shown are the total lead length and may be subdivided as is convenient. For example, if you need a series tuned circuit resonant at 144MHz, then a 50pF capacitor with a total lead length of 25mm (1in) will be needed. For ease of physical positioning, one lead of the capacitor may need to be 20mm long and the other 5mm. This is perfectly acceptable, as the total lead length is still 25mm.

If you're in some doubt as to the resonant point of a capacitor used in this manner, first solder the capacitor in position, then with no power applied to the equipment, place a heavy short across the points where the capacitor is connected. Next, take your g.d.o. and place the instrument's coil near the capacitor; by sweeping the oscillator a broad dip should be noted at the required frequency. **PW**

Reading & Understanding Circuit Diagrams

(with a bit of theory thrown in)

In Part 11 of this series, R.F. Fautley G3ASG takes a look at r.f. power amplifiers, starting with Class A operation.

A drive unit for the r.f. power amplifier will be ignored at this time so as to keep the description to the minimum necessary for the understanding of the simplest (and cheapest!) Morse transmitter.

So, we will go straight into the bit providing the power which, we hope, will leave the antenna and shower the world with dots and dashes. (Don't forget there's the Radio Amateurs' Examination first before you can go on the air at all, not to mention a Morse test before you can operate on amateur bands below 30MHz.)

This is where the amateur is best advised to leave semiconductors alone unless interested in QRP operation (low power), say up to about ten watts. This 10W is quite an arbitrary figure and it is very much open to argument at which power level transistors should be dropped in favour of valves. That's if they should be dropped at all. It is, however, generally agreed that valve amplifiers are electrically more rugged than semiconductor types. This means that valves stand more in the way of output circuit mis-tuning and mis-matching (and general bad treatment) than is the case with transistors. This was one reason I decided to describe valve amplifiers in this series. Another is that it is much easier for the beginner to build an amplifier which is likely to work right from the start. Perhaps not perfectly, but it will enable him or her to alter circuit values and generally experiment without an early demise of the main component, the valve.

With semiconductors, although the voltages used are very much lower and therefore safer for the handler, the devices will not put up with excessive voltage or current without the likelihood of disaster, mostly evident as a dead transistor. This is my opinion only and no doubt many arguments could be made in favour of the semiconductor at high power levels. Indeed, most modern h.f. transceivers use transistors for their 100W power amplifier stages.

Let's get back to the simple valve r.f. power amplifier which is illustrated in Fig. 11.1. This shows two new circuit symbols, M1 for a meter and V1 for a valve, in this case a tetrode.

The term "tetrode" simply indicates that the valve has four electrodes, whereas a "triode" valve has three. The four electrodes of the tetrode are:
(i) Control Grid—usually just called grid
(ii) Cathode
(iii) Anode — in our circuit it's the valve type with the anode brought out to a cap at the top of the valve, rather than to one of its base pins
(iv) Screen—or Screen Grid

But what about the other bit at the bottom of the valve symbol designated "heater"? Well, this bit is often ignored as its only function is to heat the metal cathode, which gives off electrons when heated. The heating is provided by passing a current through the heater. Although the heater is quite thin and it glows visibly, it doesn't actually burn itself out (unless the voltage applied to it is much higher than it's supposed to be) because it's mounted within an evacuated glass bulb, called an envelope.

So, all valves have heaters and they have to be provided with their own power supply which is usually quite a low voltage, 6.3V being a popular value. Alternating current is usually used for this supply as it is easily available as a winding on the power supply mains transformer.

Look at the circuit diagram, Fig. 11.1. Output from the Morse generator is fed to the amplifier input via the low impedance "link" (or coupling) winding, L1, to the tuned circuit, L2/C2, and so to the grid of the valve V1. As both grid and anode circuits are tuned to the same frequency, it is necessary to ensure that there is **minimum** possible coupling between them or our amplifier could turn into a power **oscillator!** This is rarely indicated on a circuit diagram and instability could result if the physical layout of the components is not considered. One method of ensuring good isolation between input and output is shown in Fig. 11.2. A metal sheet, perpendicular to the chassis, is fitted with the valve mounted horizontally through a hole cut into it. With the grid circuit on one side and the anode circuit on the other, the metal sheet acts as an "electrostatic" screen. This prevents electrostatic fields (fields due to electric potential) on one side of the screen interacting with those on the other side. Although the screening is not perfect, the degree

Fig. 11.1

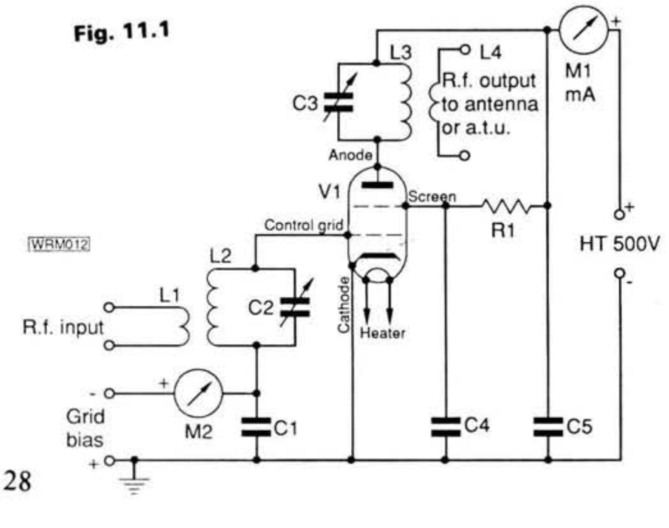
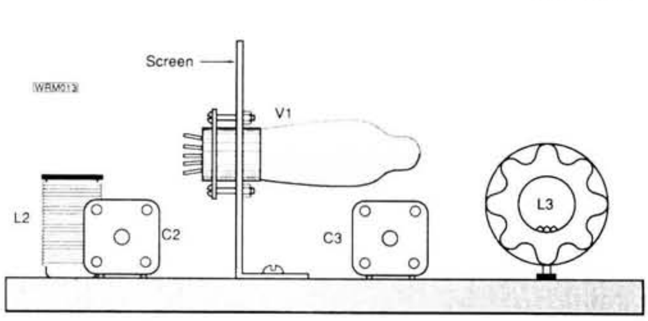


Fig. 11.2



of attenuation introduced is usually sufficient for stable operation.

That's not all. Another type of possible unwanted coupling is "magnetic" or inductive. The best way to prevent interaction between the magnetic fields surrounding inductors (in our case between L2 and L3) is to mount them as far apart as physically possible and fit them with their windings at right angles to each other as in the layout of Fig. 11.2.

Another well-used component layout is to mount the valve vertically in the usual way on the chassis, the grid tuned circuit being below the chassis and the anode circuit above. The chassis then acts as a screen.

Just a note about the other few components. Screen current (d.c.) flowing through R1 drops the supply voltage (500V) to the maker's recommended voltage for the screen grid and r.f. decoupling is provided by C1, C4 and C5.

Now for a bit more theory, very necessary for understanding the operation of an r.f. power stage. There are several different types, called **classes,** of amplifier which have almost identical circuits. In fact, the major differences between amplifiers operating in different classes are just component and voltage values.

The **class** in which an amplifier falls depends on how **much** of one complete input cycle produced anode current.

Just try and get that in your mind and what follows will begin to make sense. So, here we go with the main power amplifier classes:

Class A—anode current flows during the whole of the input cycle (360°).

Class AB—anode current flows during about $\frac{2}{3}$ of the input cycle (240°).

Class B—anode current flows during about $\frac{1}{2}$ of the input cycle (180°).

Class C—anode current flows during about $\frac{1}{3}$ of the input cycle (120°).

Class A

What is meant by anode current flows throughout the whole of the input cycle? It means that the input (or grid) voltage is varied within certain limits to **ensure** that anode current, which though varying in amplitude, flows the whole time. Why should this be?

Have a look at Fig. 11.3, looks a bit technical doesn't it? Well, it is a little, but let's take it bit by bit. First look at the two axes on the graph. The horizontal axis represents the voltage at the grid of the valve relative to its cathode, V_G, it may be any value from negative through zero to positive. The vertical axis represents anode current, I_A, increasing from zero.

Now look at the curve. It shows the value of anode current that would be produced by any particular grid voltage if the anode voltage, V_A, remained at a fixed value, say 500V. Point A shows that if the grid voltage was set at −10V then 50mA of anode current would flow; Point B that −15V would produce 10mA and Point C, −5V for 90mA. You can check this by following the vertical and horizontal lines from the A, B and C points on the curve to the axes.

What does all this tell us? It shows that if we were to adjust the d.c. voltage between grid and cathode so that the grid was −10V relative to the cathode and the d.c. anode voltage was +500V to the cathode, then the anode current would be 50mA. This would be the "quiescent" or "zero-signal" current, i.e. the anode current flowing in the absence of any input signal at the grid. This value of d.c. grid voltage is referred to as the "grid bias".

Now if a sinewave signal of 5V peak (about 3.54V r.m.s.) were to be applied to the grid, this varying signal voltage would be **added** to the existing grid bias of −10V d.c., thus swinging the grid potential above and below the grid bias point, as in the table shown here as well as Fig. 11.4.

Grid Bias	Input Signal	Effective Grid Voltage	Graph Point
−10V	0V	−10 + 0 = −10V	G1
−10V	+5V	−10 + 5 = −5V	G2
−10V	0V	−10 + 0 = −10V	G3
−10V	−5V	−10 − 5 = −15V	G4
−10V	0V	−10 + 0 = −10V	G5

and so on.

Fig. 11.3

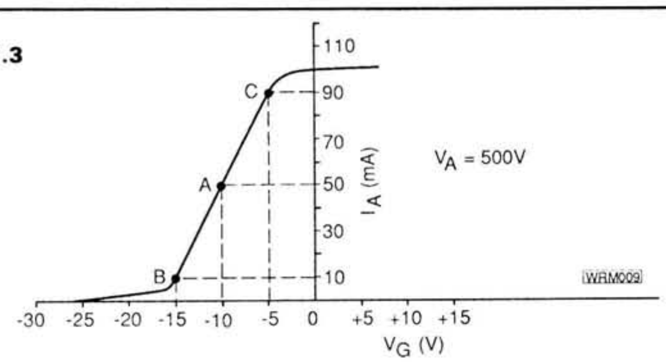
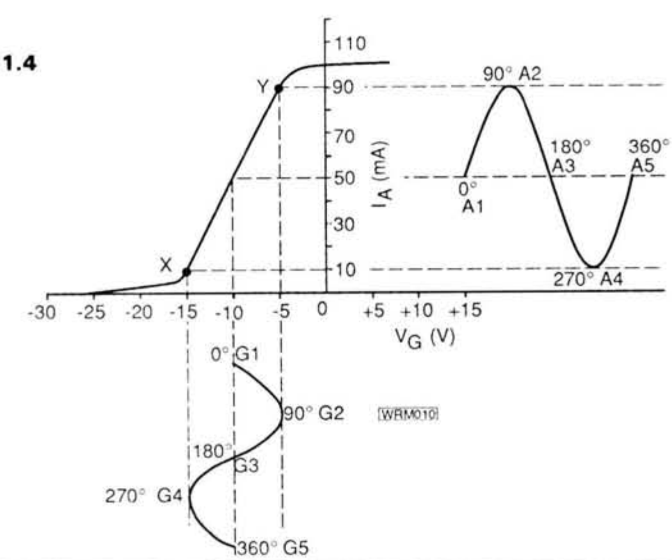


Fig. 11.4



You can see that Fig. 11.4 is just Fig. 11.3 with the addition of the **input signals and the resulting anode current.** The latter can be seen to be a complete sinewave, exactly the same **shape** as the grid voltage waveform. Check that this is so by comparing the following tabulated points on Fig. 11.4.

Point on V_G Waveform	Point on I_A Waveform
G1	A1
G2	A2
G3	A3
G4	A4
G5	A5

This will only be true if the part of the curve in Fig. 11.4 between X and Y is a **straight line,** that is the relationship between V_G and I_A is a **linear function.** For the mathematically minded, the straight line part of the valve curve is a curve of the form $y = mx + c$, or a linear equation. If this were not so, the **output** waveform would be different, i.e. distorted, as in Fig. 11.5 which represents one form of a non-linear characteristic. Note that the anode current waveform is certainly not the same shape as the sinewave at the grid.

This distortion will consist of harmonics of the frequency of the grid input signal and for an r.f. power amplifier could produce radiated signals capable of causing interference to other services.

For correct Class A operation the **mean** value of anode current—the current read by a meter in the anode d.c. supply lead (M1 in Fig. 11.1)—does not change, whether a signal is present at the grid or not. Why doesn't it change? As the anode current swings from a minimum of 10mA to a maximum of 90mA (see Fig. 11.4) the average anode current is:

$$\frac{10+90}{2} = \frac{100}{2} = 50\text{mA}$$

which is the same as the quiescent value! So, whether a signal is present or not, the anode current is constant.

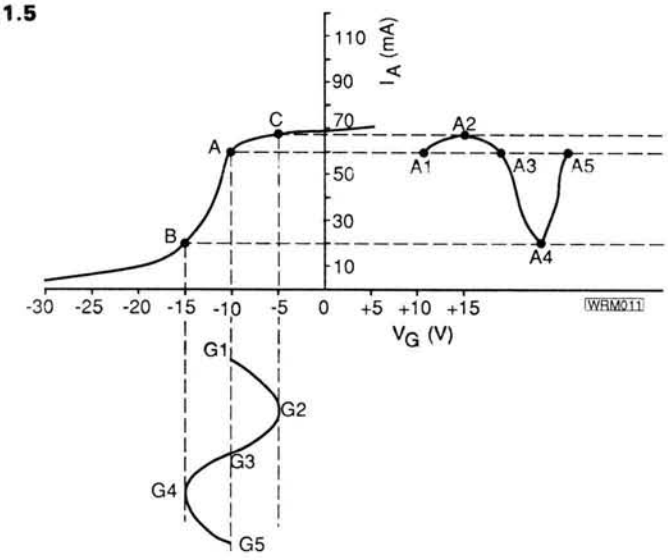
As its theoretical efficiency does not exceed 50 per cent, it is rarely used as a power amplifier at radio frequencies, but is nearly always used for hi-fi valved a.f. amplifiers. Theoretical efficiency? Yet another term to explain.

An r.f. amplifier's efficiency is a measure of its ability **to convert d.c. power into r.f. power.** For example, if a valve amplifier has a d.c. supply of 500V and the anode current meter indicates 50mA, the anode **input power** will be:

$$V_A \times I_A = P_A$$

$$500 \times \frac{50}{1000} = \frac{500 \times 50}{1000} = 25\text{W}$$

Fig. 11.5



If the r.f. output power from the amplifier, measured on an r.f. power meter is 10W, then the efficiency of the amplifier (η) is:

$$\eta\% = \frac{\text{Pout}}{\text{Pin}} \times 100$$

$$= \frac{P_{RF}}{P_{DC}} \times 100$$

$$= \frac{10 \times 100}{25} = 40\%$$

With an input power of 25W and an output of only 10W—where does the other 15W go? The answer is that it stays inside the valve heating up the anode and is called the "anode dissipation". For safe operation, the valve in our example should have an anode dissipation rating of at least 15W.

Information supplied by valve manufacturers always includes this important rating which should never be exceeded.

In Part 12 we will look at Class B, AB and C operation.

PW REVIEW

The Standard C5200ED VHF/UHF Transceiver

If you're looking for the latest in dual band v.h.f./u.h.f. rigs, the Standard C5200ED reviewed here by Mike Richards, could be just what you've been waiting for.

The C5200ED from Standard is one of the latest in the continuing development of dual band f.m. rigs. The C5200ED is actually called a twin bander which is significant as it really is virtually two separate rigs in one case, the only shared component sections are the loudspeaker, microphone, logic and power supply. Although intended as a mobile rig it can be quickly detached from its mobile mount for use as a base station.

The Manual

With any complicated equipment a good manual is essential in order to obtain success quickly. The C5200ED manual comprises an A4 book containing some 41 pages of reasonable English, with a few notable exceptions, i.e. "Is not the battery consumed?"

The first section deals with the installation of the rig and covers both mobile and base station use. The text is very well supported with plenty of diagrams and they have even managed a touch of humour which makes a pleasant change. This is followed by sections covering the controls and operation of the rig and again very good use is made of diagrams. The next section is also well presented and gives a selection of operating tips including how to use repeaters.

Standard have also not forgotten to include a help section for when the rig appears to be faulty, but you are not sure if it might be something you have done. However this section has come out worst of all in the translation and may cause more confusion than it clears!

As with most Japanese rigs there is a full circuit and block diagram supplied on fold-out sheets. The print quality of these diagrams was very good and they were perfectly readable without a magnifying glass! There were even a few test voltages thrown in for good measure.

Installation

As the C5200ED is primarily intended as a mobile rig, the mounting brackets and associated hardware are very important. I'm sure that most people purchasing a sophisticated transceiver like the C5200ED would like to be able to use it both as a base station and a mobile rig. In order to achieve this, a quick release mounting bracket is required. Fortunately Standard have put quite a bit of thought into their mobile mount and it performs very well.

The C5200ED is held in place by four rubber pads which grip the outer case of the rig. To release it you simply squeeze two clips, one on each side of the mount, the pressure is released and the rig can be removed. I thought that this was a very ingenious technique and meant that there was minimal risk of scratching the outer case of the rig, which often happens with mobile mounts. In addition to this mount, there was an extra bracket supplied which is used if you want to mount the rig at an angle to a panel, as opposed to parallel to it. All the mounting brackets were very substantial, being made of 1.5mm steel and painted the same colour as the rig. Just to complete the picture they even supplied a selection of nuts and bolts along with a hexagonal wrench to tighten them!

Once the rig has been transported into the shack the next problem is usually finding a way of propping it up so that you can see the display and hear some audio (the speaker's mounted on the bottom). Again Standard have done their homework and provided a very neat wire stand that clips into the sides of the C5200ED and leaves it at an ideal angle for shack use.

Having sorted out the mount, the next stage was to connect up. As the C5200ED has a fairly hefty current demand (10.5 amps), it's best to provide separate wiring from the rig directly to the battery. The supplied 2m of power cable proved to be ideal for this and was even fitted with a 12 amp fuse in each leg. To allow the rig to be easily removed from the car a pair of insulated "bullet" connectors were used at the radio end of the lead. Although these were perfectly adequate from a current handling point of view, I would have preferred to see a dedicated plug and socket which would have been the "icing on the cake".

The antenna connection was quite simple and comprised a pair of flying leads fitted with SO-239 (UHF) sockets marked 144MHz and 432MHz. I decided to use a diplexer in conjunction with the mag-mounted dual band collinear for my installation.

The only other connection you may need is for an external speaker. I must admit I didn't find a need for an external speaker, as the sound quality and volume from the internal unit was perfectly adequate. If you do feel the need for an external speaker though, there are two sockets on the rear panel which are wired to give some very clever combinations. If you plug an external speaker in the 144MHz socket then, as you would expect, 144MHz signals are heard via this speaker but 423MHz signals are still heard via the internal speaker. If, on the other hand, you plug the speaker in the 432MHz socket, the internal speaker is disabled and signals from both bands use the external speaker. Are you confused yet! Finally, if you connect two external speakers, one to the 144MHz socket and the other to the 432MHz socket, then only 144MHz signals are heard on the 144MHz speaker and vice versa! I think someone at Standard must have sat down for quite some time to work that lot out.

The CMP838 hand microphone was supplied with the rig and this was fitted with a novel bracket which could be reversed to give a large or small ring. The large ring was ideally dimensioned to fit over a cigar lighter which was really quite convenient. Personally though, I don't like using hand held mics in the car and would normally use a headset for hands free operation.

Controls and Display

The controls are generally well laid out though some are a bit fiddly for mobile use, but more of that later. As I mentioned at the start of the review the C5200ED is a true twin bander and as such there are separate volume and squelch controls for each band. These are the conventional concentric controls with volume and squelch for 144MHz on the left hand side of the front panel and 432MHz on the right. The main tuning control is a 20mm knob on the left of the front panel which has twenty steps to its movement. Mounted concentrically with the tuning knob is a switch which defines the effect of the tuning knob, i.e. normal tuning, fast tuning or memory tuning.

The remaining controls are all push buttons with all but two positioned directly underneath the main display. The two exceptions are the low power/audio mute buttons which are located next to the volume control for each band. To help minimise the number of controls, whilst maintaining the maximum number of features, many of the buttons have dual functions. The secondary function is obtained by pressing a button marked SP first.

One criticism I have concerns the CALL button which appears on the front panel and the microphone, unfortunately these two buttons have totally different effects. The CALL button on the front panel puts the rig into transmit and sends a 1750Hz repeater access tone, whilst the CALL button on the microphone recalls a memory! I think one of these needs to be renamed to overcome this unnecessary confusion.

The fluorescent display is quite rightly the centre piece of the C5200ED and contains a wealth of useful information. Being a twin bander the display is actually split in two with 144MHz information on the left and 432MHz on the right. The range of information shown on the display is identical for each band, which successfully overcomes the problems associated with dual band rigs using shared displays.

In addition to the frequency, each half of the display has its own S-meter along with a variety of letter indicators to show what options have been selected. One special indication is a red box marked MAIN, this shows which band is currently selected. This is necessary as despite the C5200ED's flexibility you can only transmit on one band at a time and the MAIN indicator shows what band will respond to the p.t.t. Although the display characters were quite small, the result was very clear. One problem that often shows up under mobile conditions is that if the display is bright enough to be read in sunlight it is too bright for night use. This is not a problem with the C5200ED as the display can easily be dimmed if required.

Circuit Description

The C5200ED is far too complicated for me to give a full description here but it is appropriate to outline the important points.

Starting with the u.h.f. section, the antenna is fed via a diode change-over switch and band-pass filter to the first of two r.f. amplifiers. The first r.f. amplifier uses a dual-gate m.o.s.f.e.t., and the second a junction f.e.t. After the r.f. amplifiers, the first mixer produces an i.f. of 21.8MHz, which is where the main filtering is carried out. After amplification, this is fed to a dedicated n.b.f.m. integrated circuit where the signal is amplified, filtered and demodulated. This dedicated i.c. (TK10420M) also controlled the squelch operation which, in the review model, was excellent. I'm sure you have noticed that most rigs give out a fairly loud burst of noise when the squelch closes at the end of a transmission. Not so with the C5200ED, the noise burst has been reduced to the point where it is hardly noticeable. The recovered audio is finally amplified by a μPC2002H, before passing to the speaker.

The transmit side starts, fairly obviously, with a microphone pre-amplifier, which is used to produce f.m. by modulating the main carrier v.c.o. This is somewhat unusual as the majority of modern rigs actually use phase modulation as opposed to the true f.m. used here. One other point is that when in transmit this v.c.o. generates the final carrier frequency, so there are no mixer stages in the transmit chain. Final amplification to 40/50W is achieved using the seemingly standard hybrid p.a. module.

The v.h.f. section is entirely separate, but very similar to the u.h.f. section. The main difference is that one r.f. amplifier is employed and the first i.f. is 10.7MHz.

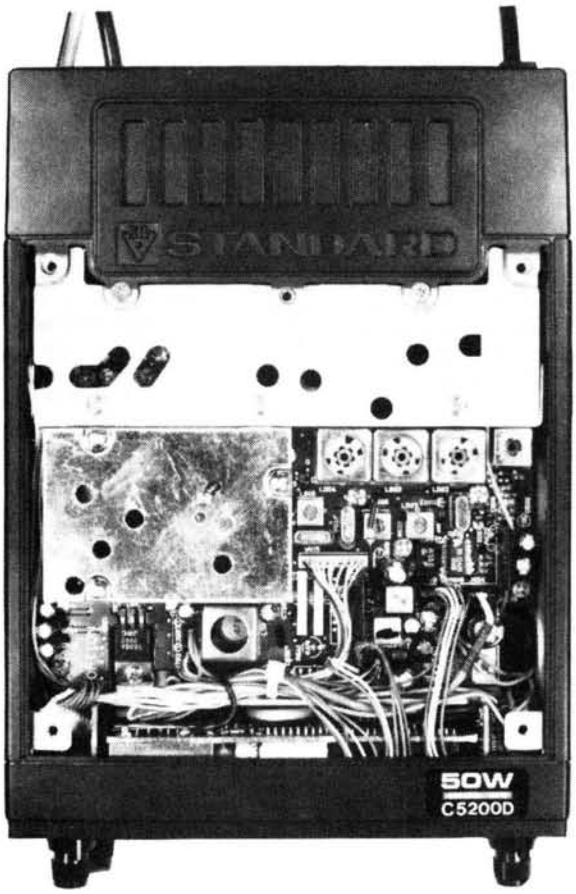
The only common sections in the C5200ED are the power supply and the microprocessor. Even so, the latter can control the two bands independently. All variable frequency generation is achieved using v.c.o.s and p.l.l.s under the control of the microprocessor.

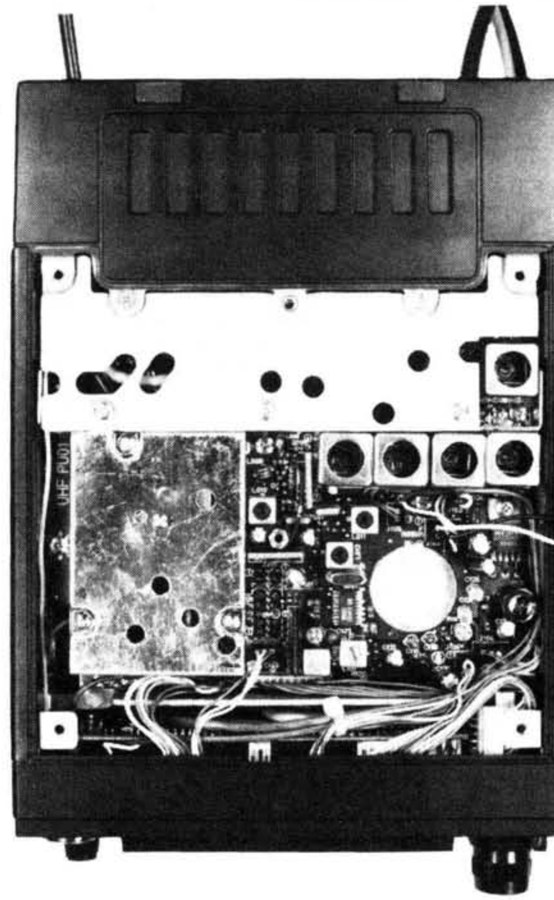
The C5200ED makes extensive use of voltage regulators to tame the raw vehicle power supply. Another good feature from the reliability point of view is that there are no relay contacts in the C5200ED, with diode switches being used instead.

