ELECTRONIC COUNTER MEASURES:
How a moth, a 40 year-old aircraft and the RAF join forces to cause confusion

FLYING DUTCHMEN!
The ingenious Dutch get HF QRV from 600ft

LEICESTER SHOW PREVIEW
Oct 27-28th
Rumours have abounded for some months that Kenwood were once again about to take the HF transceiver market by the throat, and with the announcement of the TS-950S those predictions have proved to be true. It is an undisputed fact that Kenwood HF transceivers have always led the way, and it seemed almost impossible for their design team to make significant advances on the success of the TS-940S, — but they have.

We don’t have to tell you that the receiver performance is outstanding; a noise floor of -140 dBm will do that. Nor do we have to mention the ease of use; Kenwood has an enviable reputation in this area. What we must give a few hints about are some of the new operating aids which Kenwood have included, such as a dual receiver which allows you to listen up to 500 kHz away from your operating frequency — even during transmitting; such as the revolutionary digital signal processing option which gives improvements of up to 10 dB in carrier and unwanted sideband suppression; variable transmit bandwidth; adjustable rise time of the CW envelope; and much more.

The photograph and this brief text can only give a hint of what the TS-950S can deliver — the full story can only be told by a visit to your Kenwood approved dealer or a browse through some detailed literature, but take it from me that once again, Kenwood have shown the way forward in HF transceiver design.

John Wilson G3PCY/5N2AAC
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**COUNCIL BRIEF**

30 March 1989 Council Meeting

- The policy of Council to move the Society's Annual Meeting to different parts of the UK, to give more members an opportunity to attend the Annual Meeting, was discussed at length.

- A decision on the location of the 1989 Meeting would be made at the next meeting of Council.

- A new Chairman for the VHF Contest Committee, Bryn Liewellyn, G4DEZ, was appointed following the resignation of John Quarby, G3XJY. Council thanked G3XJY for his great contribution to the work of the Society.

- Procedures were agreed whereby the Society would be represented at Railies by locally based officers of the Society.

- The Tartan, Scottish and Founders Trophies were discussed.

- Council discussed the Editor-in-Chief's letter to Mr Willis, G8VR, in which he had asked Mr Willis to stand down as the contributor of the VHF bands column. Mr Willis attended the meeting of Council to put forward his views. After much discussion, Council thanked Mr Willis for his attendance and agreed that in future columnists should be appointed annually by the Editor in association with the Technical and Publications Advisory Committee.

- The terms of reference for the Finance and Staff Committee were discussed and clarified. The Committee Chairman, Willie McClintock, G3VPK, attended the meeting to describe the work of the Committee and to seek closer liaison with Council on financial matters and reporting.

- An ad hoc Committee was set up to discuss ways of seeking better publicity for amateur radio. John Greenwell was appointed Chairman.

- A long discussion took place for plans for Project YEAR and Novice Licence frequency allocations.

- Other matters discussed included: the half yearly accounts, the co-ordination of external events, the opening of a Dollar Account, the RSGB Legacy Fund, the International Beacon Project, VHF Contest matters, RAE

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**News from the HF contest committee**

**AFS and cumulative results**

For the members who enquired about the late publication of these results, the AFS Results appeared in the September 1989 issue of RadioCom, and the LF Cumulatives appear in this issue.

**Contest Log and Declaration Sheets**

A number of clubs have asked if there is any objection to using photocopies of the RSGB contest stationery, as they often need extra copies for NFD and SSB FD etc. The HFCC will always accept photo-copies provided they are A4 size. The samples in the RSGB Callbook are undersized, but as the reduction applied to both width and length, a small amount of enlargement during the copy process brings them up to A4 size. Computer-derived logs may also be used for all RSGB HF contests, but again they must be formatted to the standard contest log sheet (40 entries per page) and use the A4 paper size. There is no restriction on the paper size for the declaration (cover) sheets. There have been enquiries as to why the standard log sheet is not formatted to line-printer or daisy-wheel standards. The format was agreed some ten years ago during the IARU Region 1 Brighton conference and was supposed to be a standard for all IARU Region 1 societies. The line-spacing was based on a typewriter standard, which was thought to be suitable for most uses. This has not proved correct as the introduction of electronic, golf-ball and daisy-wheel typewriters, together with the mass use of word-processors and printers have made the spacing non-standard and difficult to use. To overcome this the HFCC will shortly be producing a revised log sheet with altered line-spacing which should make things easier for those who wish to use it on their printers. There will also be a revision of the declaration sheet. Further details about the changes and availability of the new sheets will be announced in Radio Communication.
CLUB CALLS CONTEST
A reminder to Club Secretaries and Contest Managers that the next CCC will be on 11 November. Now is the time to plan your entries for this popular event (all modes including SWL section).