With 40/50W of power available, the p.a. stages are obviously going to get rather warm, especially in a mobile environment with very little ventilation. To overcome this, the C5200ED is fitted with a miniature fan which is used to circulate air directly over the main cooling fins. As cars can be notorious for the amount of dust, the

★ SPECIFICATION

Frequency range:	144MHz to 147.995MHz 430MHz to 439.995MHz	**Selectivity:**	12kHz @-6dB 24kHz @-60dB
Modulation:	F3		
Supply voltage:	13.8 V d.c. ± 15%	**Audio output:**	3 watts
Current consumption:	10.5A @ 50 watts 9.5A @ 40 watts 3.5A @ 5 watts 600mA receive	**RF power output:**	50 watts 144MHz 40 watts 432MHz
		Spurious outputs:	-60dB
		Dimensions:	150W×50H×205D mm
Sensitivity:	0.158μV for 12dB SINAD	**Weight:**	2.0kg





Left and right internal views of the C5200

air input to the cooling fan is fitted with a filter to stop the rig getting clogged up with dust. Although this is a good feature, it only stays that way if you remember to unclog the filter from time to time.

Operation

Whilst the rig was on review, I had plenty of chances to try it out both mobile and in the shack. I found that the tuning control on the rig had both good and bad points. First the bad, it had a rather unusual "springy" feel which wasn't positive enough for me—although I imagine you would get used to it in time. The good points were the tuning rates available, the channel steps could be set to one of five options between 5kHz and 25kHz. Additionally you could change this to 100kHz or 1MHz per step just by moving a small switch. This was great for moving around the band quickly —especially under mobile operation. You could also tune the C5200ED by using the UP and DOWN buttons on the microphone.

One other interesting tuning mode which really demonstrated the C5200ED's capabilities was the SUB-band mode. This is activated by pressing the SUB button on the front panel whereupon a flashing SUB appears on the display. Whilst this is flashing you can alter the frequency of the unselected band. This may seem a bit of an odd facility at first, but I found that it was great when you wanted to QSY between bands. I was able to successfully search 432MHz for a free channel whilst still transmitting on 144MHz which I think is pretty impressive!

To begin with I found the memory operation of the C5200ED a little confusing. There are ten independent memories for each of the two bands, each one retains the frequency and any repeater shift necessary. The thing I found confusing was having to remember to operate the small switch on the edge of the tuning control. This takes you in and out of the memory functions and to store a frequency you have to move this switch twice. After a few frequencies had been stored the confusion disappeared and I got used to it.

As you tune through the memories, the frequency stored is displayed as well as the letter M. If you tune through an empty memory channel the display reverts to the v.f.o. frequency and the letter M flashes to let you know this channel is empty. This is very useful as it helps prevent you overwriting any memories you particularly want to keep. There's a lithium battery in the C5200ED which maintains the memory contents when the power supply is disconnected.

In addition to the basic memories there are two others, CALL and RMR (repeater memory). The CALL memory can only be recalled by pressing the CALL button on the microphone and I found it very useful for storing the calling channel, i.e. S20 on 145.5MHz, particularly when operating mobile. The RMR memory is slightly different in that it is recalled by pressing the RMR button on the front panel. As the name suggests its intended use is to hold a repeater frequency and again was particularly useful when operating mobile. By the way, these two memories can hold a different frequency for each band.

Another very useful facility is the REV button which allows you to reverse the transmit and receive repeater frequencies, ideal for when you want to check the input signal to see if you could operate simplex. This button has a toggle action, i.e. the first press reverses the frequencies and the second restores them to normal.

Whilst on the subject of repeaters the microprocessor logic has been set up so that it is impossible to transmit accidentally out-of-band, which is quite easy to do if you operate below say 145MHz with a −600kHz repeater shift!

You have probably gathered by now that this rig is ideally suited to anyone with a split personality. One of the initial problems I had, particularly when monitoring a 144MHz and 432MHz repeater, was trying to work out which station I was actually listening to, as both signals appear from the same speaker. Yet again Standard have thought of this problem and have provided a selectable audio mute facility. This can be set-up on either of the two bands and means that the band of your choice becomes the dominant one and any transmission on that band mutes the audio from the other.

Back in the car, mobile operation was very successful once I became familiar with the layout and general operation. The hefty output of 40/50 watts was particularly useful under mobile conditions, but of course high output power is of little use if the receiver cannot match it in terms of sensitivity. I found that the receive performance was very good indeed and I didn't suffer any problems working simplex or repeater QSOs. I did have a few problems in the car at night as, despite the excellent display illumination, the small mode buttons were not at all easy to identify. Having said that though I'm sure you would soon learn how to find them given time. 42 ▶

The British ATV Crowd Invade Dayton

Andy Emmerson G8PTH and Trevor Brown G8CJS tell us what happened when the BATC (British Amateur Television Club) went to the Dayton Rally in 1988.

The USA was "found" by Christopher Columbus in 1492: for the BATC this discovery came a little later. For a while the club had been thinking of ways of expanding the membership. It occurred to the giant brains of the club that North America was a huge area populated (among others) by ATVers who spoke and could read English. Sure, they were already served by *Spec-Com* magazine and the US ATV Society, but their appetite for things ATV might be big enough to stomach a bit more besides. We already had a handful of members in the States and Canada and had advertised the club in *Spec-Com*, but there was nothing like taking the product to the market for stimulating volume sales.

And so it came to pass that Trevor Brown G8CJS and Andy Emmerson G8PTH were despatched to the 1988 Dayton Hamvention to drum up a little business. The club would make a contribution to travel expenses and, very conveniently, we could share a stand with Sue and Don Miller (Wyman Research). They were long-term BATC members and had just offered to act as American representatives for the club. To add to the fun, Steve Mitchell G8JMJ decided he would take his family over to the States at the same time and would give us a hand on the stand. All the omens were fine . . .

To Business

To justify our trip we had to publicise the BATC and we did this from the safe base of the Wyman Research stand. The visiting BATC sales team numbered four in all: G8CJS, G8JMJ, G8PTH and, surprise, surprise—Michael Sheffield ZL1ABS had made the trip all the way from New Zealand, giving the BATC a formidable presence.

Don Miller W9NTP and his wife Sue W9YL made us very welcome on the stand (booth if you're American) and helped us sell BATC books and sign up new members. In turn we helped them sell the various v.h.f. and u.h.f. equipment they dealt in, including some Wood & Douglas gear.

Our stand, by the way, was not too distant from some familiar names —LMW Electronics and Microwave Modules were there doing business, and I believe the G-QRP Club were around somewhere. Also not far away was BATC member Tom W6ORG using a hand-portable TV camera and 430MHz band ATV rig (Kreepie-Peepie, to use the vernacular) to send pictures of Don's stand back to his own. This may have been industrial espionage at work, because both these well-known ATVers run rival ATV companies (Wyman Research and PC Electronics).

Another essential part of the three day event was talking. Tom W6ORG had thoughtfully got us onto the official Dayton lecture timetable and we were able to present a resumé of ATV operation in Europe. The lecture timetable is perhaps an understatement: there were several streams of lectures going on simultaneously and just for the ATV mode there was a whole afternoon of information. Too bad if you wanted to listen to packet or RTTY people as well!

Tom W6ORG from LA—"the smog capital of the world"—explained that the unhealthy atmosphere there had

The BATC was domiciled on the Wyman Research stand. Here Don Miller W9NTP gives the sales patter while Sue W9YL checks out the sale price list

one advantage, at least for ATVers. The virtually permanent smog created an inversion layer, which gave daily ducting. Image that—tropo DX every day! He also explained that NASA (and the FCC—Federal Communications Commission) had given the ATV community blanket permission to re-transmit video from the Space Shuttle. ATV took a high profile in his part of the world, assisting a lot of public service and emergency communications work, this helped ATV achieve a positive and good public image.

Bill Brown WB8ELK described his exploits with an ATV beacon sent aloft in a weather balloon. By studying wind speeds and directions he determined the best time to launch the balloon. Having planned the "expedition" down to the last degree he was rewarded by amazing success. The 1W video transmitter was seen 500km away, while the 100mW 144MHz audio beacon was heard in two places 645km distant. His project is a balloon which would stay in earth orbit for two years—or until someone shot it down!

Steve Goode distributed copies of a very detailed study of the possibilities for ATV on the next Space Shuttle flight. Very detailed calculations showed that many options were open and that uplink and downlinking on the 430MHz band a.m. were quite feasible.

That was the official lecture stream in the Hamvention site proper; it is also the custom for speciality modes to have their own shows in local hotels. Mike Stone WB0QCD, publisher of *Spec-Com* magazine, did the business in the Ramada Inn North. Not only did he lay on two nights of ATV chat, there were book sales, as much beer as you could drink and a glamour show thrown in! Admission was one dollar and the drink was at cost price, too. He really put himself out to make sure everyone had a good time. He had also booked rooms for us to sleep in this hotel. The rooms were next-door to the ATV session—clearly Mike didn't intend us to miss anything!

SSTV

Not to be outdone, the slow-scanners had their own "do" in the Holiday Inn on Friday night, and to do justice to both modes we agreed to split forces. Trevor covered the SSTV meeting and Andy the fast-scan workshop. Friday, April 29 was the evening when all the top SSTV operators met, including HB9ANT who must be the only person to come further than me (Trevor) to this gathering.

Formal lectures started with a discussion of the Martin Emmerson G3OQD ROM (no, he's not a relation). This software extends the Robot 1200C's capabilities by interfacing an Atari mouse and providing on-screen drawing facilities. The G3OQD software also allows the Robot to run the European standard line or frame sequential colour, without which it would not be possible to interchange colour pictures with the Volker Wraase screen converter.

Don Miller W9NTP then gave a short lecture on possible future developments in the field of SSTV. Main topics were the idea of replacing lines lost in QRM and sound-in-picture systems. Tom Hibben KB9MC and Steve Cupp N9NCT demonstrated the use of a Commodore 128 to control a Robot 1200C. The hardware is available from Robot and the software is written in BASIC. The results are a very flexible SSTV system with full digital effects and picture manipulation, coupled with disk storage of pictures.

The coffee break is always my favourite spot, where one can give and receive feedback. I managed to come away from this with some very clever 3-D SSTV pictures (screen shots) which needed to be viewed through red and blue glasses. The results were excellent and apparently the work of Clay Abrams K6AEP. W8ASF presented a video tape demonstration of the Australian LM900 in action. This scan converter appears so similar to a Robot I am surprised they are not fighting it out in the high court.

Video Phone

The next demonstration was by Mitsubishi of their video phone. This small unit connects to any phone in the world and sends a 96 × 96 pixel picture using 32 levels of grey. The unit is self-contained with its own built-in TV camera and a fast-scan display to compose your imagine on. The transmission time is 5.5 seconds and uses an a.m. system. As yet, there appears to be no standard for this kind of equipment (it's coming—G8PTH) and none of this equipment is compatible across manufacturers.

I (G8CJS) could not let the evening pass without a turn at the lectern. I introduced the *Slow Scan Companion*, explained the projects and outlined some of the chapters. I knew this was a smart crowd and they bought lots of books—lucky I had taken a plentiful supply. It was past midnight when the meeting closed and I left for the Ramada Inn and a few ZZZZZs. But, as I thought, the fast scanners had more staying power, their meeting was still going strong and another three hours passed before I managed to power down for the evening!

Don's ATV shack is well-equipped by any standard. He works fast, medium and slow-scan with a Red Indian skull as the station mascot. Both he and his wife are keen archaeologists

Flashing back a few hours to 4pm, Friday's FSTV session opened and was scheduled to finish at 11.30pm (actual finish 2am and then more eating, drinking and talking); Saturday's started an hour later (and finished an hour later, at 3am). Apart from the fashion show, there were talks by BATC members, technical lectures, heated arguments (sorry, discussions) over "future mode" versus "ancient modulation" and lots of video replays. Mike made the annual "Good Image" presentation to the amateur who had made the best contribution to raising the profile of ATV. The trophy is a camera tube (image orthicon actually) on a polished wooden base, with engraved plaque: it was won by Bill WB8ELK for his signal success with the weather balloon TV experiment.

Incidental Intelligence

In the Flea Market it was a pleasure to meet two of our American members, John KD0LO and Dave WB0ZJP. Dave is the one who produced the ATV picture reporting chart that we all have hanging up in our shacks. Like most of us, he has changed, so perhaps Dave it's time to remake the chart so we can all recognise you. How about a chart of f.m. while you're about it?

We picked up a lot of interesting info about practical ATV operation in the States. In the midwest the terrain is very flat, which means that what we might consider DX on the 430MHz band is a daily occurrence—certainly 160km is not difficult under flat conditions. During openings, hook-ups over 645km have been made, even 930km with P3 pictures. There is less (TV) activity on the 1296MHz band, though there are 225 aircraft radars across the States which share the band. Dave WB0ZJP and John KD0LO said they had had some fun with one of these radars in St. Louis, Missouri. It operates alternately on 1297 and 1303MHz and the receiver tracks the magnetron (which is apt to drift) with a 12MHz wide receive window. Apparently Dave and John were causing the radar people no little worry until they found out about ATV; apparently the ATV signal appeared on the radar screens as a wedge of blips, looking exactly like a dozen 747s coming right at them!

This duo also had some fun on 2305MHz ATV. They were troubled by an annoying 60Hz hum bar on pictures, which irritated this pair of technical perfectionists. Dave tore apart his power supply, transmitter and camera looking for the cause, while John checked out his receiver. No fault was found and it was driving them crazy! The cause suddenly came to light when John's wife put the baby's bottle in the microwave oven to heat it up . . . bang, terrific QRM. The source of the "mains hum" was out-of-band radiation from microwave ovens: apparently the effect is chronic at supper time, the only safe time to play microwave ATV is after 2am, unless someone is suffering from night starvation and gets up for a midnight snack, that is.

Was it all worth it? Of course it was! As far as the visit was concerned, we would rate it extremely successful in terms of cementing international relations, in making an impact on our potential North American market and promoting our style of amateur television. The only snag is that we all want to go back there next year—and how on earth can we afford it? ***PW***

BATC membership details from D Lawton G0ANO, Grenehurst, Pinewood Road, High Wycombe, Bucks HP12 4DD. Please include an s.a.e.

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▶ 34 My only other gripe regarding mobile use was the CALL button, the one on the front panel that is, this puts the rig into transmit and sends a 1750Hz repeater access tone. The problem is that if you press the microphone p.t.t. before you release the CALL button the tone stays on throughout your transmission. To be fair this point is mentioned in the manual but nevetheless I hit the problem on several occasions.

Moving on to the performance in the shack, I was pleased to see that the output power could easily be reduced to 5 watts by a simple press of a button.

Whilst in the shack I hooked-up my Siskin TNC-220 to see how the C5200ED performed in Packet radio. This turned out to be a very easy operation as all the necessary connections (speaker output, mic input and p.t.t.) were available on the microphone socket. This means that you only have to wire-up one simple lead and makes changeover from Packet to phone very quick and easy. The performance on Packet was, as expected, very good with no problems at all.

Conclusion

The C5200ED has proved itself, at least to me, to be a very strong contender in the dual band mobile/base station market. The facilities available combined with the versatility of full dual band operation make this one a winner. There were a few niggles which I'm sure the manufacturers will address, but none of these was serious.

So as you've probably gathered I was impressed with C5200ED and was very sorry to see it returned, perhaps I'll have to have a word with Santa!

The C5200ED costs £599.00 and is available from **Lee Electronics, 400 Edgeware Road, London W2, telephone 01-723 5521**, to whom we offer our thanks for the loan of the review model. ***PW***

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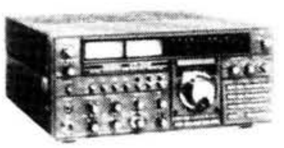

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Introduction to Digital Communications

Perhaps the best place to start learning about digital communications is at the beginning, says J. Huggins BSc G0DZX, and this means starting by explaining what is meant by the term digital.

What does digital mean? Basically anything which can only take certain fixed values is said to be digital. Analogue is the opposite of digital and describes things which can be varied continuously, at least over a limited range. Stairs and ramps are examples of digital and analogue devices. When you climb stairs you can only stop at fixed heights above the ground, the heights of the steps themselves. On a ramp you can pause at any height you choose.

The word digital has come into common usage with the popularisation of computers and so many people link the two topics together. Although computers are based upon digital techniques, digital processes occur in many other areas of life as the example previously shows.

The Original Digital Mode

Many people do not realise that c.w. (Morse code) is a form of digital communication. When you press the key, you turn on the carrier, when you release it the carrier drops, two positions—on and off.

Early telegraphy was a relatively slow and therefore expensive process which required highly skilled operators to both send and receive the messages. It was therefore natural for machines to be developed which would be faster than human operators and also not be prone to human error. By the 1930s, these teleprinter machines were quite sophisticated and were capable of rapid automatic transmission and reception, requiring less skilled staff to operate them.

Baudot and Binary

Morse code is really quite complicated. Not only does it require the signals to be turned on and off, but parts of the "on" have to be longer than others. This is illustrated in Fig. 1(a), which is a representation of the letters CW in Morse code in which time is measured in distance from left to right. In telegraphy, "on" is commonly referred to as "mark" and "off" as "space".

A more straightforward approach was proposed by the French telegraphist Emile Baudot in 1874. In his code, each unit of information, or bit, was distinguished by being either on or off, rather than by its length as with Morse's "dits" and "dahs". Using this technique, the code for each letter was the same length—five units or **bits**. This is one advantage which makes Baudot's code more effective for mechanical sending.

Baudot's code is an example of a binary code. Binary simply means two possible positions. Many people say that they don't understand binary codes. Yet, nearly every time they go out in their cars they interpret a binary code—traffic lights. Traffic lights are designed to give us one of four messages or instructions.

One lamp can be either on or off, so it can indicate one of two possibilities (stop/go, enter/wait, etc.). Three lamps have eight possible arrangements or combinations, see Fig. 2, and five lamps (or bits) can have thirty-two different possible combinations. This is greater than the number of letters in the alphabet and is the basis of Baudot's binary code. In this code, or more correctly its modern successor the International Telegraph Alphabet No. 2 or ITA 2, the letter "A" would be represented by the first two lamps being on and the last three being off. Similarly, every other letter of the alphabet is associated with a different, unique combination of "on's" and "off's". To send "A" using the ITA 2 code we simply decide the length of a "bit", turn on the carrier for twice this period and then turn it off for three times this period, see Fig. 1(b).

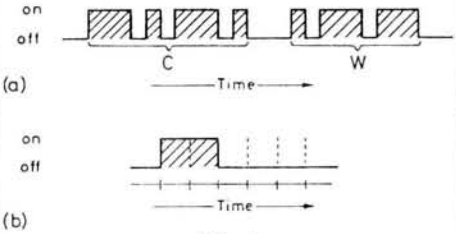

Fig. 1

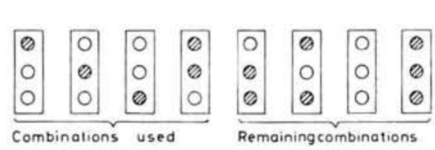

Fig. 2

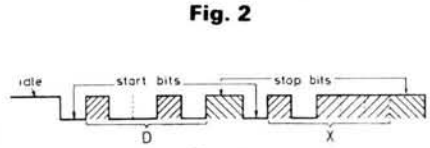

Fig. 3

Suppose the receiver tunes into the transmission while it is in progress. How will it know when one letter ends and the next begins? Looking at Fig. 3, you can see that before the code for a letter is sent, the carrier is switched off for one normal "bit" and this **start bit** indicates to the receiver that a symbol is about to be sent. Similarly a **stop bit** which is one and a half times the length of a normal bit is sent when the five bits of the letter have been completed.

Control Codes & Other Problems

Two important control codes are carriage return and line feed as these move the printer head to the start of the line and feed the paper up for a new line. These control codes are also Baudot combinations, two of the "left over" ones.

You will have noticed that there are too few combinations left to represent numbers and punctuation marks. Well, just as most keys on a typewriter have two functions (by using the shift key), so each combination in the Baudot code also represents two characters. So, for example, the combination for "R" (off, on, off, on, off) also represents the number "4". Similarly both "Y" and "6" share the same combination (on, off, on, off, on). To distinguish between the two possible characters, two further control codes are used. These are known as **figures** (or figs) and **letters** (or ltrs). This means if the letters code is received the teleprinter will print letters until the figures code is received and vice versa.

Many RTTY operators begin their transmission with a row of RYs. This is because this transmission consists of a series of alternate "ons" and "offs" which helps with initial tuning. Sometimes this appears as 4646464646 and this is because either the "ltrs" command has been missed at the beginning of the transmission or the teleprinter (or computer) has mistaken some noise for the "figs" command.

If a nasty bit of QRM pops up during a carrier off period, the receiving teleprinter will misinterpret the noise as carrier. As a result it will read the data wrongly. For example, "P" (on, off, on, on, off) could be read as "Q" (on, off, on, on, on) if noise occurred during the period when the last bit of the code was transferred.

The major problem is that not only does an error occur, but that there is no way of detecting it. In plain text, the error will probably show up, but not when a series of numbers or coded information is transmitted.

To reduce the degree of disruption from QRM (noise), frequency shift keying (f.s.k.) was introduced. Here, the carrier is not simply switched on and off, instead it remains on constantly but it is switched from one frequency to another. The separation of the frequencies is generally quite small—usually 170Hz for amateurs and 425 or 850Hz for commercial systems. This way efficient use is made of the radio spectrum.

Most amateurs use a modified form of f.s.k. known as audio frequency shift keying (a.f.s.k.). With minor exceptions, f.s.k. and a.s.f.k. give the same result. In a typical amateur a.f.s.k. system, a two-tone audio oscillator is used to generate 1445Hz (mark) and 1275Hz (space) tones as required. These tones are then fed to the microphone socket on the transceiver, which in turn is set in single sideband mode. If, for example, the transceiver was set to 14.100MHz in upper sideband mode, then modulation with the **mark** tone would result in an r.f. signal being produced at 14.101445MHz, while the **space** tone would generate the signal at 14.101275MHz. The two r.f. signals would still be 170Hz apart, but unlike f.s.k. signals they would be produced at slightly different frequencies to that indicated on the transceiver display.

Speeds & Baud Rate

Teletype speeds are usually measured in "bits per second" or **bauds**. This is the number of the on/off pulses which can be sent in each second. Baud rate cannot simply be converted into words per minute as the stop bits are one and half bits and the exact ratio varies from one convention to another. Most amateur systems use speeds of 45.45 baud on the h.f. bands, but 50 baud is common on the v.h.f./u.h.f. frequencies.

Setting Up a RTTY Station

If you fancy trying RTTY then, in principle, all you need is a transceiver, a microcomputer, a suitable program and connecting leads. Probably the best place to start is on v.h.f. where the bands are quieter, 144.600MHz is the generally accepted calling frequency for s.s.b. work. There is also some activity on 145.300MHz (Channel S12) using f.m. If there is local RTTY f.m. activity, then this is the place to start as the tuning requirements in this mode are not so critical as on s.s.b.

The program you have chosen may require a **terminal unit** and in its simplest form this is a filtering device based upon tuned circuits or operational amplifiers. A lead from the extension speaker socket is brought into the filter unit which is normally designed to filter out all sound other than tones of 1445 and 1275Hz. These pure tones are then passed on to the computer for translation. It is also common to include some kind of tuning aid, as tuning is very critical indeed in this situation. Terminal units also often include an audio oscillator to generate the tones required for a.s.f.k. transmissions.

I think any serious attempt at RTTY will really require the use of a terminal unit of some kind. This may be a sophisticated device capable of running all sorts of digicomms such as the PK-232, or it can be a relatively cheap, home-brewed job. BARTG(1) (British Amateur Radio Teledata Group) market kits and p.c.b.s for ST5C terminal unit and John Morris G3LIV(2) can supply a p.c.b. and instructions for another terminal. Home-brewed terminals should be considered seriously as they are not difficult to construct, they are relatively cheap and normally have excellent performance on RTTY.

There are several sources for programs, the TX-3 by Technical Software(3) being quite popular, as are J&P Electronics(4). There are also several programs produced by Dr P. Harris G3WHO(5) and M. J. Kerry G3BMK(6).

There are a number of points to look for in a good RTTY program. First, split screen display and type ahead facilities are important. One half of the screen (usually the top) displays the incoming message while the other contains the text to be transmitted, this allows the operator to prepare the reply whilst reading the incoming text. Very few operators can type fast enough to keep up with the rate at which RTTY is transmitted so this reduces the pressure of typing and the frustration at the receiving end.

Memories

Memories are also important. Most programs contain commonly used messages such as RYRYRYRY and CQ CQ CQ DE which can be sent using one key. This saves a lot of time, but other memories that you can program are also useful. A real-time clock is another facility offered by many programs and this allows you to make a note of the start and finish times of the QSO for logging. Better programs store the QSO in memory and label the beginning of each transmission with the time for later review.

A "callsign capture" is also a help. Programs with this facility "look" for "DE" in the incoming text and store the callsign which follows it. Finally, and perhaps most important, check that the program automatically sends CR/LF codes after 65 characters have been sent. Older, mechanical teleprinters do not automatically CR/LF and so you might end up with a very irate operator of a mechanical teleprinter at the other end!

The ability of a good RTTY station to "pull" signals out of the background hash never ceases to amaze me. Strong QRM can make life difficult, but deep and slow fading is a real problem. If the signal completely fades into the background noise for several seconds than large chunks of text are lost and make the QSO meaningless. Yet there are modes that overcome this problem.

Error Correcting Systems

SITOR is a commercial system designed to overcome the shortcomings of RTTY. AMTOR (AMateur Teleprinting Over Radio) is a system which was derived from SITOR in the early 1980s mainly by Peter Martinez G3PLX.

It uses a seven-bit code rather than the five-bit system of RTTY, which means 128 different possible arrangements. Only those arrangements that have four marks and three spaces are used though, and there are 35 of those. This means that if QRM corrupts a character as it is received, the chances of the result "looking" like another legitimate character are just under 4:1 against.

It's fine to know that a mistake has been made, but it is just as important to be able to correct the fault, or at least to be able to get the character repeated. AMTOR has two different modes of operation which approach this part of the problem of error-free reception differently. The simplest form to understand is called **forward error correction** (FEC). This technique is very much like normal RTTY, the difference lies in the fact that each character is sent twice with a gap of about one third of a second separating the two characters. To do this, the system sends characters in groups of four, leaving a short pause before repeating the group.

The second approach is restricted to use between two stations which are in direct contact with each other. It is known as **automatic repeat request** (ARQ) and is much more complicated. First, the system is in a synchronous mode unlike RTTY which is said to be asynchronous. The AMTOR system doesn't use stop and start bits, but relies on good time-keeping between transmitting and receiving stations. Secondly, the two stations "lock" onto each other, sending and receiving groups of three characters in a 450 millisecond cycle. In each cycle the transmitting station must send three characters and quickly turn over to receive. The receiving station must read the characters, check they are legitimate and go over to send an acknowledgement. Then, if all is well, both stations start all over again with the next three characters.

The checking system depends on the use of two control codes, I'll call them CS1 and CS2, which must be sent alternately if all is well. Before we work through an example, there are two other terms I should explain. The station which makes the original transmission is called the **master** and the other station is called the **slave**.

Using Fig. 4, the master would send the first three letter group (GOO) and would wait for confirmation before continuing. The slave, having received the group correctly, would send CS1. Provided that the master receives CS1, it "knows" all is well and sends the next three letter group (D M). If this is also received correctly, the slave sends an acknowledgement, this time CS2. The master expects this code and so continues with ORN.

Suppose the letter R is corrupted, the slave should detect this and will indicate the problem by repeating the previous control code—CS2. As the master is expecting CS1, it therefore "knows" there is a problem and repeats the group ORN. If this is received correctly, the slave sends CS1 and so the master carries on with sending ING. Again, if the slave receives this correctly it replies with CS2.

If the master fails to receive this acknowledgement, it sends a third control code, RQ, which asks for a repeat acknowledgment. The slave repeats the control code and so the master continues, if it sent the other control code the master would repeat the last three characters again. In this way the message is checked and if necessary corrected every three characters.

Sending messages by ARQ AMTOR may not be perfectly error free, but it isn't far short! AMTOR is sent at 75 baud, but as it uses a longer code and pauses for acknowledgements, its real speed is about half this value. In poor conditions where many repeat requests are sent, the speed may be much lower than this.

AMTOR Operation

Many RTTY programs are also capable of decoding and sending AMTOR signals. So it's often not difficult to convert a RTTY station to AMTOR use. There are two major problems. First, to be effective in ARQ mode, a transceiver must be capable of rapidly changing from transmit to receive and vice versa. Many rigs do not possess this ability, but most can be easily modified to cope. In many cases it means changing a couple of capacitors. The modifications for most rigs are well established and easily obtainable from the AMTOR community.

The second problem is one of synchronisation. This is usually achieved by adding a crystal controlled timing board to the terminal unit. Again, expensive multimode terminal units will already have such devices, but for

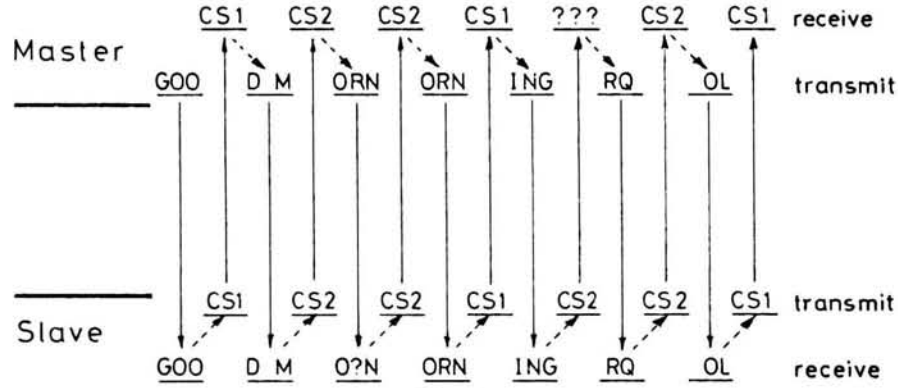

Fig. 4

home-brew specialists, John Morris G3LIV[2] can supply an additional clock p.c.b. and instructions to work with his and other terminals designed for asynchronous use.

Packet Radio

No discussion of digital communications today would be complete without a consideration of packet radio. The basic idea was to attempt to use a single frequency for several different, but simultaneous, QSOs as a possible way of reducing overcrowding in the v.h.f. region of the radio spectrum. To achieve this aim, data was sent at very high baud rates. As a result, messages could be sent in quite short bursts or **packets** rather than the more or less continuous stream of data which occurs with AMTOR and RTTY.

Current amateur packet systems typically send data at 1200 baud using a.s.f.k. tones of 1200 and 2200Hz at frequencies above 30MHz—although some systems run considerably faster. For h.f. work, 300 baud is employed with correspondingly smaller tone separation. Obviously two communicating stations must use the same code, frequency, baud rate, etc. These values are those generally used according to current convention. In packet circles, conventions tend to be called protocols.

The structure of a "packet" is also defined by a convention. The structure of a typical AX.25 packet is illustrated in Fig. 5. You can see the packet of information contains more than the message being sent. The following data is sent in each packet:

Flag: This is the first part of the transmission and consists of a coded message warning the receiving station that information is about to follow.

Address: The second part contains the callsigns of the station sending the message and the station it is being sent to. It is possible for other stations to relay the message if a direct link is not possible. If this is the case, this section also includes the callsigns of up to eight stations making up the relay chain. This section enables stations not involved in the QSO to ignore it.

Control: This indicates the purpose of the packet—it may be to start or end a QSO, to carry a message, to ask for a repeat, to acknowledge, etc.

Information: This contains up to 256 characters and is the message being sent, or at least part of it.

FCS: This stands for frame check sequence and is a number calculated by the transmitting station based on the code in which the message is sent. This value is also calculated by the receiving station as it receives the message. If the value sent is the same as the value calculated then the receiving station "knows" that the message is error free and sends an acknowledgement. If the values differ the receiving station requests a repeat of the packet.

Flag: This is the same as the first flag, but now indicates the end of the transmission.

Terminal Node Controllers

It is quite possible to program a microprocessor to operate packet radio but this would leave precious little computer time for other facilities. Such a system would not be very "user friendly", so it's usual to use a second computer for the purpose. This computer is already programmed and can do only one job, run packet radio. Such machines are called terminal node controllers or TNCs. They are usually controlled by your own home computer, so the usual set-up for packet radio is that shown in Fig. 6.

Digipeaters, Mailboxes & More

As I mentioned earlier, stations not directly taking part in a QSO can relay messages on. This is probably the most exciting feature of packet radio. In theory, provided a suitable network of relay stations exists, a low power v.h.f. station can initiate a QSO which can

Flag	Address	Control	Information	FCS	Flag
1 byte	14-70 bytes	1 byte	up to 256 bytes	2 bytes	1 byte

A typical AX.25 packet

Fig. 5

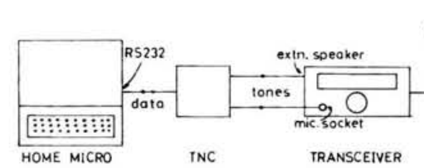

Fig. 6

be relayed nationwide (worldwide?) with all of the relaying stations using the same frequency. A station which can recognise its callsign in the address section of a packet, and then automatically repeat the message so that it is received by a more distant station, is called a digipeater.

Mailbox or bulletin board systems are becoming very popular these days. These are basically packet radio (or RTTY/AMTOR) stations which are automatically operated by computer and are active for most, or all, of the day. When called, the bulletin board will respond and store a message for another operator, or perhaps just general information, on computer disk. This information can then be retrieved by the other station at some later date.

Finally the term **gateway** often crops up in the context of packet radio. This is simply a packet station which has access to two different frequencies —typically 144MHz and 14MHz. Gateways are very useful for v.h.f. operators as they can be used to relay messages worldwide via an h.f. network.

Starting next month Packet Radio Update

References

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2: J. Morris G3LIV, 2 Salters Court, Gosforth, Newcastle, Tyne & Wear NE3 5BH.

3: Technical Software, Fron, Upper Llandwrog, Caernarfon, Gwynedd LL54 7RF.

4: J & P Electronics Ltd., Unit 45, Meadowhill Est., Dixon Street, Kidderminster DY10 1WW.

5: Dr P. Harris G3WHO, 10 Appleby Close, Great Alne, Alcester, Warks B49 6HJ.

6: M. Kerry G4BMK, 2 Beacon Close, Seaford, East Sussex BN25 2JZ.

Amateur Radio in Spain

Our intrepid Australian author Greg Baker reports to us this time from the sunny climes of EA land; giving us the low-down on the state of amateur radio in Spain.

My first experience with amateur radio in Spain was on a Madrid street about halfway between the Puerta del Sol in the heart of the city and the main post office. It is here that the Madrid branch of the Union de Radioaficionados Espanoles (URE) (Spain's RSGB equivalent) has its offices. That's a useful place for it to be. It's also a few dozen metres from one of the red light areas, which is interesting but not particularly useful.

Facing the street is a barred door, securely locked, a name plate, door bell and an intercom. For me it's hard enough using my crude Spanish face to face where communication is made easier through eye contact and gestures. This was daunting. In true amateur fashion I keyed the microphone.

"Soy escritor de Australia. Quiero hablar," I stumbled. I am an Australian writer. I want to talk.

The speaker squawked back at me, signal RST 345. Here my Spanish deserted me. My XYL, whose Spanish is adequate to the task, elbowed me aside and took over. It seemed the man was alone, the office not open. Could we return the next night at 1930 local?

We could and did, conquering the door and intercom with the ease of practice. Upstairs we entered the plush offices of the Madrid chapter. In an inner room classes were in progress, but Victrenano Pascual Llorca EB4BCN, Jose J. Ordas Medina EA4DNT and Aniceto Martin Gil were there to talk with us. We sat in a room beside the Madrid QSL bureau and talked. Only Aniceto spoke any English but, nonetheless, we were prepared, our minds and notebooks bulging with questions and vocabulary.

They plied us with information and directed us to the national office of URE for further information.

The next day it was the suggested office at Maiquez, 48, 1st Floor. Here we spent time with Juan Martin, the administrative secretary, filling in the details of amateur radio in Spain. Juan, too, bombarded us with information and the kids with key rings and URE car window stickers.

Examinations and licences

All amateurs must be licensed. Licences are issued by the Ministerio de Transportes, Turismo y Comunicaciones (MTTC) who conduct examinations three times per year in February, June and October. It is usual, though not obligatory, to attend classes like those we saw at the Madrid branch of URE. There are four examinations: (i) regulations, (ii) theory, (iii) Morse code, both receiving and sending, and (iv) operating procedures. This latter mightn't be a bad idea in a few other countries as well!

The author

Three classes of licence are issued: Class A, Class B and Class C. There are about 25000 A class licences on issue, about 10000 B class and about 5000 C class. This makes about 40000 radio amateurs for Spain's population of 39 million.

Class A licences are unrestricted licences. Morse required is 12 words per minute and power output limited to 250 watts. Class C licences are for those whose Morse is only 8 words per minute and power is restricted to 20 watts. B class licence holders operate v.h.f. and above only and need no Morse. Their power output is limited to 50 watts. In addition, Class C licence holders are restricted to the band sub-segments 3.55 to 3.6, 7.02 to 7.03 and 21.03 to 21.15MHz in telegraphy and 3.6 to 3.7, 21.15 to 21.20 and 28.90 to 29.10MHz on phone.

Annual licence fees are about £17 for Class A, £9 for Class B and £4 for Class C. These are reduced **by 90 per cent** for pensioners, those who have retired and those over 65 years of age. That would go down well in the rest of the amateur world, I'll bet! Sitting exams costs about £3 each. Repeaters with wide coverage have a licence fee of £25 and this falls to £10 for local coverage repeaters.

Callsigns

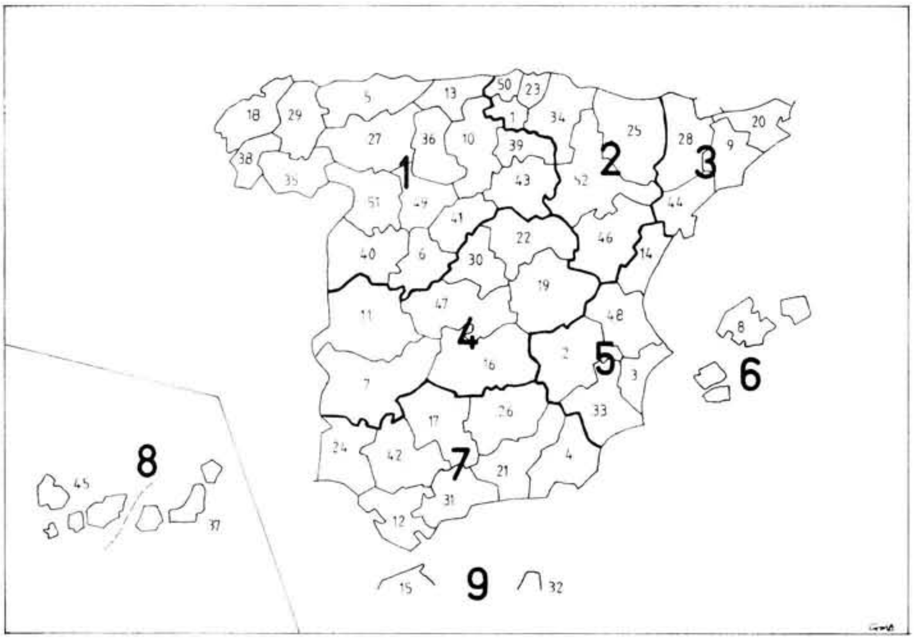
Spanish callsigns are predominantly allocated from the block EAA to EZZ and take the form E*Ln*xy or E*Ln*xyz where *L* is A, B or C, *n* is a number in the range 0 to 9 and x, y, z are letters of the alphabet.

A Class licence holders have the forms EA*n*xy and EA*n*xyz, B Class licence holders have the forms EB*n*xy and EB*n*xyz and C Class licence holders the forms EC*n*xy and EC*n*xyz.

Calls beginning ED*n*, EE*n*, EF*n*, etc., are used for special event callsigns. Recent examples are ED1FPB for the Fair of Peñaranda del Bracamonte, a town in the province of Salamanca, west of Madrid; ED3IMG, EE3IMG and EF3IMG for the amateur expedition to the Costa Brava island Medes; ED2IZO for an expedition to Izaro, a 500m × 100m island off the Basque coast and ED1AI for an amateur expedition to Arosa Island off the coast of the province of Pontevedra, northwest of Madrid. Amateurs are hoping to be allocated EG, EH, etc., calls and AM, AN (also allocated to Spain) for the 1992 Barcelona Olympics.

The number *n* indicates the region. Spain is divided into 9 regions representing four countries on the DX countries list. EA6, EB6 and EC6 are from the Balearic Islands, the Spanish islands off the east coast of the mainland, EA8, EB8 and EC8 are from the Canary Islands in the Atlantic Ocean and EA9, EB9 and EC9 are from Ceuta and Melilla, the two Spanish enclaves on the north coast of Africa. All other districts are on the Iberian peninsula (see Fig. 1), except that the district numeral 0 is used for Antarctic operations such as ED0BAE, the special call for the Spanish base "Juan Carlos I".

An exception to this seems to be the callsign EA0JC, held by an honorary president of URE, His Majesty Juan Carlos I, King of Spain. I don't know if he uses it or not, or whether it is honorary, too, but I'd love to have a QSL.



The licence document in Spain shows not only the name, address and callsign of the licence holder, but also the equipment they possess. All gear must be registered by make, model and serial number with MTTC and sales and purchases must be notified and amended on the licence document. Licences for mobile equipment show vehicle make and model and registration number.

In addition, a plan of all new installations must be sent to MTTC and be inspected by an official from MTTC to ensure it complies with regulations. It is permissible to possess amateur transmitting equipment without holding a licence. Many people, such as Aniceto Martin Gil at URE Madrid, buy and instal their equipment concurrently with attending classes and passing exams.

Spain does not allow amateurs to handle third party traffic. However, amateurs work closely with the Spanish Red Cross and civil defence authorities to provide emergency communication in times of need. Amateurs co-operating in this way carry a special civil defence pass issued by their municipal authority. This pass identifies them, their civil defence function and, in the case of radio amateurs, their special civil defence callsign. This civil defence traffic is using the amateur's own equipment and is usually on 144MHz.

Equipment

Equipment is in general more expensive than in the UK. Some retail prices are: Yaesu FT-980 all-bells-and-whistles transceiver £1850; Kenwood TS-430S £915; Kenwood TS-440S £1050; Yaesu FRG-9600 £640; Yaesu FT-270R 144MHz mobile £560; Icom IC-28E 144MHz mobile £470.

An offer of gear from one shop had three "complete" stations: (i) Kenwood TS-440S, 5-band vertical DX antenna, 30A power supply, 25m of coaxial cable and 2 PL-259s for just under £1500; (ii) Kenwood TS-530SP, 5-band vertical DX antenna, 25m of coaxial cable and 2 PL-259s for just under £1000; and (iii) Kenwood TH-221S 144MHz transceiver, mobile antenna, 10A power supply, 25m of coaxial cable and 2 PL-259s for just over £400.

There are four or five shops in Madrid and the same number in Barcelona selling amateur equipment, as well as a few scattered through the provinces. These include the big department store El Corte Ingles. Shops selling electronic components are more widespread. Spain seems to be experiencing a boom in technology related pastimes—computers, electronics, etc.

The street Calle Barquillo near the main post office has many electronics shops selling books and components. Examples are Componentes Barquillo, Barquillo 11, Shop 9 and Hipper-Music: Hipermercado de la Imagen y el Sondio (Picture and Sound Hypermarket). The latter has a huge range of electronics and amateur books. But the most colourful and interesting place to buy gear or even browse is in the Rastro area of Madrid. The Rastro is a huge market held outdoors every Sunday morning.

There you'll find Florentino Sanchez Argiles EA4AHR and his son Jose Luis Sanchez Sanz EA4BWQ at their components stall on the street called Ronda de Toledo. Every component you can remember from the electronics shop hey-day are there and more. Jose Luis speaks good English and is a mine of information on Madrid and Spain's amateur scene. A hundred metres up the hill towards the Puerta del Sol at 28 Arniches is the shop of Cristobal Laorden Martinez EA4BDA. Open seven days a week, Cristobal's shop has components but also receivers and transceivers, both new and second-hand. In between these two establishments on Sundays, during the Rastro, are thousands of stalls, a score or so selling magazines, including bargain priced English (and Spanish) language electronics and computer magazines.

While I'm on the subject of prices, a couple of prices from the consumer market: 12in black and white television £67, 16in colour television from £225 to £240 and 20in colour television £300.

TABLE 1: PROVINCE LIST

1	VI	Alava	EA2
2	AB	Albacete	EA5
3	A	Alicante	EA5
4	AL	Almeria	EA7
5	O	Asturias	EA1
6	AV	Avila	EA1
7	BA	Badajoz	EA4
8	PM	Baleares	EA6
9	B	Barcelona	EA3
10	BU	Burgos	EA1
11	CC	Caceres	EA4
12	CA	Cadiz	EA7
13	S	Cantabria	EA1
14	CS	Castellon	EA5
15	CE	Ceuta	EA9
16	CR	Ciudad Real	EA4
17	CO	Cordoba	EA7
18	C	La Coruna	EA1
19	CU	Cuenca	EA4
20	GE	Gerona	EA3
21	GR	Granada	EA7
22	GU	Guadalajara	EA4
23	SS	Guipuzcoa	EA2
24	H	Huelva	EA7
25	HU	Huesca	EA2
26	J	Jaen	EA7
27	LE	Leon	EA1
28	L	Lerida	EA3
29	LU	Lugo	EA1
30	M	Madrid	EA4
31	MA	Malaga	EA7
32	ML	Melilla	EA9
33	MU	Murcia	EA5
34	NA	Navarra	EA2
35	OR	Orense	EA1
36	P	Palencia	EA1
37	GC	Las Palmas	EA8
38	PO	Pontevedra	EA1
39	LO	La Rioja	EA1
40	SA	Salamanca	EA1
41	SG	Segovia	EA1
42	SE	Sevilla	EA7
43	SO	Soria	EA1
44	T	Tarragona	EA3
45	TF	Tenerife	EA8
46	TE	Teruel	EA2
47	TO	Toledo	EA4
48	V	Valencia	EA5
49	VA	Valladolid	EA1
50	BI	Vizcaya	EA2
51	ZA	Zamora	EA1
52	Z	Zaragoza	EA2

Note that the province numbers above are not the same as Spanish postal code district numbers.

Organisations

Amateurs are represented to government and the IARU by URE, the Spanish equivalent of the RSGB. It costs £17 per year to join. For this fee, amateurs receive an un-named monthly magazine, a free QSL bureau, and free antenna insurance. The latter is essential for radio amateurs. The URE insurance is for liability of £95000. Private cost of antenna insurance is about £19 for the same £95000 cover or £11 for £45000 cover, so URE membership is good value. It is interesting to note that ordinary household radio and television antennas do not need to be insured.

Magazines

Spain has two monthly amateur magazines. One is the un-named URE journal included in the URE subscription. It runs to over 60 pages a month. Advertising proportion is below 20 per cent. A typical issue contains editorial, technical articles, regional URE news and columns on c.w., computers, DX, v.h.f./u.h.f./s.h.f. reports, awards and diplomas, new members and members' advertisements.

The other monthly magazine is *CQ Amateur Radio,* an offshoot of the US magazine of the same name. The Spanish edition billed as "La Revista del Radioaficionado"—the radio enthusiasts magazine—is mainly sourced in Barcelona, Spain's second largest city after Madrid. There are some translations of US editorial content. News stand cover price is £1.60 but this falls to £1.45 per issue on subscription. It runs to 84 pages. A typical issue has about 22 per cent advertising and contains editorial, reports of amateur affairs, technical and construction articles, gear reviews, columns on DX, satellites, v.h.f./u.h.f./s.h.f., propagation, awards and diplomas, new equipment and free subscriber advertisements.

There are no propagation predictions in the URE journal but *CQ Amateur Radio* regularly runs three-monthly predictions from the Caribbean and Central America, from South America and from the Iberian Peninsula and North Africa.

Books and Manuals

Spanish electronics shops seem well stocked with amateur publications, many from Boixareu Editores, the Barcelona specialist publisher of *CQ Amateur Radio.* Examples and sterling equivalent prices are: 1986 *ARRL Handbook* in Spanish £43; Clay Laster W5ZPV *Guia del Radioaficionado Principiante* (Guide for the Beginner Amateur Radio Enthusiast), 400 pages, £17; Ed. Jose Mompin Poblet *Manual del Radioaficionado Moderno* (Modern Amateur Radio Enthusiasts Manual), 2nd Edition, £19; P. Duranton *Bandas de 27 y 28.30MHz* (10 metre Bands), 412 pages, £7, and a series of amateur radio manuals at about £4: *Microcomputers and the Radio Amateur, What is Amateur Radio?, RTTY for Radio Amateurs.*

Specialist Modes

Activity in specialist modes is small. Satellite users are limited to perhaps 200 amateurs, amateur television to perhaps 30 and RTTY to about 150 people. While *CQ Amateur Radio* and the URE journal both run computer articles, the use of computers is not yet widespread, limited to about 300 amateurs presently. This is increasing all the time, however. About 50 amateurs use Esperanto, too, which must be the specialist mode par excellence.

Spain has one hundred 144MHz repeaters, 11 432MHz repeaters and six beacons. Of the repeaters, 81 are operated under the auspices of URE and the remainder by other associations.

Awards and Contests

The Spanish calendar includes 120 contests. While some are RSGB and ARRL contests, most are Spanish and South American contests. The five main contests are S M el Rey (His Majesty the King) in April, Cervantes in June, Huelva Cuna de America in July, Iberoamericano in October and the Carnavales de Tenerife in November.

Spanish amateurs principally work towards Spanish and South and Central American awards. On Spain's 100 most wanted DX countries' list, UK calls appear four times: South Sandwich VP8 at position 15, South Georgia VP8 at 16, South Orkney VP8 at 64, and South Shetland VP8 at 91.

I have supplied rules for five Spanish awards to the editorial office of *PW,* a copy of which can be obtained with

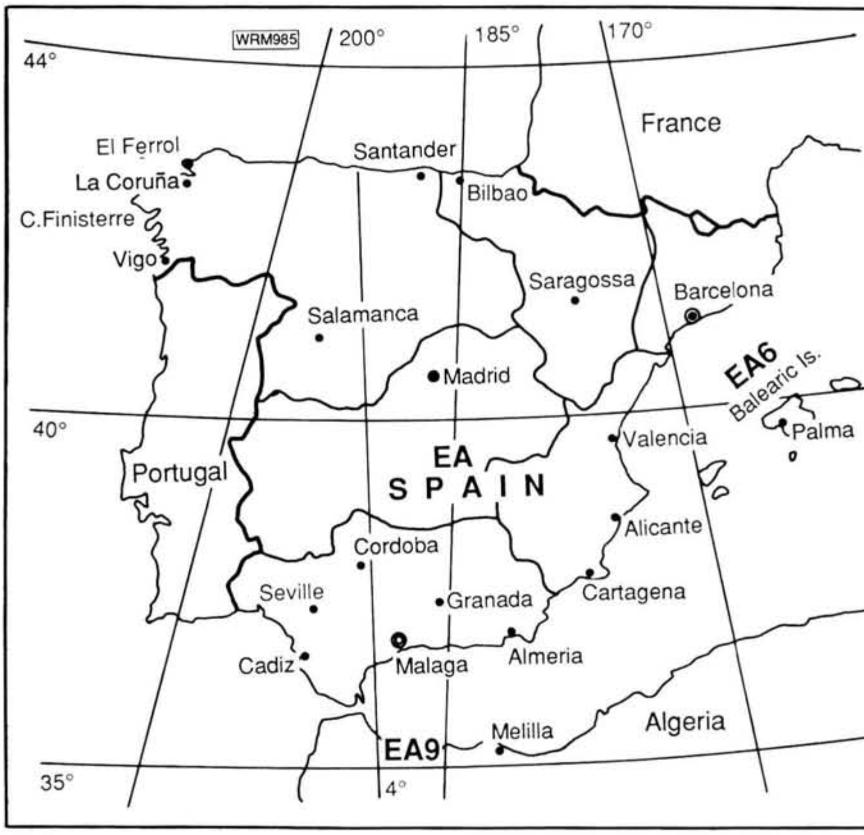


TABLE 2: TRUE BEARINGS

From ▶ To ▼	Belfast 54°35′ N 5°55′ W	London 51°30′ N 0°10′ W	Birmingham 52°30′ N 1°50′ W	Glasgow 55°53′N 4°15′ W
Madrid: 40°25′ N 3°43′ W	173° 1580 km	194° 1260 km	187° 1350 km	178° 1720 km
Barcelona: 41°25′ N 2°10′ E	155° 1580 km	170° 1135 km	165° 1270 km	161° 1675 km
Valencia: 39°29′ N 0°24′ W	164° 1730 km	181° 1335 km	175° 1450 km	170° 1845 km
Seville: 37°24′ N 5°59′ W	180° 1910 km	199° 1630 km	193° 1710 km	184° 2060 km
Las Palmas: 28°08′ N 15°27′ W	199° 3040 km	212° 2890 km	208° 2930 km	201° 3210 km

either an s.a.e. and 2 first-class stamps or 3 IRC's. Go to it! Basic QSO's in Spanish were outlined in *PW* September, October and November 1983, and beam headings for Spain from centrally located Birmingham are on Fig. 2; other centres' beam headings are appended also.