ROPOCO Timings
Judging by the comments from competitors, there are mixed feelings about changing the start and finish times and it seems the majority wish to keep the status quo. The IFCC will decide about this when reviewing the rules for ROPOCO at the end of the year.

28MHz CUMULATIVE CONTESTS
By the time this news is published, the next series of these combined CW and SSB events will be starting. Sessions are on 9, 17, 25 October and 2, 10 November. Rules are unchanged from the last set of sessions earlier in the year and were published in Contest News for August.

EMC News
The Chairman of the EMC Committee will announce the EMC Coordination Scheme at the HF Convention at Oxford on 1 October 1989. The organization of the scheme is to provide local contact points for general EMC advice, with the necessary support from the Committee, Corresponding Members and the EMC Committee members. This service will in the first instance only provide a telephone/mail contact for advice and will not provide for local visits without authority from the EMC Committee Chairman. It is hoped that a full list of the EMC organisation will appear in the next issue of RadCom and the RSGB Call Book with a full description of the services provided.

Raynet Zone 2 Election Results
Results of the Raynet Zone 2 election are hereby announced:
Mr W F Marshall G4HOD received 9 votes.
Mrs P M Smith G4ZWQ received 30 votes.
There were 7 spoilt votes.
Mrs P M Smith G4ZWQ is therefore elected as representative for Raynet Zone 2.

Installation of the 1990 President
Mr Frank Hall, G88BZL, will be installed as the Society’s President on Saturday 9 December 1989.
The ceremony will take place after the Society’s Annual Meeting. Tickets for the evening dinner are priced £12 per person. Those applying for tickets will be sent a map of Dunoon, together with full details of accommodation if required.
Please mark you envelope ‘Presidential Installation.’

Fine Tuning the UK Licence

Last January saw the culmination of two years of work by the DTI and the RSGB aimed at bringing the UK Amateur Licence up to date. Improvements included the addition of CEPT privileges, relaxed identification requirements, permission for digital repeaters, plus unattended beacon operation, direction finding, low-power remote control, and digital communications.

In September this year, the US licences went through a similar change following ARRL and FCC discussions. Some of the improvements to the USA licence were based on those which the RSGB had already obtained in the UK. Of particular importance was the adoption of the UK Government’s view that traffic generated by, and intended for, licensed radio amateurs is not Third Party in the sense intended by the International Radio Regulations. This should considerably improve the passing of packet radio messages between US amateurs and those in the rest of the World. This is another example of the RSGB’s work having a positive influence on amateurs worldwide.

Despite our general satisfaction with all of the benefits of the new UK licence, there remains a number of areas where further negotiation was felt to be necessary. Accordingly, the Society recently met with the DTI to argue the case for changes, in some cases minor but nevertheless important.
In brief, the Society’s requests were for:

1) Clearer numbering of paragraphs
2) Club stations to allow greetings messages from non-licensees
3) Unattended operation to be permitted in various sub-bands in the 430MHz band
4) Clarifying the wording of the sections relating to Unattended Operation
5) Operation by visitors from overseas under supervision
6) Updating the Schedule to reflect the full release of 18MHz and 24MHz bands
7) Better wording for the period of identification requirements when at a temporary location
8) Maximum carrier power to be 26dBW (400 watts) on CW to align with SSB operation
9) Unattended stations for Amateur Radio Direction Finding to be permitted on 3-5MHz and 1-8MHz
10) Validation Document to include list of countries with whom 3rd party messages can be exchanged
11) Changes since last renewal to be noted on Validation Document
12) Incorporate full details of 28MHz equipment restrictions in Notes

The DTI’s response to many of these has been favourable and the results of the discussion concerning unattended digital communications can be seen in the News pages. The full list of revisions will appear in a future edition of Radio Communication once the DTI have considered our representations further. In fact, it now appears that there will be an annual opportunity to ‘fine tune’ the new UK licence.

Whatever is finally agreed, there will always be further improvements which amateurs would like to see. Nevertheless, it is a most encouraging sign that our licence conditions are becoming more liberal at a time when pressure on the radio spectrum from other services has never been greater. This is further confirmation that, as far as the UK Government is concerned, amateur radio has a vital role to play in modern society.