Lastly, remember if you're in Spain check out the gear in shops like that of Christobal at 28 Arniches, El Corte Ingles or the components on Calle Barquillo or at the Rastro stall of Florentino and Jose Luis on Sundays. You'll get a great welcome and make your trip that much more interesting. **PW**

Constructional

Kitchen Konstruktion

In number 10 of his occasional series, Richard Q Marris G2BZQ tells how to make a few useful home constructors' tools

If you dabble in home construction then no doubt you probably own and use a Junior hacksaw, or maybe its big brother, the standard hacksaw. These types of saw are great for cutting general d.i.y. materials, provided the cut is to be made along an accessible edge and the material's cross-section is not greater than half the length of the blade. Outside these parameters the hacksaw loses its usefulness due to its bow-type construction.

The saw needed to overcome these restrictions is called a padsaw and is ideally suited to cutting rectangular holes in large panels. This type of saw was very popular about thirty years ago, when chassis bashing was in favour. However, since that period this tool has largely been forgotten; which is a pity as it's a very useful item to have.

For those of you that have never clapped eyes on a padsaw, the following description may help you understand its qualities. A padsaw in its most basic form is merely a clamp type handle, capable of holding a hacksaw blade. Normally these handles will accept only standard size blades, rather than Junior blades. Padsaw handles are still available at about £5 from companies like Electromail. But if you don't fancy forking out for a ready made padsaw handle you could make your own.

To make a standard size padsaw handle, take one new hacksaw blade and fit a handle as shown in Fig. 1. The handle is made from two strips of wood, wider than the depth of the blade. With the two pieces of wood clamped together, drill and countersink a suitably sized hole, to take a small nut and bolt. Next degrease the hacksaw blade with methylated spirit, and Superglue the two pieces of wood to the blade (Fig. 1). Then add the nut and bolt and tighten accordingly. After the glue has cured, round off any rough corners on the handle and smooth its surface with glasspaper. Finally give the handle a good coat of varnish.

To make a Junior padsaw, obtain a small wooden file handle, available from your local d.i.y. store. The file handle consists of a piece of turned and shaped wood, which has a small hole partially drilled up its centre. This hole is to accommodate the tang of a file and order to stop the wood splitting when the file is rammed home, a metal ferrule is fitted around the entrance of the hole.

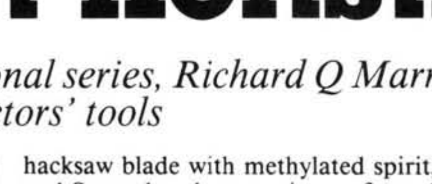


Fig. 1: Standard sized home made padsaw

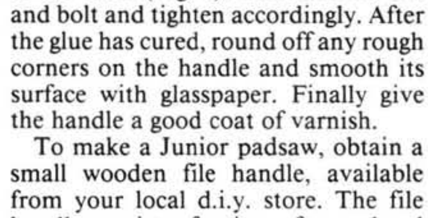


Fig. 2: Junior sized padsaw

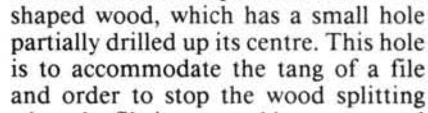


Fig. 3: Long insulated screwdriver

Take the file handle and using a screwdriver force off the metal ferrule. Then using a Junior hacksaw cut a slot partially down the centre of the handle. This slot is to accommodate a Junior hacksaw blade, as shown in Fig. 2. Next using pliers, remove the pins from both ends of a Junior hacksaw blade. Slide the prepared (degreased) hacksaw blade into the slotted handle and Superglue in place. Then force the metal ferrule back onto the file handle.

Long Insulated Screwdriver

Every now and then it's necessary to make crucial adjustments deep in the heart of a working piece of equipment. Long thin ($\frac{1}{8}$in dia.) screwdrivers are available with 150mm to 200mm blades, but seldom are the blades insulated. If one attempts to use one of these screwdrivers the inevitable will happen, you'll short something out. As a golden rule, never, unless it is vital, try to adjust equipment in this way, when it's live. Remember SWITCH OFF before doing any unnecessary internal twiddling, as death is so permanent.

However, having made the warnings clear, there is a way around shorting things out with long screwdrivers. Take a length of suitable diameter heatshrink sleeving, twice as long as the screwdriver blade. Then using a hair drier shrink first one layer on and then the other over the top of the first. This way the blade is double insulated and more robust. If however, the sleeving becomes damaged in the course of time, remember to repair it before use, by adding a fresh top layer of sleeving. **PW**

RF Operated Relay

Simple circuits are often the best and most useful, as is this one from Paul Benton G8SVE. Don't be put off by this project's lack of technology, because the next time you build a QRO p.a. for your black box transceiver, you'll need this little circuit.

This simple design was produced out of necessity, after the author had built an external p.a. and a separate pre-amplifier in an effort to improve the performance of an ageing transceiver. The transceiver had no facilities for hard wiring an external p.t.t. line and the technical information regarding the equipment was rather scant. The author eventually came up with the design shown in Fig. 1 to overcome the need to modify the transceiver in question. There are many other uses for the r.f. operated relay, besides switching antenna circuits. You could for instance use it to mute another receiver while on transmit, to switch on and off cooling fans or even to run an "On-Air" light outside the shack.

The relay specified for the project won't handle the full legal power, but it should put up with at least 25W at 144MHz. The relay is quoted as having an a.c. contact rating of 5A at 250V.

Circuit Operation

Operation is relatively straightforward. The r.f. is picked up via a short length of wire (sensing antenna) and is then fed to rectifier doubler circuit C1/D1 and C2/D2. The resultant d.c. level is then fed to the base of Tr1, which along with Tr2 forms a Darlington pair high-gain amplifier. The d.c. level causes the Darlington pair to conduct thus energising RLA. The purpose of D3 is to protect Tr1 and Tr2 from the back e.m.f. generated in the coil of RLA every time it is de-energised.

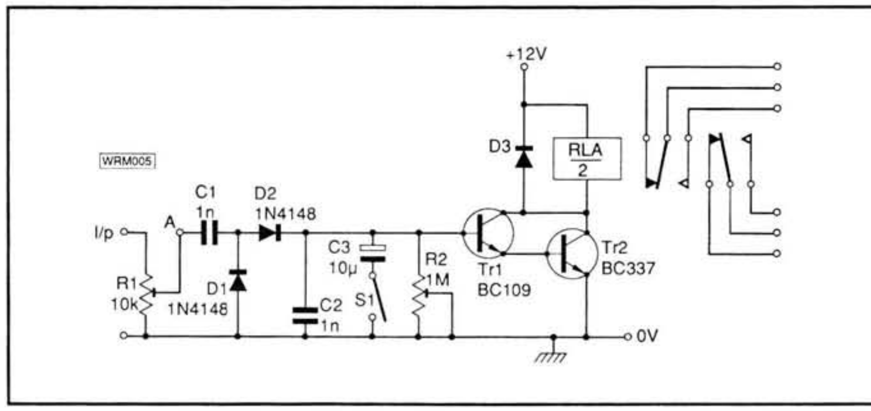


Fig. 1: Basic circuit of r.f. operated relay. D3 is a 1N4005

The combination of C3 and R2 form what is known as a "hang-time" circuit, which is required for c.w. or s.s.b. operation. These two transmission modes are not continuous in nature and will cause the relay to chatter. The "hang-time" network will slow down the decay of the d.c. level present across C3, thus holding RLA in during the short gaps in the transmission.

Construction

The construction of the project is very straightforward. First mount all the components on the p.c.b. and install Veropins where off-board connections are to be made. As mentioned earlier the relay contacts are rated to handle mains voltage.

If you intend to use the finished project to control mains-powered equipment, great care should be taken to use well insulated wire that is rated for 250V a.c. and to sleeve all bare off-board connection on the p.c.b.

Circuit Modifications

To increase the "hang time", the value of C3 should be increased. The switch S1 could be replaced with a wire link if the unit is to be used exclusively on s.s.b.

The prototype unit had no input attenuator (R1), so when it was tested with a child's QRP c.b. rig, the relay tended to false-trigger even on the stray r.f. picked up from the receiver's local oscillator. This means there's no lack of sensitivity, in fact in a shack with

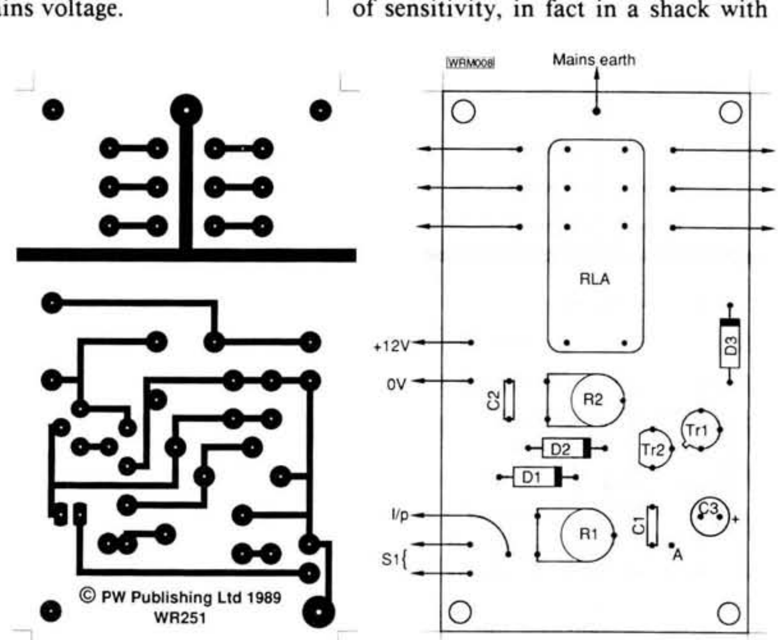


Fig. 2: Full size single sided track pattern and component placement diagram. Note, mains earth connection need only be used when the relay is controlling mains powered equipment

more than one TX the circuit may still false-trigger. To have a more positive control over the relay, a tuned circuit may be installed in place of R1 (Fig. 3). With the resonant circuit tuned to the same frequency as the required transmitter the relay will then operate only with that one rig, providing there are no other transmitters in the shack running on or near the same frequency band.

In areas with high field strength it may be necessary to install the relay in the same screened box as the ancillary equipment it is to operate. Then a closer form of coupling can be used as shown in Fig. 4., instead of the short length of insulated wire which forms the sensing antenna. ***PW***

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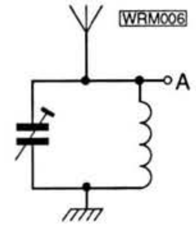

Fig. 3: Tuned circuit for making the r.f. relay frequency-selective

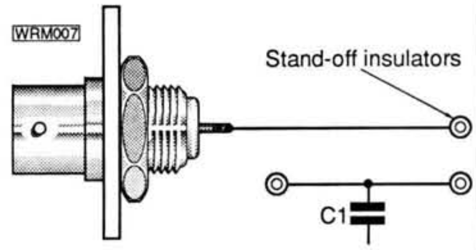

Fig. 4: Suggested close coupling technique shown inside ancillary equipment

SHOPPING LIST

Resistors		
0.15W 20% Carbon		
Horizontal preset		
10kΩ	1	R1
1MΩ	1	R2
Capacitors		
Monolithic ceramic 63V		
1nF	2	C1,2
Sub-miniature radial electrolytic		
10µF	1	C3
Semiconductors		
Diodes		
1N4005	1	D3
1N4148	2	D1,2
Transistors		
BC109	1	Tr1
BC337	1	Tr2

Miscellaneous
RLA OM1 Cirkit (46-70060); p.c.b.; connecting wire; S1 s.p.s.t. miniature toggle; Veropins.

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A FEW SIMPLE RULES: Your ad. should follow the format of those appearing below, it must be typed or written in block letters; it must be not more than 40 words long including name and address/telephone number. Swaps only—no items for sale—and one of the items MUST be radio related. Adverts for ILLEGAL CB equipment will not be accepted.

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Have Yaesu FT-757GX, FP-757HD and FC-757AT, unmodified and little used, on receive only. Would exchange for quality medium format camera system, or picture mounting hardbed press and picture mount cutter. Mr Barnes. Tel: Halstead 0787 473112. *E947*

Have 48K Spectrum+ with RS232 interface and Microdrive, plus lots of spare cartridges. Complete with leads, p.s.u., manuals and reference books all in good condition. Would exchange for working condition Commodore 64 computer with disk drive. Richard G6AKG. Tel: 0202 678558. During office hours. *E948*

Have Realistic PRO-2004 scanner. Would exchange for a Yaesu FRG-7700 receiver. Ray. Tel: 0443 755876. *E893*

Have Praktica MTL5B camera with auto flash, 50mm, 35 and 135mm lenses plus shoulder strap and holdall in excellent condition. Would exchange for hand-held scanner, e.g. Tandy Pro-32 200 channel or good 144MHz hand-held transceiver, w.h.y? Dave G1CCL, 192 Ambleside Road, Lancaster LA1 3ND. *E895*

Have Nissen Panasky short wave DX receiver with bandspread, covers m.w., 5.9–6.2MHz, 9.45–9.8MHz, 11.65–12MHz, 15.05–15.5MHz with logging scale. Would exchange for Zenith 12 35mm camera or telescope with 100x magnification or Super 8mm sound films. G8BSK, 290 Priory Road, Southampton SO2 1LS. *E950*

Have photographic colour analyser, professional valved type, made by Lectra Laboratories model number PTM-10. Would exchange for scanner 25MHz up with f.m. Tel: Walsall 642509. *E962*

Have Realistic DX-300 communications receiver 0–30MHz. Would exchange for Matsui MR-4099 type portable receiver. M. Whiting, 122 Weatherhill Road, Lindley, Huddersfield. Tel: 0422 79023. *E965*

Have 63 *Practical Wireless* magazines 1974 to October 1988, all in excellent condition but some issues missing. Would exchange for portable receiver covering 108 to 174MHz. Tel: Paignton 550035, after 11 a.m. *E985*

Have Realistic DX-440 digital readout h.f. receiver with a.m. u.s.b. and l.s.b. modes, covers 150kHz to 30MHz continuous plus 88 to 108MHz f.m. worth £150. Would exchange for v.h.f.-u.h.f. scanner, must cover 144MHz and 430MHz amateur bands. Ken. Tel: 091-548 7041. *E993*

Have Emidicta model 2400E/12 recorder; Cossor 1035 Scope; Marconiphone 248 cabinet; Eddystone 358X cabinet and 10W amplifier 12V d.c. input. Would exchange for any military wireless equipment, government surplus wireless equipment handbooks or Eddystone 'S' meter for 888A receiver. Tel: 0926 400876. *E994*

Have A.W.A. CR6B valved dual-conversion receiver, made in Australia, in mint condition. Would exchange for English or European made receiver. 39 Central Avenue, Maylands, West Australia 6051. *F002*

Have 10GHz QRO Klystron, 75mW flange output with micrometer tuning. Would exchange for good CdS light meter. Mann. Tel: Cambridge 860150. *F015*

Have FT-690 MkII complete with NiCads case and manuals, also 50W linear amplifier. Would exchange for 430MHz multimode base or mobile or FT-726. John. Tel: 061-202 2715. *F023*

Have Yashica FR and FX-II SLR 35mm camera. Would exchange for dual-band hand-held transceiver or one for each band, 144MHz and 430MHz. J. D. Bolton G4XPP, 10 Bowness Road, Coniston Park Estate, Timperley, Cheshire WA15 7YA. *F032*

Have Standard C58 multimode portable transceiver plus manual and accessories. Would exchange for amateur radio gear (no computers). J. D. Bolton G4XPP, 10 Bowness Road, Coniston Park Estate, Timperley, Cheshire WA15 7YA. *F032a*

The G2BCX

Antenna Clinic

Session 2

In the course of a year, antenna specialist F. C. Judd G2BCX receives many queries from radio enthusiasts, both about his own designs and about antennas in general. These come not only from various parts of the British Isles, but also from as far afield as Australia, New Zealand, Indonesia, Sri Lanka and several European countries.

Often, several people will ask a very similar question, highlighting a point that may be widely misunderstood. This series aims to explain some of these.

Q "I want to construct vertical antennas for the 14, 21 and 28MHz (20, 15 and 10m) bands, based on the 'Ring Base' antenna for 144MHz (2m) published in *Practical Wireless* October 1982 (reprinted in the PW publication *Wires & Waves*). Can you supply the dimensions and the value of the loading inductance for each antenna? Also, what would be the optimum height above ground for these antennas?"

A The 2m Ring Base antenna was designed to operate as a virtual "free space" antenna at a height of several wavelengths above ground. Its overall length is approximately 1.27m (50in), the diameter of the quarter-wave (λ/4) ring at the base being about 140mm (5.5in). The general configuration is shown in drawing (a). On a frequency ratio basis, the approximate dimensions for each of the h.f. bands mentioned would be:

Band	Length	Ring diameter
14MHz (20m)	13.15m (43ft)	1.4m (55in)
21MHz (15m)	8.76m (28.7ft)	980mm (38.5in)
28MHz (10m)	6.35m (20.8ft)	700mm (27.5in)

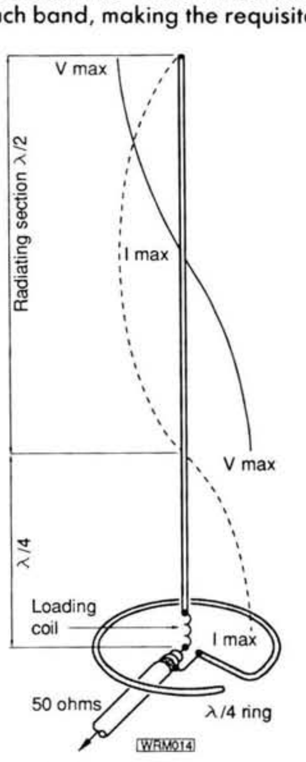
The minimum height of the **bottom of the antenna** above ground to prevent detuning the ring at the base would have to be at least a quarter-wavelength at the frequency of operation. In view of the total length of each antenna, the construction would need to be fairly substantial, with large diameter tube for the elements and a strong mounting base. For the 14MHz band, the bottom of the antenna would have to be about 5m (16.4ft) above ground. This, plus the length of the antenna itself (13.15m) would bring the overall height above ground to 18.15m, or about 60ft!

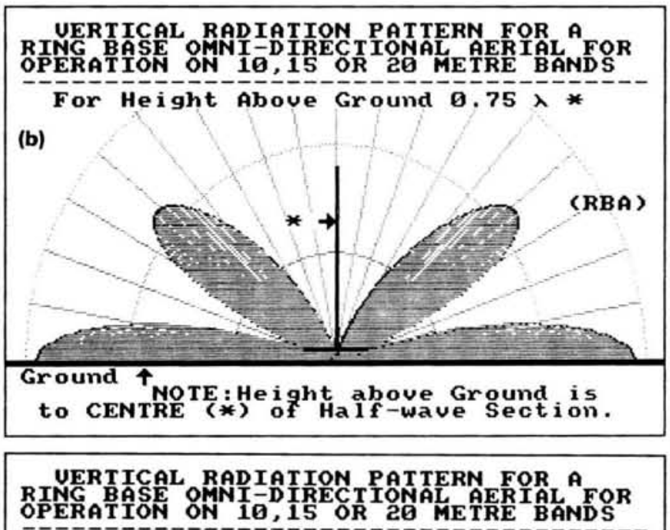
Even for the 21MHz band, after allowing for the minimum height to the bottom of the antenna, the overall height would be 12.46m (41ft).

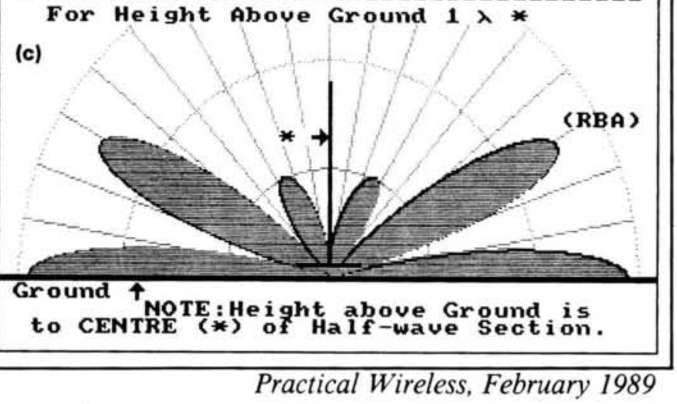
The amount of series inductance between the bottom of the vertical element and the base ring would have to be determined empirically, because of the additional but unknown capacitance and self-inductance introduced by the much longer and larger diameter material used for the main element. To establish this would entail building a prototype antenna for each band, making the requisite adjustments and then measurements to ensure an acceptable performance. There would be no point in doing this for the following reason.

The vertical radiation pattern is determined by the height from ground to the **centre of the half-wave section,** which must also take into account the initial minimum height of the bottom of the antenna. For either band this would be a minimum of three-quarters of a wavelength (3λ/4). The resultant vertical radiation pattern (computer generated) would be as shown in drawing (b). This shows two lobes at a very low angle and two of more or less the same magnitude and width at an elevation of 40°. Since the r.f. power to the antenna is shared between the lobes, about half would be wasted at the higher angles. Increasing the height of the antenna, which could prove mechanically difficult, would do nothing to improve the vertical radiation as the second pattern (drawing (c)) illustrates. So, in this case, it is not just a matter of "scaling up" the size of the antenna. The design simply does not lend itself to h.f. band operation.

(a)







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- ★ Superb sensitivity — less than 0.16V at 12dD SINAD
- ★ 6 different Dual Watch modes — yes, 6 different monitoring methods!
- ★ 14 different scanning modes
- ★ Paging function — individual and simultaneous group call available
- ★ DTMF and CTCSS available as optional extras
- ★ Seperate Tx and Rx frequencies can be set for semi-duplex operation
- ★ Squelch-Off button to save knob twiddling
- ★ Battery Save and Automatic Power Off facilities
- ★ Rotary or Pushbutton frequency selection
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On The Air
On The HF Bands

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

The bands have doubtless seemed better than they should have on account of the DX pile-ups and the contests; but my own yardstick is the signal strength of some of the Antipodean "regulars" over the long path in the mornings—and by and large these have been pretty steady

Question!

A nice letter from **G0KDZ** (Thirsk) to kick off with. Mike poses the question: if one can work the world with 100 watts, a CB antenna up at 7m, what is the point of a 18m tower surmounted by a four-element beam, and a linear down below? Clearly we have here a candidate for the G-QRP Club! Seriously, one can indeed work the world with very little when the conditions are right; but the 28MHz band (10m) will be virtually dead for several years at the bottom of the sunspot cycle and on the 21MHz (15m) and 14MHz (20m) bands any attempt at cracking a pile-up is made so much easier if one has a Big Signal. Do any readers have words of wisdom to add to this?

Mentions

John Fitzgerald writes to mention the WAB Awards which are available to the s.w.l.s as well as licensed amateurs. The regular WAB net frequencies are (nominal) 1.93–1.95MHz, 3.76MHz, 7.06MHz; and the DX enthusiasts congregate on 14.28MHz, 21.36MHz and 28.46MHz. Details on everything WAB from G4KSQ at 22 Burdell Road, Sandhills Estate, Headington, Oxford OX3 8ED.

G0DKN (Salisbury) offers a note of his activities in October in Malta. Andrew took along a FT-290R driving a Howes 2-20 transverter, putting ten watts into a dipole at some 20 metres above ground, 9H3JJ was the call. Among others AL7FQ, C30DSA, LU5DL, N5AU, ON4RIP, P4OP, RO5OC, VK3AG and ZL2JL were raised. On the licence question, G0DKN telephoned a couple of days before to enquire about a ticket—he was told to bring along a photocopy of the front page of his licence and a photocopy of the Validation document. On arrival in Malta the licence was issued within ten minutes!

Finally in this section we must mention **G0EWR** (Stourport-on-Severn) who has a QSL for c.w. contact with W4NTW, Echo Radio Club, for a c.w. QSO on 16 June 1987, on 21.020MHz. Will the rightful owner please claim his QSL—it certainly couldn't have been for G0EWR for various reasons. The address is: D. Wale G0EWR, 47 Ribbesford Drive, Stourport-on-Severn, Worcs DY13 8TQ.

Top Band

Where have all the reporters gone? Our only mentions this time are from **G3BDQ** (Guestling) and **G2HKU** (Sheppey); the former used s.s.b. to raise JX1UG, UP8A, HB0CZS, UO4OXV, LX1BV and other Europeans, plus c.w. to UG6GAW and EA6NB.

G2HKU used his s.s.b. for contacts with UP8A and ON7BW, while c.w. accounted for OZ3FI and OK1DRU.

The 3.5MHz Band

Yes, there is some gold to be found amid the vapourings here! Try c.w.! However, all this being said, alas the only reporter on this band was **G0HGA** (Stevenage), and even using her full power Angie didn't manage to get outside of Europe save for UA9FB. Although, on the other hand, she did make it to just about every part of Europe, in the evenings.

The 7MHz Band

This seems to hve been the main area of interest for G2HKU this time; Ted offers c.w. with UZ0QWT, RF0FWW, U0AL, UL7VAB, RI8BT, UA3AVV, W1KM, K2OZ, VU2ASH, N4UB and SV4AAQ.

The 7MHz band (40m) activity at **G4XDJ** (Billingham) included contacts with ON7VA, G3LPN, U1AU, G4ITL, W1MK, G0GRU, SM4GL and SM6LJU.

G0JFM (Brixham) managed to find time for s.s.b. with I2UPG and SV1DO on this band.

Quite an enormous list comes in from G0HGA. Most of them were Europeans while using QRP, but on the 100 watts of c.w., KB2RM/4, UZ0AB, J3/K8CV, N9BQ/M, W4BQF, TA1Q, N2ER, K1ZZI, W3NZ, 5N70KRA, W2FH, N5IP and UA9SH were all popped in the bag.

Up North now, to **GM3JDR** (Wick), Don stuck to c.w. on the band, which resulted in 9Q5DX, RV0YF, U0AL, JX1UG, JA5DQH, JE7MQB, JR1TNE, JA3RRN, JA6BSM, JA4GQK, JA8DLQ, JE1VTL, JH1GRG, JF1NZW, JH1QOJ, JA5RH, CM2QN, CO2SO, TA2AO, UA0WAO, YC5PD, NS7Z, WO7K, KH6IJ, KL7KJ, AL7B, AL7IF, AG4T/KL7, NT0Z, VU2ASH, 3W8CW, HC3AV/5, 8P6AU, YC3HRM and XE3PLV.

Finally for this band, G3BDQ who stuck mainly to s.s.b.; that way he raised 21 assorted JAs, UZ9CXX, UA0SEM, UJ8JJI, 6W8KW, VE2RP, TA2BK, VK3NC; c.w. knocked off SN70POZ (Poland), UH9HWB, A92BE, C6ANX and UI9ACP.

The WARC Bands

G2HKU tried 10MHz and made c.w. contacts wih UA6LGM and DL1DQ.

A 24MHz addict s.w.l. is **Ian Hatton** (Derby) who uses a G5RV and a Racal RA17. Using this combo, Ian picked up ON4ABB, ND1T, YU2WM, CU2AF, 4X6RN, KV4AD, IS0EP, W9WPV, EA9TP, CT2HB, J37AJ, W5CNE, K4VHV, W4QO, EA4DW, T77T, 5B4OK, I0AMU, Y25WJ, VU2NR, W0CM, TK5BF, VE3VX, K6STI, YT1V, PY3NZ plus loads more Stateside stations on s.s.b. around 24.890–24.990MHz; some of the latter were working an (inaudible in Derby) P29ZL.

GM3JDR found c.w. on 10MHz did the trick with JP3AZA and VK5FE, while on 24MHz he managed Ws, VEs, EA6BD and TU4CO.

The 14MHz Band

On this band we start with G2HKU who found DL4EB/SV9, HK1FCG, W2MUM, LU5EID, HK1ATG and P43SF.

On 14MHz (20m), G4XDJ mentions VK5GZ, VK3GFO and VK3PX.

Turning to G0HGA, clearly Angie doesn't go a lot on the band, but she did get around to putting a fifty watt carrier up the vertical, which managed UO5AR and ZZ2WV (QSL via PP2WV): in addition there were lots of Europeans in the contest.

G3BDQ tried some QRP—three watts to a doublet—and raised CT3CU on s.s.b., then AL7FG, DK2SC/4S7, VE8RCS and V47Z.

The 21MHz Band

Now here's a band for you; more active than 28MHz, less noise than 14MHz and plenty of DX. What more could one ask?

First, we have a report from **GM4SVM** (Stirling) who offers c.w. contacts with 5N28ELT, VU2SFY, PY2PAR, CO6SF, ZC4RF and CX8DR, who came back to a CQ when the band was dead due to auroral activity. Then s.s.b. yielded KP2BH, P4/KQ2M, ZS6OT, JY7CI and 4X1OZ. Gordon has just finished a monoband two-element beam to replace the rotary dipole and wonders if as a result he will miss much DX off the back. I doubt it, somehow!

G0CLP (Wymeswold) used to be G5ECD. He is operational, between studies, with an Icom 730 and a three-element beam, mainly on 21MHz (15m). In the contest on October 16, Chris had some 450 QSOs, and a multiplier of 67, with all JA call areas, all W prefixes including some twenty stations on the West Coast and all Canadian prefixes; also VK8AV, VK6LW, UL7CW, UM8MAD, UJ8JA, 5N0B/G3IGQ, VS6UO, NY6M/KH2, ZC4NC and several PY and LU stations. On October 28, P40TL was hooked along with UZ9OWM/UJ7 and WB4FLB/V47. In the s.s.b. contest on October 30, HD9OT, ZP5OY and YS0YS were raised. Finally, late on November 2 and into next morning, a session produced ZL3BJ, PY5BI/ZP9, ZL1AW, all dredged up from what appeared to be a dead band.

Now to G0HGA and the QRP; her c.w. managed YU1BEF, EA6ZY, UA3VBU, UR2QA, UA1DZ, UV1AS, UA9FGJ, K2UPD, N2KW, VE5UF, K2SIG, AA6DX, K3ZO. KA1DWX, WB0O, K2MGR, NM2Y, VE7CC and shoals of Europeans.

That 50:50 ratio of c.w. and phone seems to have been used all month by G4XDJ; however, it may be on 21MHz he made it to KI1K, UA6LHB, VE8RCS and HB0CZS.

Now GM3JDR. First the c.w.: HL0K, 3D2XX, 5UV386, P40ZZ, W6KG/5B4 (Lloyd and Iris Colvin on tour again), A4XEF, FY4EP, plus lots of JA and W; on s.s.b. were VP8APK, V44KI, JA, PY and Ws.

As for G2HKU, he obviously didn't fancy the band much this time, with just the one c.w. contact with VE1CAF in the list.

The short s.s.b. list from G3BDQ includes 9N1RN, UZ9OWM/UJ7K, 9V1WP, NW2000 (USA), PJ0J, HI3JO, 8P9X, HD9OT, PJ1B, FJ5AB, ZF2ML/8 and TA2KB.

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Access

The 28MHz Band

Having little result on 14 and 21MHz, Mike at G0KDZ tried 28MHz (10m); on s.s.b. he made it to 9K2DR, YC0OMO, TJ8UQ, HC5CL, FM5DN, TE2Y, D44BC, C53FV, 5H1HK, 8P9Y, 8P9FD, ZX0F, ZF2ML/A, a near-miss with 9Y4IBN, XM3NBE, 9Y4VU, BY1BH, JY7SR, JY7EA and VP2ET. On c.w. the contacts included VQ9QM, XE2XD, VU2DPG, PJ2AM, FY5YE, KH6SS/5N0—and, of course, smaller fry such as W, VK, ZL and JA in both modes.

Turning to G3BDQ, John reckoned it to have been one of the best months ever for DX, although lower at the time of his letter. Contacts using s.s.b. on this band included J73LC, PJ2FR, J3/WD8MQJ, J6LAH, A25/ZS6P, FH5EF, KB6VIR/5N3, 9Q5NW, JY9LC, H5AK (Bophuthatswana), OA4BQH and TE5T; and of course the usual run of VK, ZL, ZS, W, JA and other log-fillers.

Turning to **GM4ELV** (Glasgow), Dale uses QRP but has a good take-off. He mentions J87CD, ZD8MAC, CE3BFZ, PYs, ZP5Y, CE6EZ, LUs, EL8E, UJs, FT5ZB, Z21JE, Ws, HK6BER, VK, EA9AX, OY9JD, ZL, VEs, TI2YEM, ZSs, VP8BRY, HL88IKL, KP4FBA, TU4CQ, OD5QX, RI8OA, HL88BPI, HL0AQF, JAs, 6W6JX, CN8FC, 5N4/4X4FF, CU3AA,7X2LZ, EK8IZN (QSL via UA9OJ), 6W1PM, C53FV, 5N3/KB6VIR, VO1QF, PJ2FR, P40V, HD0OT, NP4CC, JW5E, FM5DN, 6Y5NP, JY7HH, 9Q5NW, VE3PRU, YI0BIF, 9N1RN, PT2ZDR, SZ2COT, SX2VPH (both Greek varieties) and a load of the smaller fry. Dale notes that the JY7s were a celebration of the birthday of King Hussein, JY1. Work seven of them and you can receive a splendid certificate; for details, write to the Royal Jordanian Amateur Radio Society, PO Box 2353, Amman, Jordan; if applying for the certificate, enclose 10 IRCs.

GM3JDR notes his c.w. contacts with VS6UP, UA0LAY, 5UV386, AX8HA, JT1AO, VU2IIT, LU9CV, CX7BBB, RT7U, CR2CWT, VK3DQJ, UZ0UWI, VK7RK, VK2DID, VS6UN; the s.s.b. managed 7P8EG, ZL1CD, ZL2BPO, ZL1ATV, UZ0UWE and ZS6KW.

Next we come to G4XDJ and it was fifty-fifty phone and c.w., including W2RNH, W3ARK, KA8CVH, WA4WIN, K2SIG, G0IXE, AE4X, VE3JFH, NR5B, PY7GI, KI1K, W1PAN and KM4EH.

Next we come to G0HGA, who has been on the band with QRP at 5–7 watts and c.w.; this resulted in JA0DWY, JA7CTU, JA1SGX, PY7AFL, W4OO, K2QJ, UV0BB, JR2BPV, JA9BGO, JE5CXD, JL3KEH, AE4X, K2KIB, W9DH, N4AR, 4Z4DX, JA4ISL, 4X6JS, UA0JB, W0WP, W9VE, KC2X, N8FGH, N7HUS, K2POF, UA0LAY, UA9KCN, UA0BAM, UL7JW, N2KW, K1HZ, WB8RTW, WA2VYA, ZC4ZR, EA7AAW, N1FES, AA4SB and K1BU. Then, by going to about 50 watts, Angela was able to raise VK4TT after not quite connecting at the lower power level. In addition to this lot, of course, there were lots of the usual and inevitable smaller fry.

G0GJB was interested to read the reference to the Ten Metre FM Group in this piece and wants the address to write to, so for him and any others who may be interested here it is: try G4XRU, at 33 Hayling Rise, Worthing, W. Sussex BN13 3AL.

G0JFM offers his collection for the month, with VE2OC, A4XJV, OH1AT/9 in Lapland, whose antenna fell down during the QSO, and OA8K in the Amazonian jungle.

Forthcoming Events

As always, my thanks to the invaluable W1WY Contest Calendar, to RSGB's *DX News Sheet*, and to *The DX Bulletin*, as well as the passing comments in your letters and my own ears.

Mostly this section is a look into the future; but we must say this time what a wonderful job the HA group have made of their Vietnam expedition. 3W8CW and 3W8DX have delighted the ear and the eye with the sheer style of their operating. Their advertised aim to roll up some 100 000 contacts seems well on the way to fruition. At one stage they were on 28.535 listening two up, while a pirate was active on 28.535 transceive! On the negative side of this one, I understand they were not hopeful any longer of any XW operation this time, but that they would make it a prime target for next year.

If you are looking for SU, look for SU1EE; Charles Signer finally got the call after a year of trying and is very active. We hear he is there till May when he moves to the Sudan.

That 3D2XX Rotuma operation, although a mite overshadowed by the Vietnam job, still managed some 32 000 contacts; the QSL address is Box 1, Los Altos, CA 94023, and NOT the usual NCDXF address.

Still with the Big Guns, we see that the P40V expedition score in the CQ WW SSB contest multi-class knocked up a raw (i.e. before removal of dupes) score of about 58 million points, which seems to knock the 1981 previous world record for six. Over 5000 contacts, 158 countries, more than 38 Zones on each of 28/21/14MHz, on 7MHz there were 125 countries in 32 Zones, 95 in 28 Zones on 80, and 45 countries in 17 Zones on Top Band.

Looking at RTTY, I note that YI1BGD is now using the gear left by JR6AIB.

On the negative side, the planned Wallis FW0 operation was cancelled for want of some transport, so Vili stayed on as 3D2VV which caused some confusion when the Rotuma expedition was operating in somewhat similar style!

Albania may be never with us, but it is, in spirit, always with us: the latest manifestation of Slim is called Ramiz, ZA88RA, giving his location as 60XNR1, United Nations, Tirana, for QSL purposes. Nothing if not an optimist is Slim, whether from Tirana or anywhere else!

The current "possible" on the DXCC trial is now 320, with the acceptance of Malyj Vysotskij Island, and QSLs may be submitted for DXCC credit from 1 March 1989.

A possible new one is being mooted now; Ua-Huka Island, in the Marquesas. It is difficult to be sure without good charts, but this one lies closest to Fatu Hiva in the Marquesas and Tepoto in the Disappointment group, and if the waters between are clear, then it seems handsomely to meet the Countries Criteria laid down by ARRL.

When you get this, you should soon be able to hop into the shack and find Mellish Reef and Willis Is activity, by way of a group comprising VE3CPU, NM2L, KB2HE, ZF2KN and VE3IEO; they are setting off on January 3, thanks to an assist in the way of transport from Jim Smith VK9NS.

Looking a litle further ahead, word has it that Marion Island ZS8MI, will be activated from April 1989, by ZS6PT for a 14 month stint. QSLs are via ZS5E for Europe and Africa, while for the Yanks the route is to WA3HUP.

On the Awards front, I hear from G4XDJ that the Scandinavian award, mentioned in previous issues has now, thanks to Brian's pleadings, acquired a QRP section. Details on this one from Rick Meilstrup, OZ5RM, DK-7192185, Baynestien 6, DK2850, Naerum, Denmark.

So—there it is for another time. I need more reports form users of the bands, particularly for 1.8 and 3.5MHz. Come on you dab hands—show us how to do it!

The next three deadlines are: Jan 25, Feb 27 and Mar 29

VHF Up

Reports to Norman Fitch G3FPK
40 Eskdale Gardens, Purley, Surrey CR2 1EZ

As this is the first issue to appear in 1989, may I wish all readers a Very Happy New Year. This time last year I see I was reporting on a fine spell of tropospheric propagation at the beginning of November. However, for once history did not repeat itself and this month's postbag was of more normal proportions for an average, non-eventful month.

Awards News

Congratulations to Italian Reader **Silvio Rua IW1AZJ** (DF79j) who was awarded the "125" sticker for this 144MHz QTH Squares Century Club certificate number 80 on Nov 17. Of the 26 cards submitted, three were for Sporadic-E QSOs, five for tropo contacts, the rest for m.s. and all but one were on s.s.b. mode. His total squares worked at Nov 4 was 143 and he hoped to have reached 150 after the Geminids in December.

Tropo contacts from Turin are difficult, hence Silvio's reliance on m.s. for the more distant squares. He now runs 100W using a Jaybeam 8-ele quad antenna for tropo and Es and an 11-ele Yagi for m.s. He can use c.w. on m.s. using an IBM "clone" computer with his own software. PA3DZL/P (BN57h), on an old North Sea platform, was worked this way on May 15 last year.

Some unusual confirmations were from HG1YI/MM in CX (JM27) square off the coast of Algiers on 2 Aug 1988 and I0JXX/O in FB (JN51). The latter was a very rare one since there is only a tiny piece of land in the extreme north-east of the square. The place is mostly under military control, but the World Wildlife Foundation manages the Oasis of Macchiarotonda from where the expedition operated in April last year.

The 1988 Tables

The rather early copy date for the March issue (December 22) dictates that the final placings for the 1988 annual tables will be published in the April edition this year. This means you will have up to January 25 to get your final scores to me.

Beacon Notes

I see from issue no. 88-16 of Hal Lund's ZS6WB *ZS VHF News* that ZS5SIX (KG50) is now operating on 50.321MHz having been relocated near Pietermaritzburg. It runs 10W to a halo antenna. ZS6PW (KG44) is on 50.010MHz from about 1200 to 1900UTC beaming north.

A new beacon began operating from Iceland on 50.0575MHz on Oct 29 running 50W to a vertical antenna. The callsign is TF3VHF and the locator is HP94CC. It has been heard in Holland but no reports of its reception in any letters from British Isles correspondents. Such reports should be sent to G4CVI or TF3JB.

Amstrad Computer Programs

The paragraphs in the December issue about amateur radio programs for the Amstrad PCW8256/8512 computers brought several inquiries. I have since added further programs to my library. These include: YAGIS based on DL6WU's doubly optimised designs for v.h.f. Yagi antennas; FSPL, a simple free space path loss calculator and SPB, a satellite power budget program.

For meteor scatter operators I have a couple of useful programs. MSD1 produces a table showing the reflection efficiencies in eight directions at hourly intervals. MSD2 is a dedicated program for you and your sked partner and calculates the antenna azimuth and elevation plus distance as well as displaying the efficiencies in percentage and histogram form. In each version 17 popular showers are programmed in and any others can be accommodated by entering their right ascension and declination figures.

Previously I offered to supply listings but this is inefficient. I am now only prepared to copy onto your ready formatted disks, either CF-2 or CF-2DD if you have a Drive B available. Drop me a line first enclosing an s.a.e. and I will send a list of all the current programs and other information. Please do **not** send any disks without prior agreement.

My local public library has a good selection of books referring to the Amstrad range. One of them is called *The Amstrad Companion* written by David Lawrence and Mark England and published by Sunshine Books. The ISBN number is 0-946408-95-5. It is devoted to CP/M, Basic, GSX and Logo and I find it much more informative than the Amstrad manuals.

Mallard BASIC is quite fast. For example the design for a 25-ele u.h.f. Yagi takes just eleven seconds while a complete pageful of satellite data appears in 45 seconds. I have no idea if these programs would run on other than the Amstrad PCW8000 series computers.

Scandinavian VHF Meeting

I was talking with a Danish station on the 14MHz v.h.f. net recently and he mentioned the annual meeting of v.h.f. enthusiasts. The Scandinavian countries take it in turns to run these events and this year's will be in Jutland on the second weekend in June. They attract dedicated v.h.f. folk from all over Europe and offer a good mix of technical and social content. I will publish more details when I get them. It is a pity they occur at the peak of the Es season though, and this could discourage some from going.

Annual v.h.f./u.h.f. table
January to December 1988

Station	50MHz Counties	50MHz Countries	70MHz Counties	70MHz Countries	144MHz Counties	144MHz Countries	430MHz Counties	430MHz Countries	1296MHz Counties	1296MHz Countries	Total Points
G1KDF	48	17	—	—	92	22	66	12	37	7	301
G6HKM	47	15	—	—	78	28	54	19	31	15	287
G4XEN	47	14	36	5	72	34	51	15	—	—	274
G1SWH	59	20	—	—	95	20	55	9	—	—	258
G8LHT	38	8	33	5	67	32	48	17	6	2	236
G1LSB	37	12	—	—	71	25	55	19	—	—	219
G4SEU	35	13	67	9	48	11	29	4	—	—	216
G0IMG	49	15	36	6	49	12	24	5	—	—	196
GM0EWX	57	15	—	—	58	24	7	3	—	—	164
G4DEZ	33	16	—	—	30	16	27	6	34	10	162
G6MXL	20	9	19	4	42	19	19	9	9	3	153
GW6VZW	50	16	—	—	70	17	—	—	—	—	153
G1IMM	35	11	—	—	56	12	31	7	—	—	152
G0EHV	—	—	50	7	68	23	—	—	—	—	148
G4VOZ	27	14	58	8	—	—	29	8	—	—	144
ON1CAK	—	—	—	—	72	34	23	15	—	—	144
G1EZF	—	—	30	5	76	33	—	—	—	—	144
GM0HBK	48	13	—	—	54	22	—	—	—	—	137
G4YCD	12	9	—	—	84	30	—	—	—	—	135
GJ6TMM	30	15	—	—	44	21	10	11	—	—	131
ON1CDQ	—	—	—	—	66	34	16	15	—	—	131
G8XTJ	34	5	—	—	58	14	—	—	—	—	111
G4ARI	—	—	33	4	60	13	—	—	—	—	110
G8PYP	21	9	2	1	50	16	6	2	—	—	107
G4ZEC	—	—	—	—	78	29	—	—	—	—	107
GW4FRX	—	—	—	—	71	30	—	—	—	—	101
G7ANV	—	—	—	—	75	26	—	—	—	—	101
GI4OWA	19	17	—	—	48	16	—	—	—	—	100
G3FPK	—	—	—	—	78	22	—	—	—	—	100
G6MGL	19	10	—	—	49	10	—	—	4	2	94
GW4HBK	22	18	43	6	—	—	1	1	—	—	91
G1SMD	21	17	—	—	25	18	—	—	—	—	81
G4AGQ	—	—	15	2	38	8	12	4	—	—	79
G1DOX	16	2	19	2	22	5	5	2	2	1	76
G2DHV	5	1	22	2	30	6	7	2	—	—	75
G1CEI	—	—	—	—	59	12	—	—	—	—	71
G4WHZ	6	4	—	—	33	19	—	—	6	2	70
G4WND	—	—	60	7	—	—	—	—	—	—	67
G3EKP	12	3	16	4	7	4	5	1	—	—	52
GU4HUY	—	—	—	—	35	16	—	—	—	—	51
GM0JOL	—	—	—	—	30	10	—	—	—	—	40
G4ZVS	—	—	—	—	34	5	—	—	—	—	39
G0HGA	—	—	—	—	30	6	—	—	—	—	36
G0HDZ	—	—	—	—	30	5	—	—	—	—	35
GM1ZVJ	4	3	—	—	14	7	—	—	—	—	28
G8PNN	—	—	21	3	—	—	—	—	—	—	24

Worked All Britain

John Fitzgerald G8XTJ (BKS) has sent the December Press Release covering the WAB awards. The first 50MHz Decade Award for s.s.b. went to G4ZUR and the first District Award Class 3, for working 200 districts on 144MHz f.m., was won by GW8PTS. There are WAB nets on 144.43MHz on Fridays at 2030 and on Sundays at 1000 or 1030 local time. On 144.44MHz the net meets on Mondays, Wednesdays and Fridays from 2000 or 2030 and all are welcome to join in. Full details of the WAB group can be obtained from G4KSQ.

Contest News

As usual at this time of the year, the RSGB seems not to want to let anyone know any details of v.h.f. and u.h.f. contests. On a more positive note, the Derby and District ARC has forwarded details of its 144MHz event scheduled for March 12, 1300–1700UTC. Any mode provided you observe the band plan. Usual RS(T) exchanges with serial numbers starting at 001. State your adminstrative county, even if it no longer exists, e.g. Greater London and Greater Manchester.

Scoring is two points per contact except that G3ERD is worth ten. There is a county multiplier and countries outside the UK are regarded as extra counties. There are three sections; Full legal power, Low power—30W maximum output—and listener. Fixed and -/P categories and entries should be sent by March 29 to the DADARS at 119 Green Lane, Derby DE1 1RZ. The rules mentioned -/A operation but there is no such licence category now, of course.

The 50MHz Band

Danish stations seem to expect they will get a 50MHz allocation within two years. Similarly the Swiss amateurs might have an allocation in the next year or so.

After all the excitement reported last month, it has now gone rather quiet on the band from the UK. **Bob Nixon G1KDF** (LNH) operated in the Trophy Contest on Oct 23 for a few hours and had 15 contacts of which seven were with new counties.

Mike Devereux G3SED (HPH) sent a resumé of his activity up to Nov 2. At 1250 on Nov 2 he reports that G3GJQ was signing G3GJQ/5NO from JJ16 in Nigeria, the previous 5N28 being a special event suffix. Roy was running 7W to a 3-ele Cushcraft Yagi at 24m a.g.l. At 1944 he heard LA3EQ via Ar, then worked GM4COK and GM4DGT.

Ela Martyr G6HKM (ESX) has worked very little on the band, her only addition for the table being G1WWU (NOR) on Nov 14. Since his historic "first" G/5N QSO on Oct 22, **Bill Biltcliffe G6NB** (OFE) has only worked a few GWs and Northern G stations. Little activity either from **Steve Damon G8PYP** (DOR) who was going to install a gamma match on his 3-ele Yagi. **John Pilags G8HHI** (SRY) has managed to update his station at long last. He is now

active on the band using a Kenwood TS-680 and 5-ele Yagi.

The sole new one for G8XTJ was G0BLB (AVN), the only other noteworthy contact for John being with GJ4ICD. Welcome to **D.J. Mullan GI6EIR** (LDR) who wrote mainly about the Amstrad programs but also mentioned forthcoming activity using a Yaesu FT-101ZD/FTV-901R transverter set-up with a 4-ele Yagi.

Keith Boleat GJ6TMM worked ZS3AT (JG87) at 1732UTC on Sept 9 and claims it as a GJ/ZS3 "first" on the band. He contacted Tom again on Sept 14 and ZS6XJ (KG33) on the 16th. Nov 4 brought GW1PDN (GNW) in IO81 for a new county, country and square.

Colin Robertson GM0HBK (HLD) on the Isle of Skye had not written for some while so sent details of his activity from last June. His most recent addition was a fairly local station GB2WQ on Oct 26.

Paul Baker GW6VZW (GWT) reckons his claim to fame was hearing ZS3AT repeat his callsign. Unfortunately Tom faded out before a QSO could be completed. In the Trophy Contest best DX was GW4MGR/P (CWD), other new counties being BFD, LEC, NHM and YSN.

The 70MHz Band

It is hardly worth a separate heading this month as there was virtually no mention of 70MHz activity in your correspondence, even though 17 readers have table entries. Only **Gordon Emmerson G8PNN** (NLD) reported anything and he worked G4PMK (YSW) on Oct 23 for a new county.

The latest issue of *QSB, The Newsletter for Four Metres* carries a front page item recording a new tropo distance record. This was achieved during the Trophy Contest on Sept 18 between G4RFR (IO90AS) and GM3WOJ (IO77WO), a QRB of 773km. Other news is of regular s.s.b. activity from GI4RYP (ARM) who listens on 70.200MHz most evenings around 2200 local time. John runs 12W to a 4-ele Yagi. G8ROU is reported to be constructing a beacon TX to be sited at Lerwick (SLD) and more details are promised later.

QSB is published quarterly at present by Roger Banks G4WND and had over 80 subscribers according to the October 1988 issue. Inquiries should be directed to him at "Rivendall", Kiln Way, Polesworth, Tamworth, Staffs B78 1JF. His telephone number is Tamworth (0827) 894464.

The 144MHz Band

Johan Van De Velde ON1CAK has written after some months, to update his table scores and those of his brother **Geert ON1CDQ**. Both are keen British Isles county hunters but Johan still needs CBA and CVE in England; ARM, FMH, LDR and TYR in Ulster; BDS, CTR, LTH, OKE, SCD and SLD in Scotland and SRK in the Channel Islands. He contacted GW4VEQ/M (IO83) on Oct 16 and EI3GE (IO63) on the 31st.

Angela Sitton G0HGA (HFD) still finds time to operate on the band, particularly on c.w. mode. During the contest on Nov 5/6 she worked an HB9 for a new country, many F stations and other DX. She concluded that conditions were good but that activity from the UK was down on the 1987 event.

Gerry Schoof G1SWH (MCH) has found his last "G" county for the year having worked GI4XKI (TYR) in IO64ML. Many readers have asked if there are any stations QRV from Tyrone nowadays, so that is a call to listen for. **George Haylock G2DHV** (LDN) operated in the November c.w. contest and has increased his ladder score as a result. He is the only reader who uses all four bands in this table.

Pat Billingham G4AGQ (SRY) has been rather work weary of late so did not feel like making much of an effort in the Marconi Memorial Contest on Nov 5/6. He made fewer than 50 QSOs, best DX being about 700km including the usual HB9s. He concluded that conditions were not all that bad as he scored more points than he got in 1986 for twice as many contacts. During a slight lift on Nov 13 Pat worked DL6KAI (DK), ON4KLY (BK) and PA3DEK (CK) on c.w. and all affected by deep, slow QSB.

Ian Cornes G4OUT (SFD) has taken over Jack Hum's G5UM job as RSGB VHF/UHF Awards Manager but found time to take part in the c.w. contest. He thought conditions were fairly good and concluded 94 QSOs in nine countries which has boosted his ladder total considerably.

Roger Colwell G4ZEC (BKS) participated in the Marconi c.w. contest, but was disappointed by the lack of support from British stations. He completed 126 QSOs of which fewer than half were with G stations and he wonders where all the GMs were. He did not think the conditions were all that good.

We discussed this contest at some length later and Roger suggests that having the RSGB event as well during the closing hours probably discourages many from taking part in the 24 hours event. It would be far better if both events started at the same time, then those who operated for the 24 hours could just carry on with their serial numbers. The disadvantage would be that of having a contest on a Saturday afternoon when many people have other things to do. Any comments from c.w. addicts?

The only exotic callsign in G6HKM's log this time is LA0DT/MM but unfortunately for Ela, Damian was in a square already worked. Her shack is in the garden but she now has a Kenwood TR-9130 in the house connected to an indoor ground plane antenna. This enables her to keep an eye on the s.s.b. end of the band during the day.

G6NB has not been at his new QTH long enough to put up all new antennas but seems to be doing well enough at present, in spite of generally poor conditions. In addition to local Gs, Bill has worked ON4XC, HB9BZA/P, F6HPP/P, PI4VHL, GJ4ICD, GJ6TMM and GW3KJW.

Annual c.w. ladder

	Band (MHz)				
Station	**50**	**70**	**144**	**430**	**Points**
G4ZEC	—	—	727	—	727
G4OUT	—	—	276	—	276
G0HGA	—	—	218	—	218
G4AGQ	—	37	167	12	216
PA3FAQ	—	—	199	—	199
G4WHZ	21	—	157	—	178
G0HLT	13	—	161	—	174
G4VOZ	29	93	—	18	140
G0HEE	—	—	111	—	111
G4ARI	—	29	80	—	109
G2DHV	10	37	45	12	104
G0DJA	11	—	69	—	80
G4ZVS	—	—	80	—	80
G3FPK	—	—	70	—	70
GU4HUY	—	—	59	—	59
GW4HBK	21	33	—	—	54
G0GKN	—	—	52	—	52
G1SMD	21	—	15	—	36
G6DIF	2	—	30	—	32
G1DOX	3	5	—	—	8

Number of different stations worked since January 1

David Law G6OYL (YSS) responded to the request for more reports on the Sept 9/10 opening to EA8, of which more later. He moved to a new QTH on Sept 23 and was nearly ready to go when he wrote in mid-November. He anticipated being on for the Geminids shower provided he could put up his mast.

G8PYP reports conditions as being generally quiet but with a few good days. Steve worked F6CTI (IN97) on Oct 31 and on Nov 4 G0AEA (IOS) for a new square IN69 at last, followed by F6IOG/P (IN97). The next day brought HB9SNR/P (JN36) and another new square JO30 thanks to DB8KJ. On the 14th he contacted EI3BEB (IO62) and GM0BQM/P (IO85), yet another new square.

The period Nov 5/6 was quite rewarding for GJ6TMM. On the 5th Keith worked five HB9s in DG, DH and EH squares. The next day brought five new squares; DG8MET (FH), DL4MDQ (FI), OE2KMM (GH) also a new country, OE5OLL (GI) and OE1RKU (II). Other QSOs were with OE5VRL/P (HI), six Ds and two HB9s in previously worked squares.

Now north of the border to **Mervyn Rodgers GM0GDL** (CTR) who worked GB2WQ on Oct 25. In a small tropo opening on Nov 14 he contacted G0AEA at 1910 with strong signals at both ends. Other south coast and some EI stations were audible but he could not stay on to have a try.

GM0HBK operated in an Ar event between 1522 and 1817 on Nov 2. Colin used c.w. to work OZ1BUR (EQ), DJ9YE (EN), DL9LBH (EO), SM6EAN (FR) and UQ2GMD (LR) which was a new country. OY9JD (WV) was another new country on s.s.b. GB3LER was Auroral at 1524 on Nov 7 but nothing else was heard till 1714 when he contacted LA5SAA (CT) on the key.

John Nelson GW4FRX (PWS) has taken down the bayed 17-ele Tonna Yagis that have served him so well with the DX. They were still in pristine condition. He has replaced them with four 18-ele Cushcraft Yagis and has also installed an elevation rotator. He is impressed with the design and construction of the new antennas except for the method of feeding the driven element, which he has altered.

GW6VZW mentioned some tropo contacts with D and F stations on Oct 16. On Nov 12 Paul worked ON2AAJ (BL) and ON4UVW (BK) which latter was a special event station at Ypres commemorating the 70th anniversary of the end of hostilities in the First World War. The same day brought QSOs with stations in DHM and ATM but he was still looking for CVE for 1988.

Reg Woolley GW8VHI (GNW) was home from Germany for a while in November. On the 14th, using 8W output and a 14-ele Yagi, he worked FC1FMU (ZI), F6APE and F1FHI (ZH), GJ6TMM, GJ7AOG/P and GU3EJL (ALD).

The 430MHz Band

ON1CAK's report went up to mid-October. On the 16th Johan worked DG8MET, DJ2IB (JN57) and GJ6TMM and the following day GW3KJW (GDD) in IO72. G6HKM reports a lot of activity in the Cumulative contest on Nov 7 and Ela had 73 QSOs including G3JOC (NOR) for a new county. She also worked three Fs, two Ds and seven PAs. G1DXI (HBS) was contacted on the 10th.

GJ6TMM worked HB9AMH/P (DH) on Nov 5. On the 6th Keith found OE2KMM and OE2CAL (GH) for a new country and square on the band, with OE5VRL/5 (HI) another new square. GM0HBK runs 100W and a 24-ele Parabeam and on Oct 10 Colin made a couple of s.s.b. QSOs via Ar with G8XVJ and G4CBW (YN). He worked GB2WQ on tropo on the 23rd but GM0GDL could not make the QSO with Tiree.

The Microwave Bands

G1KDF reports excellent conditions on Nov 15 for the third leg of the 1.3GHz Cumulatives with good reports exchanged with stations in the south-east. But Bob found activity disappointingly low and only made 18 contacts.

G6HKM made eleven QSOs in the Oct 30 leg of the 1.3GHz Cumulatives and G4APA (CBA) was a new county. In the Nov 15 session Ela made 26 contacts, G8BNE (YSW) being a new table county. On Oct 16, G8PNN worked his 63rd square on 1.3GHz thanks to FC1DBE/P (AJ). And that is all the microwave news this time.

The EA8 Opening—Postscript

Several more readers have responded to the request in the December issue for further reports on the extraordinary propagation to the Canary Islands on Sept 9/10 last year. I feel these should be published so that the propagation experts have as much data as possible to analyse.

Colin Oakley G0AEA (IN69UW) works down to EA8 ". . . with some regularity . . ." located as he is in the Scilly Isles. He uses a Kenwood TS-9130, 80W amplifier,, RX pre-amp and 10-ele Yagi 8m a.g.l. his QTH being 47m a.s.l. He worked six EA8s on the 9th and four on the 10th the calls being EA8s ACW, AGD, AOM, ARJ, AYY and BTA, plus EB8AIZ. He summarises the phenomenon as follows.

Numerous G, GI, GM and EI stations were heard working the EA8s, most of whom were S9+20dB. Several were conducting QSOs on 144.300MHz. Such was the QRM at G0AEA that Colin QSYed to the repeater frequencies and worked some EA8s, and EA7s in southern Spain, through a relay in north-west Spain. He is quite sure that if there had been anyone on from the Cape Verde Islands (D44) he could have worked them.

John Cornall G6IJM (IO83LS) runs 100W from a Kenwood TS-711E to a 17-ele Yagi by Tonna. His Blackpool QTH is only 3m a.s.l. and signals to EA8 have to traverse right over Snowdonia. He worked EA8BML at 1353 on the 9th and EA8ACW at 1436. Others were heard weakly but 'BML was copied on and off all that day and also on the afternoon of the 10th. John worked EA1QJ (IN53) at 1450 on the 9th.

G6OYL (YSS) came on the band late on the 9th and worked EA8BTA as well as EA1ED, EA1TA and EA2AGZ (ZB) who thought it was Es propagation. The next morning David worked EA1QJ, EA8BML at 0744 receiving an S9+60dB report and EA8AYY at 0835. Between 1042 and 1046 there was a pile-up on 144.300MHz with EA8s ACW, AYY and BPZ all having QSOs. Regrettably a special event station caused deliberate QRM in spite of being told about the DX.

Tony Jones GW4VEQ (GDD) had never written to any radio magazine before but was so excited by the event that he just had to put his experiences down on paper. He was at his parents' home when alerted by GW4HKX that the band was full of EA8s. He dashed across Anglesey to home only to find his electricity supply was off. The electricity board had chosen that very period to move a feed pole after he had waited three months for them to do it!

So he went out mobile with 10W and a halo antenna and between 1822 and 2158 worked EA8s ACW, ALZ, AYY, BEX, BML and BTA, plus several EA1s who were also very strong. At 1215 the next day, again using the mobile station, Tony worked EA8BML on f.m. and in the middle afternoon EA8AGD and EA8BQC on s.s.b.

He reckons the contact with 'BML on S22 was the best QSO he has ever had on the band and it lasted over two hours with GWs 0DDQ, 0GLX, 6ARL and 6DOK joining in. They also worked through the local GB3AR repeater and Mañuel's local relay on Fuertoventura Island. The QSO was conducted in Spanish and English and he even tried to teach him some Welsh.

In the December issue I mentioned the possibility that LA8OJ had worked into EA8. To date I have had no reply to a letter to Egil on the matter, nor have I heard him on the 14MHz v.h.f. net. However, in the EA8BML/GW4VEQ/M QSO Mañuel told Tony that his best DX was GM0KAE as already reported.

What I find so astonishing is that readers have reported extremely strong signals from the EA8s across such a wide front, typically from Cork to the G/GW border region; that is 300km. One reason why I have devoted so much space to this event over the last three issues is so that researchers can deduce if the duct moved around, rather like a car windscreen wiper, such that at one time the westerly stations were favoured, at others the easterly.

The European UHF Scene

GW8VHI operates mostly from Germany using his CEPT call DA4RG. Reg has been out with various groups and was a member of a team that operated from Liechtenstein in the October IARU u.h.f. contest last year. He said the trip was quite successful but he only worked on 1.3 and 10GHz. He contacted HB9, D and OE on 1.3GHz and HB9AMH/P on 10GHz, a QRB of 183km. On m.s. they only worked one station though.

They took the chair lift up to 1500m and hiked the rest of the way to 2369m. Later they discovered that helicopters can be hired quite cheaply so another trip is contemplated for this year using QRO equipment transported by this means.

Reg suggests that, contrary to what many believe, there is not such a great amount of u.h.f. and microwave activity in middle Europe. The reason they work more stations is that they are in the middle of things with stations in all directions and not stuck on the edge of the action like we are in the UK. His experience has been that, apart from contests, the bands from 430MHz up are dead. So it would seem this is a pretty universal phenomenon and not one unique to the British Isles.

432MHz Moonbounce

Last Oct 28 GW8VHI/DA4RG visited the station of PA3CSG when conditions were so good that a random CQ call on 432MHz s.s.b. was answered by OE3OBC. Geert's antenna array consists of sixteen 26-ele Yagis and he is always looking for skeds. He can work single Yagi stations running 700W, so two or four Yagi stations using the legal UK limit

QTH Locator Squares Table

	Band (MHz)			
Station	**1296**	**430**	**144**	**Total**
G3IMV	42	122	406	570
G4KUX	—	120	372	492
G8GXP	45	151	331	527
G4DHF	—	—	307	307
G4SWX	—	—	293	293
G4RGK	48	115	274	437
G4XEN	—	109	270	379
G1EZF	32	93	263	388
G4PCS	—	3	258	261
G4RRA	—	62	254	316
GJ4ICD	59	119	253	431
G0DAZ	—	114	249	363
G4DEZ	48	37	248	333
G3UVR	79	129	239	447
G4IGO	—	—	238	238
G3FPK	—	—	233	233
G4SSO	—	93	229	322
G4MEJ	—	—	213	213
G8LFB	—	—	209	209
ON1CAK	—	33	204	237
GW4FRX	—	—	203	203
G4TIF	—	110	200	310
G1EGC	23	80	198	302
G4YCD	—	—	197	197
G3XDY	86	138	191	415
G6HKM	44	105	191	340
G3COJ	44	103	186	333
G4DOL	—	—	186	186
G6DER	78	110	183	371
ON1CDQ	—	32	182	214
GI1JUS	—	—	181	181
G3JXN	87	134	179	400
G0EVT	—	49	177	226
EI5FK	—	56	172	228
G1KDF	37	98	168	303
G3NAQ	—	80	160	240
G1GEY	—	68	158	226
G6DZH	—	87	154	241
G1LSB	—	133	150	283
GJ6TMM	—	46	150	196
G4MUT	28	90	149	267
G8HHI	38	110	148	296
G8LHT	4	80	146	230
G0EHV	—	75	146	221
G8ATK	45	91	143	279
G8MKD	—	49	142	191
G6MGL	59	89	141	289
G7ANV	—	—	131	131
G6STI	24	69	130	223
G8PNN	63	98	128	289
GM6VZW	—	6	123	129
G4TGK	—	—	118	118
G8XTJ	—	—	110	110
G4AGQ	1	41	104	146
GM0HBK	—	—	104	104
GI4OWA	—	—	102	102
G1IMM	—	17	98	115
G6AJE	5	57	95	157
G1WPF	—	22	93	115
G1SMD	—	—	93	93
G6MXL	15	42	91	148
G0FEH	—	24	88	112
G4WHZ	7	—	76	83
GM0GDL	—	20	73	93
GU4HUY	—	—	73	73
G0HEE	—	—	73	73
G8PYP	-	6	64	70
G1CRH	—	—	62	62
G0HDZ	—	—	61	61
G1NVB	—	—	58	58
G4ZTR	29	29	37	95
G7AHQ	—	—	34	34
G2DHV	2	7	33	42
G1VTR	—	23	32	55
GM0JOL	—	—	29	29
GM1ZVJ	—	—	21	21

Starting date 1 January 1975.
No satellite or repeater QSOs.
"Band of the month" 144MHz

should be able to make QSOs. Reg was at Geert's QTH on the Oct 22/23 weekend when they operated in the first session of the ARRL EME contest making 37 contacts.

DXpedition Feedback

Peter Croucher G4YPC (SRY) has sent a detailed report on the Lizard operation last September and which I mentioned briefly in the December issue. The locator was IN79JX and conditions were excellent on all bands from Sept 17 to 20, but began to decline on the 21st to revert to flat on the 22nd. Thereafter very strong winds made any further radio operation impossible.

Their equipment was all under canvas and comprised: On 144MHz a Yaesu FT-221R with MuTek board, single 4CX250B 200W amplifier and two 17-ele Tonna Yagis at 12m a.g.l. On 432 MHz, a Yaesu FT-707 and Microwave Modules transverter with masthead pre-amp. 8W output to two 21-ele Tonna Yagis at 12m with LDF4-50 feeder. On 1.3GHz, a Kenwood TR-9000, MM transverter with 2W to four 23-ele Tonna Yagis at 12m again fed through LDF4-50 cable.

In summary their results on 144MHz were 85 squares and 18 countries worked, with EA, HB9, I2, LX, OE, OK, SP and Y stations contacted. On 432MHz, 29 squares and ten countries including EA, LX and Y, and on 1.3GHz four countries and 13 squares from 22 QSOs. The QSOs were 12 Gs, one GI, five Fs and four PAs.

Gem of the Month

G4AGQ passed on this gem heard on the GB3SN repeater. First G1. "I went up north last week. Lots of lady breakers on two metres up there." Second G1. "I expect women in the north are more intelligent than those in the south." Pat comments that what they failed to realise is that most of the lady operators in the south are on c.w!

Final Miscellany

GW6VZW has QSL information for the following stations: EA8BML, SM6AEK, SV1DO, 9H1CG, 9H1E, 9H1EL and 9H1FL. Anyone requiring addresses can telephone Paul on Cwmbran (066 33) 60921. I recall that some Maltese stations are not members of their national society so that cards sent to them through the bureau never reach them. Hence direct QSLing is the only answer.

Commenting on the 144.300MHz calling frequency, G8PYP writes, "Have you ever noticed how there are 'flumes' of activity with several stations calling at once, then long periods of silence? A little like waiting an hour for a bus then three coming along together." Steve concluded, "I am sure it's related to TV programme times!"

I have often listened to this at G3FPK and I am quite convinced that certain stations do hear others calling CQ then deliberately start their CQ just as the first one goes over to listen for replies. These folk would never demean themselves by answering anybody else's call; you are expected to go to them. Something to do with a "Macho Image" perhaps?

The next three deadlines are: Jan 25, Feb 27 and Mar 29

RTTY

Reports to Mike Richards G4WNC
200 Christchurch Road, Ringwood, Hants BH24 3AS.

I'll start this month with some DX information that I received from **John Barber**, actually it should have been in last month's column but I forgot it! What John kindly sent me was a couple of direct QSL addresses for Russian DX RTTY stations which are as follows:

UL0P/UZ9CWA Dekabristov 12-12 PERM, 614022 USSR

UW3TT/UJ1J PO Box 93, Gorky-centr, 603000 USSR.

If you manage to pick up any little snippets of information like this, please drop me a line with the details.

FAX Activity

Christopher Moss has written giving his experiences of monitoring amateur FAX transmissions. There still seems to be very little activity as regards h.f. FAX in the UK, whereas on the continent there is quite a lot of interest. In his letter Christopher reports that Sunday mornings on 14MHz are the best times to monitor, especially if there is a contest running. The most recent was the DARC contest, last October, where Christopher logged some 12 FAX stations during the morning. Of these stations seven were German and the rest were a mix of Western European stations, sadly there were no UK stations.

I'm sure many are put off by the thought that FAX must be expensive, but this is not necessarily the case. Take Christopher's h.f. listening station which comprises a Kenwood R-1000 receiver fed by a 12m indoor antenna. The computer is a Spectrum 48K and the RTTY and FAX software is by J & P Electronics. Assuming you already have a receiver you will need a Spectrum computer, software and a drum-speed generator to start receiving pictures. To give you an idea of cost, the J & P FAX program costs about £9 and the matching drum-speed generator about £24. As you can see this is an ideal way to get started on FAX reception. Hopefully, you should find some examples of amateur FAX received using the J & P software in this column.

If you run a BBC B, B+ or Master computer then FAX reception can be achieved quite cheaply by using the FAX decoder produced by David Bird (G6EJD). This decoder which costs £49.95 for the screen-only version and £59.95 for the screen and printer version is capable of surprisingly good results.

Another way of getting on the air with FAX is to look out for a secondhand FAX machine. One which has been well documented is the Rank Telecopier 400. Although this machine is not directly compatible with current amateur standards there have been plenty of mods published in *DATACOM* the quarterly magazine from BARTG. If you manage to find one on the secondhand market it should be quite cheap as most of them were originally given away to members by BARTG.

One other significant point is that once you have the system running, you are not restricted to receiving amateur FAX, as the decoders can be used to receive a wide range of weather charts and some press pictures.

As a final aside I have heard that an economical FAX transceive program for the Spectrum is being developed, so watch this space as the manufacturers will be letting me know as soon as it's ready.

GB2RS on FAX!

Staying with FAX for the moment I have recently heard that Dave Smith, who is a member of the RSGB Membership Liaison Committee, is looking for someone to participate in a venture to send the GB2RS news bulletin by FAX. In order to do this you will need a conventional FAX machine that is capable of taking a document and producing standard 120 r.p.m. 576 or 288 IOC FAX. You will also need to be able to produce a healthy signal on 3.5MHz and be available on Sunday mornings! I'm sure there are plenty of amateurs who could contribute to this experiment so if you would like to have a go contact Dave[1] directly, using the address at the end of this column.

Personal Mailbox Systems

Siskin Electronics[2] have just sent me the latest update for their TINY-2 Terminal Node Controller (TNC) so I thought it would be a good idea to explain just what a Personal Mailbox System (p.m.s.) can do. Taking the TINY-2 as an example the addition of this feature is simplicity itself as all you have to do is replace this existing ROM with a new one containing the appropriate software.

The next question you are going to ask is, "OK so what does it actually do?" Well, I'm sure most of you who already have packet facilities make quite extensive use of the multitude of established mailboxes for general information or for sending messages to friends. At present, in order to find out if there are any messages waiting you have to log on to the mailbox, whereupon you will be told if there is any mail waiting. By using the p.m.s. system you will no longer have to log on to the mailbox for your mail as it will automatically be sent directly to you and be stored in your TNC! This is obviously quite a change and may even help to relieve some of the congestion on the mailbox frequencies.

Before you can make full use of the system you will need to inform the local mailbox operator that you have installed p.m.s. so he can set up the mailbox to auto-forward your messages. In addition the p.m.s can be used by any other station to send a personal message to you which is quite handy.

Moving back to the p.m.s. implementation on the TINY-2 there are a number of additional commands that come with the p.m.s. ROM. Most of the commands follow the standards set by the W0RLI and WA7MBL mailbox systems so operators should have little problem in finding their way round them, there is even a simple help file if you're not sure! Probably the most used command is SEND which starts the procedure for sending a message. Once this command has been issued you then enter the callsign of the station you are sending the message to in the normal

way. As third party traffic is not allowed under current licensing regulations, there is an additional command called 3RDPARTY which, when set to off, informs anyone attempting to send third party traffic that it is not allowed. I thought this was a very useful extra command.

Once a message has been stored in your TNC the status l.e.d. will flash slowly giving you a clear indication that mail is waiting for you.

An extra plus-point of this particular upgrade is that a c.w. ident has been included which can be set to give a c.w. station identification. The timing of these idents can be set in the same way as with beacons, i.e. either at regular intervals or at a preset time after activity on the channel.

Overall I think that the p.m.s. is a very worthwhile upgrade and I particularly liked the fact that the messages are actually stored in the TNC. This feature has the added advantage that you only have to leave your rig and TNC powered up rather than your whole station which I'm sure will appeal to many packet users.

For further details of this particular upgrade contact Siskin Electronics.

BARTG

They have changed their name! BARTG now means British Amateur Radio Teledata Group. The subtle difference is the word teledata as opposed to the old teleprinter. The change has come about as BARTG wants to make it more widely known that it is not just a group for teleprinter and RTTY enthusiasts, but covers all modes of data communication over radio. Other changes made at their recent AGM include new Chairman and President, namely Ken Young G3ZOG and Alan Hobbs G8GOJ respectively. I would also thank Ted Double for all his hard work over the years as he has now decided to retire from the posts of President and Awards manager.

VHF/UHF RTTY Contests

After the poor response autumn v.h.f. RTTY contest I think it's about time that these contests had a re-think. One idea that has been suggested is that the contests are made multi-mode, i.e. RTTY, AMTOR and Packet. I think this would promote a much greater interest, as I'm

Fig. 1

sure there are many more amateurs set up for v.h.f. Packet than v.h.f. RTTY. One example of this type of contest is already in the contest calendar, albeit on h.f., so let's see a few more.

Have you a view on this subject? If so please write and let me know.

BARTG Spring HF Contest Results

This very popular h.f. contest attracted a healthy entry this year. Looking through the results I see that the highest placed single operator G station was G4PKP who managed a very creditable fifth place overall with 538 692 points. The winner TG9VT, managed to score 1 030 160 which gave this station a very significant lead over the second place with 831 600. Moving on to the multi-operator section the winner was WA7EGA with 1 143 296 points and the highest placed G station was G3UUP in eighth place with 464 520 points. The final section, for short-wave listeners, was won by ONL383 with 544 036 points and Ted Double kept the UK in the results by scoring 257 136 points giving him third place. He was closely followed by G6LAU with 215 080 points.

Wavecom W-4010

I have just received a press release from Dewsbury Electronics regarding this versatile data communications decoder. The W-4010 is a very sophisticated piece of equipment which can resolve a vast range of commercial and amateur data modes. Although not cheap it does seem to be quite well priced when compared with its competitors, i.e. the Pocomtor and Info Tech ranges. The following is a brief summary of some of the reception modes covered:

ITA No. 2 (RTTY): 30 to 250 baud including bit inversion and Arab, Greek and Cyrillic alphabets.

ASCII: 30 to 300 baud including 7, 8 or 9 data bits.

ARQ/FEC (AMTOR): Includes Swedish ARQ.

Morse: Automatic tracking in two ranges 2 to 150 w.p.m. and 150 to 300 w.p.m.

AX-25 (Packet): 300, 600 and 1200 baud.

Two Channel TDM: Including TX/RX role reversal.

Four Channel TDM: To CCIR 342.

The Wavecom W-4010 includes all the necessary filtering, meaning that a complete, professional-quality monitoring system can be assembled simply with the addition of a receiver and a video monitor.

The Wavecom can be obtained from Dewsbury Electronics(3) price £895 plus £7 for registered post.

(1) Dave Smith G4DAX, Red Roof, Goathland, Whitby, North Yorks YO22 5AN. Tel: 0947 86333.
(2) Siskin Electronics, Southampton Road, Hythe, Southampton SO4 5HU.
(3) Dewsbury Electronics, 176 Lower High Street, Stourbridge, West Midlands DY8 1TG.

The next three deadlines are: Jan 25, Feb 27 and Mar 29

Amateur Satellites

Reports to Pat Gowen G3IOR
17 Heath Crescent, Hellesdon, Norwich, Norfolk NR6 6XD.

MIR Operations

Right on schedule, in fact slightly before the planned first week-end, up came Musa Manarov U2MIR, to provide the first USSR space-to-earth manned amateur radio communications.

All went according to schedule, apart from the first pleasant change, in that the MIR spacecraft commander Vladimir Titov also showed great interest in becoming involved in the space communications experiment. As a result, being senior, he took the callsign U1MIR, leaving the first operations and the callsign U2MIR to fellow cosmonaut Musa Manarov.

The grounded USSR amateurs performed their tuition of amateur procedure within the allotted week and the very first amateur 145MHz band f.m. QSO with MIR was made by Leo Labutin, as UA3CR/W4 for the AMSAT Space Symposium in Atlanta. For this purpose, Leo had to obtain an American Licence, which he did in rapid time. He was loaned a book on the subject matter, sat up most of the night studying it, and was given a test by two "W" amateurs on the following morning. He passed his extra class licence examination with flying colours and used the station of W4BIW to talk to Musa as MIR passed over the USA at the week-end. The first contact was made on 145.525MHz simplex (S21). The ground station consisted of a small, commercially made 145MHz band f.m. transceiver plus a 30 watt amplifier, feeding a small loop antenna. The reports were 5 and 9 both ways! On the same evening, U2MIR contacts were also made by Andy Macallister WA5ZIB and Doug Loughmiller KO5I.

Andrej Oravec OK3AU, nee OK3CDI, a very keen and long time satellite enthusiast, worked U2MIR at 2046UTC on November 18, when the spacecraft was over the Mediterranean Sea, using 145.550MHz simplex. On Sunday November 20 at 1733UTC, when MIR was over the Black Sea, he had a 145.500MHz simplex QSO with Vlad U1MIR. The hat trick was almost made when on both the Saturday and Sunday, to everyone's surprise (including that of Andrej) Valery Polyakov, the medical doctor cosmonaut aboard MIR, came on as U3MIR! "They were all good signals, and we spoke in the Russian language" said Andrej.

UB5ICR reports working U2MIR with his transmission on 145.500 and the cosmonaut on 145.550MHz, the first known duplex QSO, whilst **OH5LK** reports a similar QSO, with signals at 5 and 9 both ways on Tuesday November 23, after IOLYL and OE3PU were worked.

Similar contacts were made in other parts of the world when the activity time permitted, as on Sunday November 20 at 0625UTC, 0025 American Central time, and 0925 MIR time, he was worked by **Mike WD0GML**. "He was a really strong and clear signal, pinning my S-meter," said Mike. "He spoke excellent English, although with a noticeable Russian accent. He sounded very tired, but was obviously enjoying his new hobby."

Hans ZS6AKV informs us that several contacts have been made whilst MIR was overflying South Africa, with QSOs being effected with ZS6BTG and some forty other ZS5 and 6 stations.

The reason that QSOs were not made in range of western Europe over the first two weeks of operation was the co-incidence of the times they were above the European horizon and the cosmonauts' sleeping hours. Passes were between 2200 and 0600UTC, and the space-men have a tight programme, with their required hours of rest set according to Moscow time, e.g. around midnight to about 9am MSK. As MSK is three hours later than UTC, this means that activity cannot normally be expected between 2100 and 0600UTC, so we had to wait for the third week of operation, when, as the group of passes occur over Europe daily, their free time coincided with their times of overfly. This explains why Musa appeared to be tired to Mike WD0GML, as he was obviously just awake in his early morning.

The first operation audible from the UK transpired on Tuesday November 23, when at 1940 he was heard, on S22 by **Mike Cooke G4DYC/M** mobile in Norfolk, calling stations and announcing "I am U2MIR". **John Harvey G6SVJ** heard him at 1946 calling I0LYL (three times) and OE3PU (twice) apparently without success. **Alf Ward, G3PZX** of Norwich was also listening on 145.550MHz at the same time and having not caught up with the news, thought that Musa was an Italian station coming in on a sudden Sporadic-E opening. This was a very short-lived and low-angle pass for the UK and may not have been heard by stations to the north-west of Britain. No activity was evidenced on the next pass from 2110 to 2120UTC, as the crew were probably fast asleep by this time.

The evening of Sunday November 27 produced two good active passes for the UK from 1818 to 1826 and 1952 to 2001, when U2MIR came up on 145.550MHz calling CQ from "Soviet spaceship MIR". Two Norfolk stations, G0BFL and your scribe were both acknowledged and stations in ON, DL and SM2 were also worked. **Serge UB5UN**, advises that a new frequency of 145.400MHz may be used in the future, this presumably being when the new 10 watt transceiver is taken aboard.

Some indication of what is being heard on MIR can be heard by listening on 143.625MHz, as the open microphone often permits audibility of the upcoming two metre signal, a rather surprising outcome when one considers the close proximity of the frequencies and the antennas. (Such is the closeness of the actual transceivers that on one occasion Musa picked up the wrong microphone to go back to a station calling him on 145MHz!). By this method your author was able to hear brief parts of upcoming calls being made between 2018 and 2028UTC on Monday November 28 as MIR went nearly overhead on a west to east crossing up to an elevation of 57 degrees. The level of mutual QRM overheard by this inadvertent relay was quite amazing!

With this problem recognised, a few hints and tips on how best to ensure a QSO with MIR would seem to be in order. It first has to be recognised that the level of activity observed from the orbital height on what may appear to be empty channels

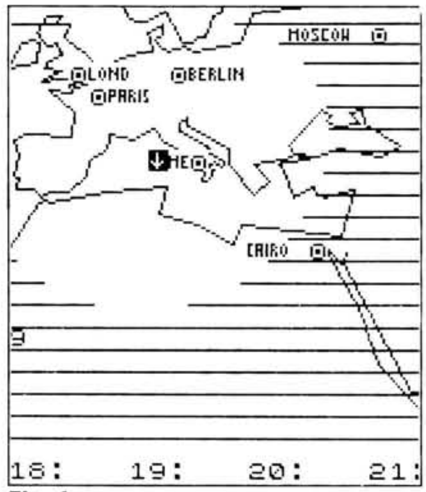

Fig. 1

to any one observer on earth is quite incredible. Your scribe has listened (with specific permission from the aircraft pilot) when flying over Europe at 30 000 feet, when a radio "line of sight" of up to 395km distance is given, e.g. an area capture of a vast area of activity is covered. Even at this relatively low altitude, the simplex channels are seen to be packed out with stations. MIR covers a much greater footprint, which can be seen in Fig. 1, where the unshaded area shows the line-of-sight path when the MIR station is over the Mediterranean Sea. All of EI, GI, GW, GD, G, most of GM, all of west and east Europe, southern Scandinavia and north Africa are "visible" and accounts for the huge number of stations, most of whom will be calling MIR on any one channel.

The problem in a spacecraft was evidenced by the tapes sent to your scribe made by Owen Garriot W5LFL. When flying over Europe, only a few calls were audible from the thousands calling at any one time, due to continuous blocking QRM without abatement. The only effective QSOs were made from the USA, Australia and Asia, where the amateur density per unit area on the 144MHz band was considerably less. In other words, the more that called, the less that were worked.

The answer is to make your calls on an adjacent channel quickly and of brief duration, i.e. only a 1 × 2 call with recognisable phonetics. As the Cyrillic Russian alphabet is quite different from the Roman, it would help identification to also give your phonetics as they do in the USSR, by common names, like "Anna" for A, "Boris" for B and so on. Do not give a long call—just a four second call and then listen, and then await the next invitation. The QRM produced if simplex channel working were to be attempted in western Europe would be phenomenal and impossible to cope with by newly licensed amateurs.

Some advantage might be effected by pointing a high gain beam to a point at which the spacecraft is expected to be at a part of the pass, as on f.m. the strongest wins by virtue of the capture effect.

Remember though that they move rapidly and may not be at that point when listening on that frequency and that you have to move it to reply again if called. A simple crossed dipole and 1 watt will give a sufficient signal throughout the pass, but is in equal competition with many similar signals.

Remember too that unlike the short duration missions of the Shuttle, MIR will be up and active for many years with a continuing amateur radio station, so you will have plenty of chances to come.

In your local area, you can have a net and form your calls as a serial, e.g. a set order of each station one after the other. This tactic was used by the Californian amateurs for the W5LFL mission and each and every W6 was heard and taped. Beams and high power are not really necessary and may be in fact counter-productive, 10 watts to a simple vertical or crossed dipole will give a 5 & 9 plus 20dB signal at the spacecraft if you are alone on a frequency.

Above all, do NOT call MIR when he is attempting to communicate with a station already indicated. The crew will make all attempts to complete the existing QSO and all QRM will elongate established contacts, reducing your chance of a contact.

It is almost impossible to give accurate pass times for MIR, as in the first week of operations alone the listed orbit period changed three times. Whilst we can give the very approximate periods some six weeks ahead and the band of times when they will be making passes over us, it is best to obtain updated times based on the known most recent, current Keplerian element data direct from the various satellite nets earlier given in these columns.

Your QSLs or reports for U1, U2 or U3MIR should go to Boris Stepanov UW3AX, Moscow 107207, P.O. Box 679, USSR, who will ensure a return. The first batch of QSLs will be sent up to MIR by the Progress supply missions for the cosmonauts to have and to provide decor for the station.

RS-10/11

At this time, RS-11 is being kept continuously active, with the Mode "A" transponder on all the time. **Leonid Maksakov RA3AT**, chief operator of the RS command station RS3A says that this will continue into 1989, with RS-11 being kept as a reserve back up. The "K" and "T" modes are not normally now in use, due to the high level of activity now evidenced on 21MHz at this period of high solar flux levels and correspondingly good propagation conditions.

Leo invites anyone with questions or the need of information on the RS satellite programme to write to him at Moscow, 117526, P.R. Vernadskogo 97,289, Maksakov L.I., USSR.

G8ATE, who has been very active on RS-11 since July writes to tell us of the stations he has worked so far, giving him 35 countries to date. His list includes EB6SU, K1WWT, KA1LMX, KE9GK, LA6QBA/P, LZ1KWF, N1ETT, NJ1H, NY2I, OE3JPA, OE6AHD, OX3DB, SP6HEI, SP8BTJ, UB4MDN, UC2OAV, VE1AMA, VE1BZV, VE1CIK, W1NU, WA1OMI, YU2CSI, plus lots of DL, F, G, EA, I, ON, OZ and PA stations.

FO-12

The Japanese Fuji satellite is currently back on again, having had a month of rest in order to attempt to recondition the battery. In order to keep a close eye on the power levels, a new telemetry program has been loaded that will permit parameter observance every two seconds in place of the one minute transmission given previously.

Planned operations made in advance cannot be assured, so it is best to continue to look and hope for indications of activity. The JARL are soliciting funding for JAS-1-B, and at the 1988 Ham Fair collected over 400000 Yen in the three days.

OSCAR-10

This old faithful is still going strong and is now out of the poor battery charge state once again. It is performing well, better than its new counterpart according to most Phase III users, but very few stations seem to be on the satellite. **Ron Pearson G3CAG** is a regular user of all the satellites and states the following: "Whilst I can hear the noise floor on OSCAR-13, and receive excellent beacon signals; I cannot get my own signals into it. Using exactly the same power and system, on OSCAR-10, all is well."

Des Carne, AMSAT-UK 1683 writes: "I find it difficult to work Mode 'B' on OSCAR-13. I am using the same equipment as I did on OSCAR-10, an FT-726R with a 50 watt p.a. for uplink, and an Icom 251E with a MuTek masthead pre-amplifier for the downlink. A single Cushcraft 410 10-element horizontal is used for the 435MHz uplink and 144-10T crossed Yagi for the 145MHz downlink. I found that on its better days I could work USA, Hawaii, South America, etc., even when the satellite was at my far west horizon. With OSCAR-13 to my west, I am unable to hear it until it is 5 degrees above my horizon."

The 145.809MHz A-0-10 beacon is on again, but is evidenced as a steady carrier without modulation. It is requested by AMSAT that if any signs of frequency modulation occur on this beacon, due to poor power regulation affecting the transponder oscillators, then all uplinking attempts should cease. If all is well, and it is in the permitted transponder deployment time, then minimum power uplinks for general QSOs are in order. At this time, OSCAR-10 should not be used between mean anomaly 30 and 90. As this eclipse period will slowly change, potential OSCAR-10 users are asked to keep updated on this non-use transponder MA period via the AMSAT nets.

Satellite Name	OSCAR 9	OSCAR 10	OSCAR 11	OSCAR 12
International Designation	81-100B	83-058B	84-021B	86-061B
Catalogue Object Number	12888	14129	14781	16909
Element Set Number	341	360	358	115
Epoch Year	1988	1988	1988	1988
Epoch Day/decimal day	302.29024608	298.55866518	302.74399601	279.26846706
Inclination	97.5995	27.0465	98.0396	50.0147
Right Asc. of Ascending Node .	339.3609	298.2929	2.0404	1.9211
Eccentricity	0.0000515	0.6037040	0.0013307	0.0011139
Argument of Perigee	212.9441	347.2463	334.5778	58.6669
Mean Anomaly	147.1750	2.4750	25.4751	301.5254
Mean Motion (orbits per day) .	15.36928141	2.05880371	14.62533140	12.44395542
Decay or Drag Factor	2.0670E-04	-5.8E-07	1.247E-05	-2.5E-07
Revolution or Orbit Number ...	39315	4036	24870	9766
Nodal Period in minutes	93.753840	699.1863	98.518097	115.653096
Longitude increment deg.west .	23.435307	175.3521	24.630316	29.239314
Beacon Frequency(s) in MHz ...	21.002/ 145.825/ 435.025/ 2401.0 MHz	145.810 MHz 145.987 MHz	145.826/ 435.025/ 2401.5 MHz	435.797/ 435.913 MHz
Reference Equator Crossing ...	03 Nov 1988	03 Nov 1988	03 Nov 1988	04 Nov 1988
Orbit Number	39403	4056	24947	10137
Time UTC (HHMM.MM)	0027.66 Utc	0632.33 Utc	0017.21 Utc	0133.90 Utc
Longitude Degrees West	64.12	204.08	39.61	156.68

Satellite Name	OSCAR 13	R S 10/11	SALJUT 7	MIR
International Designation	88-051B	87-054A	82-033A	86-017A
Catalogue Object Number	19216	18129	13138	16609
Element Set Number	19	558	294	463
Epoch Year	1988	1988	1988	1988
Epoch Day/decimal day	273.72660805	305.97826864	307.73614561	293.73977731
Inclination	57.5382	82.9286	51.6134	51.6159
Right Asc. of Ascending Node .	237.5900	46.7164	339.8504	147.7137
Eccentricity	0.6578369	0.0011150	0.0000970	0.0024353
Argument of Perigee	191.3601	330.8762	4.0169	210.4815
Mean Anomaly	139.7626	29.1800	355.9834	149.4161
Mean Motion (orbits per day) .	2.09697959	13.71912730	15.34552252	15.74544942
Decay or Drag Factor	3.0E-07	-2.4E-07	1.3804E-04	7.9726E-04
Revolution or Orbit Number ...	225	6810	37334	15344
Nodal Period in minutes	686.6553	105.021898	93.777000	91.393033
Longitude increment deg.west .	172.1935	26.381228	23.823922	23.237293
Beacon Frequency(s) in MHz ...	145.812/ 435.651 MHz	29.357/.403, 145.857/.903, 29.407/.453, 145.907/.953 MHz	19.953 MHz	143.625=voice 166.125=data (AM)
Reference Equator Crossing ...	01 Nov 1988	04 Nov 1988	07 Nov 1988	04 Nov 1988
Orbit Number	293	6852	37400	15585
Time UTC (HHMM.MM)	0330.59 Utc	0059.62 Utc	0049.12 Utc	0044.10 Utc
Longitude Degrees West	219.78	13.95	99.70	345.48

Satellite Name	NOAA 9	NOAA 10	NOAA 11	METEOR 2-15
International Designation	84-123A	86-073A	88-089A	87-001A
Catalogue Object Number	15427	16969	19531	17290
Element Set Number	295	166	15	198
Epoch Year	1988	1988	1988	1988
Epoch Day/decimal day	302.46714348	302.51339271	302.36765666	304.49254307
Inclination	99.1175	98.6686	98.9099	82.4674
Right Asc. of Ascending Node .	279.2490	331.1781	241.8696	338.0056
Eccentricity	0.0014671	0.0013081	0.0012134	0.0012478
Argument of Perigee	243.2496	199.4850	162.6391	179.0884
Mean Anomaly	116.7173	160.5829	197.5196	181.0295
Mean Motion (orbits per day) .	14.11682999	14.22665250	14.10663295	13.83620119
Decay or Drag Factor	4.78E-06	4.22E-06	4.81E-06	1.77E-06
Revolution or Orbit Number ...	19975	11099	478	9185
Nodal Period in minutes	102.062217	101.275702	102.136299	104.133281
Longitude increment deg.west .	25.513387	25.319030	25.533653	26.162612
Beacon Frequency(s) in MHz ...	137.620=APT 137.770=DSB	137.500=APT 136.770=DSB	136.995=APT	137.850=APT
Reference Equator Crossing ...	03 Nov 1988	04 Nov 1988	04 Nov 1988	04 Nov 1988
Orbit Number	20054	11192	572	9248
Time UTC (HHMM.MM)	0135.60 Utc	0117.92 Utc	0050.23 Utc	0109.67 Utc
Longitude Degrees West	141.50	85.38	167.57	86.57

Satellite Name	METEOR 2-16	METEOR 2-17	METEOR 3-2	COSMOS 1766
International Designation	87-068A	88-005A	88-064A	86-055A
Catalogue Object Number	18312	18820	19336	15331
Element Set Number	172	63	59	409
Epoch Year	1988	1988	1988	1988
Epoch Day/decimal day	305.72054093	304.87210780	305.07040891	308.29467757
Inclination	82.5575	82.5404	82.5523	82.5262
Right Asc. of Ascending Node .	40.5447	102.7808	337.7495	246.5230
Eccentricity	0.0014259	0.0016282	0.0016854	0.0025346
Argument of Perigee	115.9897	191.1945	38.5642	112.6818
Mean Anomaly	244.2744	168.8865	321.6641	247.7128
Mean Motion (orbits per day) .	13.83367789	13.84048772	13.16845036	14.73965943
Decay or Drag Factor	-2.06E-06	1.0E-06	3.91E-06	1.334E-05
Revolution or Orbit Number ...	6092	3796	1275	12200
Nodal Period in minutes	104.152391	104.101160	109.409911	97.755414
Longitude increment deg.west .	26.166699	26.154025	27.481071	24.568395
Beacon Frequency(s) in MHz ...	137.400=APT	137.300=APT	137.850=APT	137.330=APT
Reference Equator Crossing ...	04 Nov 1988	04 Nov 1988	04 Nov 1988	07 Nov 1988
Orbit Number	6138	3854	1327	12255
Time UTC (HHMM.MM)	0108.60 Utc	0133.71 Utc	0030.69 Utc	0040.87 Utc
Longitude Degrees West	22.74	327.50	76.19	173.58

OSCAR-13

Increasing activity is evidenced on the new satellite, with a growing number of stations now active on Mode "L". A list of stations heard around the world has been noted by DF5DP, DL6KG, JR1WZI, K0RZ, PJ9PC, W4FJ and W6ABN and has been made into a listing by William McCaa K0RZ, which was sent on to us by **Ted Mathewson W4FJ.** It shows that there are 77 stations active from the USA, 42 from West Germany, 32 in Japan, 11 from Italy, ranging down to 7 from England, 4 each from Argentina, Canada, Austria and Australia, 3 each from Alaska and the Netherlands, 2 each from Wales, Switzerland and Brazil, and single representatives from other countries as ON6UG, UA1ZCL, F9FT and EA8ZU.

Station equipment varies considerably, with uplink powers ranging from 7 to 300 watts, uplink antennas ranging from single short Yagis to stacks of 4 × 55-elements, many variations of helix antennas and loop Yagis, and dishes from 1.3 to 6 metres diameter. For the downlink, most use bays of Yagis, ranging from JA2ODV's 8 × 15-elements and WA4OFS's 8 × 19-element K2RIW's down to a single Yagi or helix. VE7BBG uses the same 6m dish with a GaAs-f.e.t. built in pre-amplifier. For Mode "S", a more demanding mode, we reproduce where known the list in full, the station, name, uplink and downlink, and the signal over noise of the beacon heard.

DK2ZF Rolf	—	—	10
DF5DP Bert	—	20dBd Yagi	10
G2BFO David	—	—	—
GW3XYW Stu	—	3m dish	—
IN3HER Raimund	—	1.5m dish	10
JA1UHY Hisa	10kW e.r.p.	2m dish	20
JR1WZI Ken	4kW e.r.p.	1.5m dish	10
JA4BLC Row	65kW e.r.p.	40-ele loop	3
JR4AEP —	—	—	—
JR4BRS Toshe	10kW e.r.p.	4m dish	20
K0KE Eric	40W 8×K2RIW	4m dish	8
K0RZ Bill	750W 4×15 NBS Yagis	1.2m dish	12
ON6UG Freddy	—	1.2m dish	20
VE4MA Barry	1kW 8×19 K2RIW Yagis	4m dish	23
WA3ETD John	—	1.2m dish	6
WB5LUA Al	800W 10T helix	1.2m dish	10
WB0QIY Doug	—	1.2m dish	6

The noise figures of the pre-amplifiers, not all of which are GaAs-f.e.t.s, are an important consideration. JR1WZI has a figure of 3.0, VE4MA 1.0, JA1UHY and K0KE have 0.9, whilst K0RZ and WB5LUA have theirs down to 0.8 dB!

Bill McCaa K0RZ believes that an unexpected problem is evidenced in the mode "S" transponder, as a hardware problem between the OSCAR-13 IHU and the transponder itself, preventing the ground command station from selecting the beacon only or passband only operation mode. This has resulted in the mode "S" receiver demanding far more power than expected, some 35dBW for c.w. and 45dBW for s.s.b. Bill thinks that a microswitch is at fault, giving an attenuation of some −20dB, which has to be "jumped over" with high power.

Mode "J"

No list of known users has been produced for Mode "J" as part of the "JL" uplink, as confusion between Mode "L" uplink is likely. At a guess, it can be said that at least six hundred stations seem to be active around the world using the 144.425–144.475MHz uplink.

The controversy over the use or otherwise of the low end of the 144MHz band as an uplink continues and a large number of useful and informative inputs on the problem have resulted.

Des Carne writes: "I believe, as do my colleagues here in Cornwall also, that Mode 'J' should be available for use, as it is in the all-mode section of the two metre band. Not only is it difficult for the eastern bloc stations to get Mode 'L' equipment, but for us also. I have scoured the country for a 1271, I ring Icom monthly for a 1275, and find a 736R costs £2500! Even a reasonable transverter costs £400, which, with the linear and antenna costs added would come to a bill of some £4000." He wonders how we can talk to the eastern stations, and says, "The Mode 'L' club stations are not heard in the 'J' section downlink of the 435MHz band and we need a simple access satellite that all can use, young and new callsigns alike, with 145MHz up and 435MHz down."

John Fitzgerald G8XTJ writes from Great Missenden in Bucks, and points out that we need to hear from the regular 144MHz s.s.b. users rather than the f.m. and satellite users, as the 144.425–144.475MHz uplink falls into the c.w. and s.s.b. section of the IARU band-plan. He states that it is simply not true to say that this is an unused portion of the band. "The band is so crowded in highly populated parts of the country, which extend way beyond London and the South East, that the sector is very heavily used. There are regular Worked All Britain nets on 144.430 and 144.450MHz and on at least one occasion a large net of over 20 stations spread widely over the country has been forced to QSY because of OSCAR QRM." John continues: "I have yet to hear a satellite user ask if the frequency is in use on either u.s.b. or l.s.b. The mode of operation employed mostly seems to involve netting onto a signal heard on the downlink with a lot of v.f.o. swishing and whistling." He concludes, "In view of the clearly expressed views that mode 'JL' should not be used in this country, your attitude seems irresponsible to me."

Norman Fitch G3FPK, who as evidenced by his excellent and well informed column in this magazine fully knows the 144MHz band and its contents well, also informs us of the presence of the WAB nets. He adds that further consideration needs to be given to the fact that this part of the band is used for meteor scatter, a mode that requires a quiet and reliable frequency for schedules to be effected. The main meteor showers are as follows:

Quadrantids, January 3–4	Lyrids, April 22
Eta Aquarids, May 3–5	Halleyids, May 8
Omicron Cetids, May 14	Arietids, June 11
Zeta Perseids, June 13	Beta Taurids, June 26
Perseids, August 12	Piscids, September 9
Draconids, October 8–9	Orionids, October 21
Sigma Taurids, November 3	Cassiopeids, November 9
Leonids, November 17	Gemenids, December 12–13
Ursids, December 22	

Not only must these dates be carefully observed, but other random MS times and dates when planned schedules need to be effected.

Ron Broadbent G3AAJ, having heard the extremes of both sides of the story, ranging from "... the band is continuously in use over the whole country ..." to "... that part of the band is never used ..." decided to find the facts for himself. He undertook a tour of the country right up to Scotland and listened over the disputed section from many points• en route. He stated his findings, that "... there are indeed black holes outside London with no activity evidenced, but, I did find signs of some activity in a few spots ...".

The answer in practical terms appears simple. The band is licensed for use for all UK amateurs for all modes, including satellites. The upper 200kHz is IARU agreed for satellite exclusive, but in practice the agreement is not seen to be implemented. We can, and must share our limited mixed-mode two metre frequencies, having a very restricted band total compared to the 4MHz available in other regions, despite a much greater station usage. If we all carefully listen on our intended uplink frequency on all modes, l.s.b., u.s.b. and f.m. before transmitting, and call to ask if the frequency is in use, no problems should arise.

Keplerian Elements

Apologies again for the omission of these last month, but the space was needed for the coming MIR operation information. **Birger Lindholm** has again provided them for us this month. It is pointed out that MIR will undoubtedly have changed, and although the times produced will give the general times when passes occur over you, the actual positional times will probably be well out by the time you receive this set. Please update from direct sources of supply such as the various AMSAT nets.

The next three deadlines are:
Jan 25, Feb 27 and Mar 29

Propagation

Reports to Ron Ham
Faraday, Greyfriars, Storrington, West Sussex R20 4HE.

I have always been interested in the beginnings of all aspects of radio communication, but I never thought that when I built and used a solar radio telescope I would meet the people who actually identified the radio waves that were coming from the "active" sun. By June 1973, my telescope had completed 5 years' work and I was frequently called upon to give talks to a variety of technical organisations about the instrument and its results.

In October 1973 I met Nell Corry G2YL when talking about solar activity to the Guildford and District Radio Society. Nell was their President and she told me that, in 1935, Denis Heightman G6DH heard a "hissing" sound above the background noise of his 28MHz receiver and suggested that this was caused by a solar event.

After that, with the consent of Nell and Denis, I began to research their work from original material. At the request of Patrick Moore and Cmdr Henry Hatfield I reported my findings, by lecture, in March 1975 to a national meeting of the British Astronomical Association. Unfortunately Nell died before my story was complete, but Denis attended the BAA meeting in London and saw my article entitled *The Hissing Phenomenon* published in the BAA Journal of June 1975. (See also, The Sun's Influence, *PW* November 1979, and reprinted in *Out Of Thin Air.*)

Briefly, contemporary radio enthusiasts found the short waves very exciting because the majority of them had learnt, from experience, that signals transmitted on these bands were vulnerable to a variety of natural disturbances. Many of those who studied propagation were members of the RSGB's Research and Experimental section and were always keen to investigate something new.

Often during 1935, Denis, a prominent member of the 28MHz group, heard the "hissing" whilst operating on the 28MHz band and consistently observed that this noise only occurred during daylight hours and usually preceded some form of radio disturbance. In January 1936, Nell, another experienced radio operator became the author of the 28MHz report which was published monthly in the RSGB's *T & R Bulletin*. Nell produced these reports until December 1939 which included her own work on the band and the gen about 28MHz happenings that she received from operators around the world. The information gathered was recorded daily in a set of five diaries (1936–40 inc.) which Nell gave me before her death. From her diaries and *Bulletin* reports, I found that at least 24 radio amateurs had reported hearing the "hissing" and furthermore it was not confined to 28MHz, because her entries on 31 July 1938 and 25 June 1939 revealed that Miss Barbara Dunn G6YL and Denis Heightman, respectively, heard the "hissing" at 56MHz.

In the four years covered by her diaries, which are now in my archives, I learnt that aurora was reported on 53 days, fadeouts on 140 days, echoing on signals on 26 days and "hissing" on 107 days. Although very few radio enthusiasts were able to observe during the early war years, the "hissing" was reported again in February, March and November 1940 and in June and July 1941. The important contribution that Denis made to our scientific knowledge was recognised by Dr. R. L. Smith-Rose when he was guest of honour, in 1956, at the fourth annual dinner of the London UHF Group. In his after-dinner speech, he mentioned that "radio astronomy is based on the 'hiss' phenomena, first observed by a British amateur, Denis Heightman, in 1935."

From 1973 onwards, I often thought of Nell and Denis especially when the fluctuating "hissing" from a solar event came from the loudspeakers of my 95 and 136MHz telescopes.

But now we must come forward a few years to the happenings in the last quarter of 1988.

Solar

"The mean sunspot number for October was 124.4, with every day above 100 except for the 12th, with a high of 220," wrote **Neil Clarke G0CAS** (Ferrybridge). He continued, "October 1988 saw the first daily solar flux figure in the 200s. It started the month at 179 s.f.u., climbed to peak at 202 on the 3rd then fell back to 149 s.f.u. on the 12th." Details of the daily fluctuations can be seen on Neil's computer print out, Fig. 1.

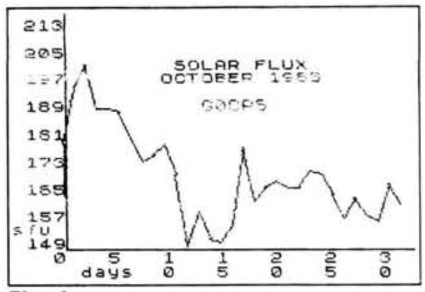

Fig. 1

With his 2.5in refractor and 4in projection screen, **Ron Livesey** (Edinburgh) noted 3 active areas on the sun on October 16 and 22 and 6 and 5 respectively on days 29 and 30. At his observatory in Bristol, **Ted Waring** counted 12 sunspots on October 29 and 16 and 54 on November 5 and 18 respectively.

Henry Hatfield, using his spectrohelioscope, observed 20 filaments and 7 quiescent prominences on October 24, 10f and 2qps on the 29th and 18 and 20f on the 30th and 5 and 7qps on the 31st. He saw various sized flares manifesting on November 2, 3, 4, 6, 13 and 14 and recorded bursts of solar radio noise, at 136MHz, on October 24, November 2, 4, 5, 13, 15, 18 and 19 and noise storm conditions on November 3, 6, 7, 8 and 9. Among the many interesting entries in his log was the one for the 8th which read, "Bursting heard at 1007. Violent continuous bursting started at 1230 and continued till 1530; then continuous noise until sunset at about 1550."

Magnetic

"October was unsettled with stormy days on the 6th and 18th but was very stormy on the 10th with an Ap index of 103," reports Neil Clarke.

Karl Lewis (Saltash) and Doug Smille (Wishaw) recorded magnetic storms on the 10th and 18th.

Aurora

The auroral influence on terrestrial radio signals was detected on October 18 and reported to Ron Livesey, the auroral co-ordinator for the **British Astronomical Association**, by Gordon Hunter (Hamilton) and Doug Smille.

Ron also received reports of visual aurora overnight from the 15th to 20th inclusive from observers in Alness and Kirkwell, Scotland and Oulu, Finland. These were described as "glows", "rays", "rayed arc" and "quiet arc."

The 50MHz Band

During October, very smeary and hazy television pictures, most likely from the Far East, have been received in the UK on Chs. E2/R1 (48.25MHz/49.75MHz), via the "F2" region of the ionosphere by **Bob Brooks** (Great Sutton), **Simon Hamer** (New Radnor) and **Edwina and Tony Mancini**, (Belper). Similar pictures were periodically seen by **Lt. Col. Rana Roy** (Meerut, India) between September 23 and November 10.

The 28MHz Band

"I've had a good time on 28MHz and 24MHz c.w. working into the States," wrote Neil Clarke on November 15. **John Levesley G0HJL** (Bransgore) found the band wide open from 0600 to 2000 on October 29 when he worked stations ranging from the USA to Japan including VK9YG in the Cocos/Keeling Isles and heard signals from Asia, South America, Europe and the Middle East. He logged many stations from these areas again on the 19th and 30th with the addition of South Africa and Canada. John found the path active towards Japan again on October 28 and November 3, 5, 6 and 12.

Propagation Beacons

First of all my thanks to **Mark Appleby** (Scarborough), **Chris van den Berg** (The Hague), **John Coulter** (Winchester), **Vaclav Dosoudil OK2PXJ** (Kvasice), Henry Hatfield, **Don Hodgkinson G0EZL** (Hanworth), **Ken Lander G3LCX** (Harlow), John Levesley, **Greg Lovelock G3III** (Shipston-on-Stour), **Ted Owen** (Maldon), **Fred Pallant G3RNM** (Storrington), Ted Waring and **Ern Warwick** (Plymouth), for their 28MHz beacon logs from which I compiled the list, Fig. 2.

You will see that the Adelaide Island beacon, VP8ADE (28.285MHz), was among those frequently heard during the period and **Laurence Howell GM4DMA**, who put it on the air in 1980 with the help of G3DME and G3ZMF, kindly sent a QSL card, Fig. 3, which he used when he was there. The photograph was taken near the site of VP8ADE which is on the rocky promontory sticking out into Marguerite Bay. The beacon has a power output of 8W and its present antenna, an east-west dipole on a rocky ridge around 31m a.s.l, overlooks the British Antarctic Survey Base of Rotherera.

Ken Lander heard "WJ7X/BCN SEATTLE" (28.250MHz) and "VE6YF/B EDM IOWT PSE QSL" (28.188MHz) for the first time on October 25 and 27 respectively.

Vaclav Dosoudil told me that the new beacon, OK0EG, which began operation on October 17, is operated by Radioclub of Hradec Kralove and sponsored by OK-Propagation Study Group. It has an output

	October 88						November 88																				
Beacon	26	27	28	29	30	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
AX2RSY	X	X	X	X	X	X	X	X	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X
DF0AAB	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X
DL0IGI	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
EA2HB																			X								
EA6RCM	X	X	X	X		X	X	X	X	X	X	X		X	X		X	X	X	X	X	X	X	X	X	X	X
IY4M	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
KB4UPI	X	X	X	X		X	X	X	X	X	X	X	X	X		X	X	X		X	X	X	X	X		X	X
KC4DPC		X		X				X	X						X	X				X		X		X			
KD4EC	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
KF4MS	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X				X	X	X	X	X	X	X	X
KI4PJ																			X						X		
LA5TEN	X	X	X	X		X	X	X	X	X	X	X		X		X	X	X	X	X	X				X	X	X
LU1UG	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X		X	X	X		X				X	X
OH2TEN	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
OK0EG								X		X						X	X			X	X		X				
PY2AMI	X	X	X	X						X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
VE1MUF	X	X				X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X
VE2HOT	X	X	X	X	X		X	X	X	X		X	X	X			X	X	X	X	X	X	X	X	X	X	X
VE3TEN	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
VE6YF	X	X	X	X		X	X													X					X		X
VK5WI	X	X		X	X	X	X				X	X				X	X		X	X	X	X		X	X	X	X
VK6RWA	X			X	X	X	X	X			X	X			X		X		X	X	X	X			X	X	X
VK6RTW	X																					X					X
VP8ADE	X	X	X				X		X	X		X		X	X		X			X		X	X	X		X	X
VP9BA	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
WA4DJS	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
WB4JHS		X	X	X	X						X	X															
WB4UPI							X																				
WC8E	X	X	X	X	X	X	X	X	X			X	X	X	X		X	X	X	X	X		X	X	X	X	X
W3VD																X	X						X	X	X	X	X
WJ7X	X	X	X	X		X	X																				
W7JPI		X	X	X	X	X	X			X		•					X			X		X	X				X
W8FKL	X	X	X	X		X	X				X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X
W9UXO	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X
ZD8HF	X	X	X																		X	X	X	X	X	X	X
ZL2MHF	X			X	X	X	X									X	X		X	X	X	X		X		X	X
ZS1LA	X	X	X	X		X	X	X	X	X		X	X	X	X		X		X	X	X	X	X	X	X	X	X
ZS5VHF	X		X			X	X	X			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
ZS6PW	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Z21ANB	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
5B4CY	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Fig. 2

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of 10W to a dipole antenna, uses the f.s.k. mode and operates from JO70WE on 28.282MHz. "All reception reports are welcomed permanently and will be verified by special QSL card. They should be mailed to CRC Bureau, Box 69, 11327 Praha 1," said Vaclav. Among the many beacon signals he heard during October, the Cyprus beacon, 5B4CY, was the strongest at S9+.

Ern Warwick logged CT3B, DK0MW, LU4AA, OH2B and 4X6TU on 14.1MHz around 0845 on October 13 and IK6BAK on 24.915MHz at 1147 on the 14th. Ted Owen logged this Italian beacon at 0905 on November 6 and 8, DK0WCY/ BEACON on 10.14MHz at 1330 on the 7th and, along with Don Hodgkinson and Fred Pallant, added ZL2MFH to our 28MHz list. Don and John Coulter heard AL7GQ on October 27 and 28 respectively and KE2DI (28.286MHz) on November 20 and 21.

Mark Appleby copied signals from the 24 and 10MHz, Italian and German beacons, on most days between October 28 and November 21 and Greg Lovelock heard IK6BAK on October 31 and November 3.

Don Hodgkinson first heard KI4PJ on 28.221MHz at 1328 on November 13 and again on 28.226MHz on the 19th, OK0EG on the 4th, PA3BBI (28.275), near Amsterdam on the 1st and WJ7X/BCN (28.253MHz) Seattle, on October 25. Ken Lander also lists KI4PJ.

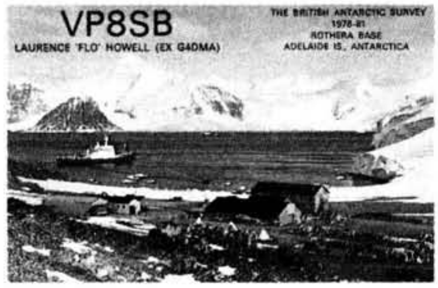


Fig. 3

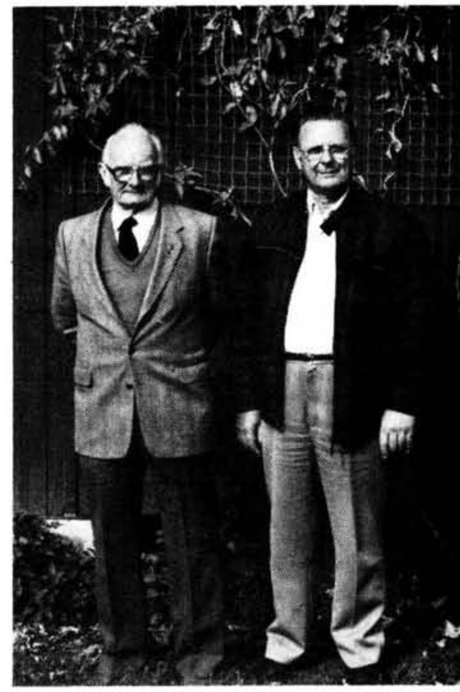
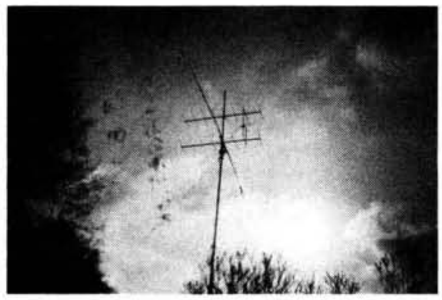


Fig. 4 ▶

Fig. 5



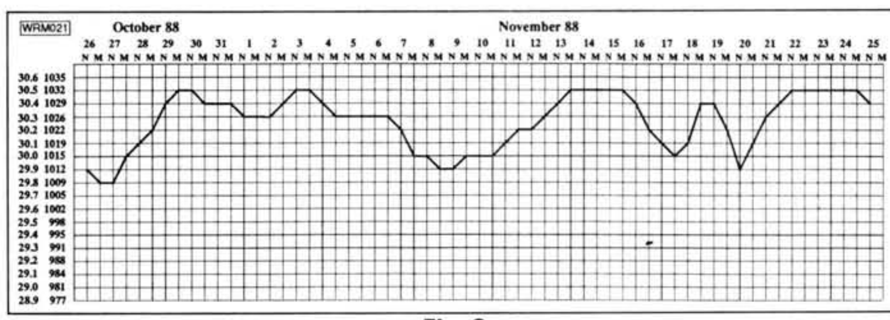


Fig. 6

Tropospheric

In October, I had the pleasure of meeting two of our readers from Rye and showing them around the radio exhibition at The Chalk Pits Museum, Amberley, Sussex. **Norman Henbrey BRS28198** and **Tony Whatman**, left and right in Fig. 4, are neighbours with differing interests in the world of radio communication. Norman has been active for 40 years and enjoys listening on all amateur bands from 1.7 to 432MHz using all modes. His receivers include FRG-7700, FR-DX400, KW77 and converters for v.h.f., u.h.f. and RTTY. He recently added a Datong Active antenna to his present system which includes an 8-over-8 slot for 144MHz, Fig. 5, a 48-element for 432MHz and a TA31 dipole, 18AVT wide-band vertical and a long wire for the h.f. bands. Norman is a member of the Hastings Electronics and Radio Club and has won listening awards from the RSGB and the ISWL. Radio next door in Tony's QTH is less extensive but none the less interesting because his speciality, which began in his service days, is aircraft and their general RT traffic. He is a member of the Robertsbridge Aviation Society and has a Realistic receiver.

The atmospheric pressure readings for the period October 26 to November 25, Fig. 6, were taken at noon and midnight from my barograph in Sussex.

934MHz

While on holiday in Deal, between October 19 and 27, **Les Jenkins GB-37** (Godalming) made contact with stations in Biggin Hill, Canvey Island, Dagenham, Detling, Eastwood, Fobbing, Hadleigh, Leigh-on-Sea, Minster, Rochford, Sandwich, Sittingbourne, Southend and Westerham. Les found conditions normal and used a Cybernet Delta One transceiver, Crestbyte receiver pre-amplifier and a Nevada quad loop antenna only 3m a.s.l.

John Levesley UK-627 received signals from GY-186 in Guernsey on October 25 and November 5, 6, 9 and 10 and worked him on the 4th, and JY-797 in Jersey on the 5th. The Channel Isles to John is around 170km.

The next three deadlines are: Jan 25, Feb 27 & Mar 29

Broadcast Round-up

Peter Shore

Radio activity has been high in recent weeks — and I'm not talking about another Chernobyl. The BBC is convinced that we are moving towards a sunspot maximum, as it has started to use the 11 metre band for broadcasts to Europe and Africa, and indeed, several other stations are now doing likewise. Details later.

Radio is proving to be worthwhile on a news gathering front, with stations in the parts of the Soviet Union where unrest is spreading providing a reliable source of information. In some cases if you are to find out what is going on, you'll have to be a linguist with several obscure tongues to your credit, as services audible here are often in regional languages. However, some do have English and French broadcasts. Details in European news desk. Some Western broadcasters are taking the opportunity of the continuing nationalist feeling to introduce new services directed to those parts of the Soviet Union. Radio Sweden introduced an Estonian newscast on December 5 at 1755 daily, on its medium wave channel of 1.179MHz.

Meanwhile, money troubles continue to plague the international broadcasting world, for whilst Radio Sweden now enjoys a new language service, its s.s.b. transmissions finish at the end of 1988. These transmissions, which have relayed Swedish Radio's Programme 1, have been in existence in trial form since 1977, from the Grimeton transmitter near Varberg. It is considered too expensive to make them permanent.

Kol Israel may be forced to leave the air soon, according to reports reaching us. More donations are required from the Jewish Agency, or alternatively the Israeli Government, if broadcasts are to continue.

The Middle East has given some interesting listening lately with Radio Jordan testing its new transmitters, and Abu Dhabi giving good reception and two simultaneous short wave services, one possibly a revamped External programme.

Radio France International and Radio Beijing started their transmitter exchange during November, and RFI has entered into new agreements with Africa Number One for broadcasts from the Moyabi transmitter site. Meanwhile, a former DG of RFI has just signed an agreement to install three high power short wave transmitters in Cape Verde which will be leased to international broadcasters for programmes aimed at Latin America and Africa.

The Dutch government is considering an

Asian relay station for Radio Netherlands, and there is the possibility of increasing the number of languages the station broadcasts. No decision has yet been made on the site of the new relay, but more information should be available within the next six months.

With short wave conditions theoretically on the up and up (although listening during the evening in late November as this is written has been most frustrating, with very poor reception on all paths), it is worthwhile keeping an ear to the regular propagation reports from Radio Australia, heard at 0425, 0827, 1225, 1627 and 2027, with weekly updates in the *Communicator* programme. Radio Netherlands communications magazine, *Media Network* also has a weekly update and forecast.

Europe

(all times UTC/GMT)

BBC World Service uses 5.875MHz, an old feeder frequency, for English by Radio, French and German from 1715 until 2200 giving good reception in Europe.

Radio Austria International's English to Europe can be heard at 0430 on 6.155MHz, 0830 and 1230 on 13.73 and 6.155MHz, at 1730 and 1830 on 6.155 and 5.945MHz and finally at 2230 on 9.87 and 6.155MHz.

The Voice of Greece has started two new language services recently. Swedish news can be heard daily at 1540 on 17.565, 15.63 and 11.645MHz, whilst Polish is broadcast at 1740, immediately after the 1725 Russian news, on 11.645 and 7.43MHz.

The Italian Radio Relay Service has been testing at weekends between 0600 and 1500 on 7.145, 7.16, 9.86 and 11.995MHz, and after 1530 on 3.945MHz. Eventually it is planned that this organisation will relay international broadcasters — for a fee, of course.

Radio Netherlands has altered two frequencies — at 1130, new 21.615MHz is used in parallel with 21.48MHz, and at 1430 new 17.605MHz is used, replacing 21.48MHz.

Radio Norway International's latest operating schedule for services which include on Sunday the English *Norway Today*, programme:

1000 on 25.73, 21.705, 15.235 & 15.18MHz

1300 on 21.705, 15.31, 9.59 & 6.035MHz

1400 on 21.70, 15.31, 15.25 & 15.19MHz

1600 on 21.705, 15.31 & 11.76MHz (and on Monday only on 1.314MHz)

1700 on 15.31, 15.22 & 9.655MHz

1900 on 15.225, 9.59 & 6.015MHz

2000 on 15.31MHz

2200 on 11.85 & 9.605MHz

Radio Exterior de Espana has two one-hour long transmissions in English to Europe at 1930 and 2130 on 11.79 and 9.765MHz.

Radio Sweden is using 17.815 between 1200 and 1600, a 5kHz move from 17.81MHz.

Soviet regional external services include Radio Yerevan from Armenia, which transmits in French Monday to Saturday at 2150 on 11.98, 9.48 and 9.47MHz, and on Sunday at 0850 on 15.51, 15.485 and 15.455MHz.

Radio Vilnius in Lithuania has English daily at 2230 on 6.10MHz and at 2300 (aimed at the USA) on 15.455, 15.18, 13.645, 9.765, 7.40, 7.165 and 6.10MHz.

Radio Kiev in the Ukraine, at present seemingly untroubled by nationalistic tendencies, is on the air to Europe at 1900 daily on 7.115, 6.165, 6.09 and 6.01MHz.

Offshore news from Europe — Radio 819 is now carrying Dutch programmes daily 0400–2300 on 819kHz, with Caroline carried 24 hours a day on 558kHz and on 819kHz between 2300 and 0400.

Middle East

Radio Jordan is using 9.56MHz between around 0500 and 2200, with broadcasts in English, apparently a relay for test purposes of the domestic English service. Reception varies, and reports are requested. Swiss Radio International uses 9.56MHz between 0745 and 1030 rendering Jordan inaudible. Reports are to be sent to PO Box 909, Amman, Jordan.

Arabic programmes from the country are heard 0330–1500 on 11.92, 11.81 and 9.54MHz, and from 1500–2330 on 11.81, 9.54 and 9.53MHz.

Iran is using 6.08MHz in parallel with 9.022 for the evening period which includes English at 1930.

Iraq is now using 15.01MHz during the morning for Arabic programming.

Tunisia is heard with good reception from around 1400 on 9.675MHz.

The United Arab Emirates station in Abu Dhabi carries English at 2200 on 9.595 (or 9.597) and 11.965MHz as well as announced 6.17MHz. UAE Abu Dhabi's Arabic programming is heard on 25.90, 21.515, 21.735 and 17.82MHz. Separate services have been noted from just after 1400 until 1530.

In UAE Dubai, the 1600 English broadcast is carried on 17.865, 15.435, 11.73 and 9.64MHz.

Saudi Arabia's English service is on 9.705 and 9.72MHz at 2000–2100.

Asia and the Pacific

Radio Afghanistan is carried on 9.635, 6.02 and 4.76 MHz at 1900 with English, but presumably from 1730.

Radio Australia is testing to the Indian sub-continent on 15.14MHz between 1500 and 1800, and can be received in the UK.

Bangladesh is on the air at 1800 on 15.51 and 7.505MHz, and announced 13.650MHz.

Radio Bhutan may just be audible in Europe on new 5.04MHz between 1330 and 1600.

All India Radio uses 7.412MHz during the early evening, with a brief English newscast at 1730.

The Voice of Indonesia is on 15.15, 11.79 and 7.125MHz between 1800 and 2100, and carries English at 2000.

Radio New Zealand's current schedule is:

0230–0630 on 17.705 & 15.15MHz (0045 on Sundays only)

0900–1115 on 11.78 & 9.85MHz (heard in UK on both channels)

1730–2015 on 15.15 & 11.78MHz

2245–0045 on 17.705 & 15.15MHz

Voice of Turkey uses 15.20 with 9.445MHz (ex 9.46) 0500–1000 with Turkish programmes.

The Americas

HCJB in Quito, Ecuador with English to Europe is heard at 0700 on 9.61 and 6.205MHz with the Australian service on 9.745 and 6.13MHz, sometimes running in parallel.

A supposed clandestine station, R. Libertad, broadcasting in Serbo-Croat is broadcast on the transmitters of WHRI on 21.84 and 15.105MHz at 1600 daily, with good reception in the UK. It is not known who is behind this station at the present time.

KUSW is herd after 1600 on 15.65MHz with good reception, and WRNO in New Orleans is audible on 13.76MHz during the evening period.

Any reports for Broadcast Round-Up should be sent to the PW offices

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