David Evans, G30UF

NEWS EDITOR

The Radio Society of Great Britain requires a News Editor for its monthly magazine “Radio Communication” and weekly on-air news broadcasts. Familiarity with the technical hobby of Amateur Radio, plus the ability to recognise a good story, follow up leads and write to fit are necessary qualifications. Some experience of working with modern electronic production and office communications equipment would also be highly desirable; the RSGB’s publications are moving rapidly towards desk-top publishing.

It is a staff position within a small, enthusiastic new team, operating from offices in Potters Bar. Salary is negotiable, according to experience and age.

Please apply in writing, enclosing a CV, to the Editor, Radio Communication, Radio Society of Great Britain, Lambda House, Cranborne Road, Potters Bar, Herts. EN6 3JE. Please mark the envelope “Editorial Vacancy Private and Confidential.”
AVAILABLE NOW

RAE Manual
by George Benbow G3HB

Recognised as the standard text book for the Radio Amateurs' Examination, the twelfth edition has been revised for the 1989-91 syllabus. The book is presented in an easily understandable format taking the candidate step-by-step through the course topics including:
Solid-state devices
Transmitters
Receivers
Power supplies
Propagation and antennas
Transmitter interference
Electromagnetic compatibility
Measurements
Operating practice and procedure

In addition to supplying the candidate with the basic requirements for the examination, this book will continue to be a valuable source of reference long after passing the examination.

How to pass the RAE
by Clive Smith G4FZH
and George Benbow G3HB

Companion volume to the RAE Manual, this book takes a practical approach to the Radio Amateurs' Examination. Chapters explain the nature and correct approach to multiple choice questions and how to prepare for the examination. The majority of the book is given to sample examination papers so that candidates can familiarise themselves with the examination and assess their ability.

See this month's mail order list for details - pages 45-6
Flying Dutchmen

A new record for kite-borne horizontal multiband HF antennas was recently established by PI4ARA. This is the callsign of a club station in the Dutch town of Almere, which is located about 12 miles east of Amsterdam and - believe it or not - below sea level! An antenna height of 102 metres (334') AG L was achieved and contacts made in the 3.5, 14, 21 and 28MHz bands. Our reporter is Erwin David, G4LQI and ex-PACGC.

The word 'new' describes almost everything in or about Almere. Fifty-five years ago the entire area was part of the Zuider Zee, a brackish tidal area of water covering much of the northern part of the Netherlands. After having been separated from the open sea by a dyke, the throughput of river water gradually washed out the salt; parts of what is now a lake known as the Ijsselmeer, which were selected for their agricultural potential, were surrounded by more dykes and pumped dry. In this way an entire new province called Flevoland was created, and twelve years ago the new town of Almere was built. In 1986 local amateurs formed a club, 'Amateur Radio Almere' which now has 60 members. Those who live in Almere are mostly young families who are fiercely proud of their achievements and lifestyle, and they're always eager to tell the world about both. As a contribution to a civic promotion which took place in the summer, a local group of kite-flying experts - 'Roge Vlieger Partners' - joined forces with members of the Almere club in an attempt to establish a new record for kite-borne antennas. The occasion would also mark the inauguration of the Almere club's new callsign, PI4ARA.

A 40-metre (131') long coaxial-fed horizontal multi-band "FD4" antenna (similar to the I7SWX antenna described in the March 1988 Technical Topics on page 186) was to be lifted to an altitude of 100 metres by anything between five and seven kites depending on wind speed and connected to a 100W HF transceiver. This would be operated by Bodhi, PA3EKY, who happens to be blind and would be sitting in a 'wheelchair taxi' with suitable motive power. Bodhi would attempt to make contacts on 80, 40, 20, 15 and 10 metres if conditions permitted. In the Town Hall square adjacent to the field in which the kites would be flown, a tent containing a demonstration station capable of a variety of modes of operation on HF and VHF would enable the public to follow the HF contacts made by PI4ARA, together with the 'command and control' net used by the kite crews. Overall coordination was in the hands of Hub, PA3EOU, who had obtained permission from the National Aviation Authority to fly kites up to 200 metres AGL. He also had to defend his all-day reservation of the town hall square against a national political party who wanted to hold an election rally there!

Several rehearsals were held, and in the course of one of them a 144MHz ground-plane had been operated at the top of 100 metres of low-loss H100 cable. Since this is quite heavy, it had helped in stabilizing the kites and was therefore used for the HF antenna as well. The kites used were hexagonal 'Sanjo' models; those which raised the coax were 7.5 sq m (81 sq ft) in area and 5 sq m (54 sq ft) for the 'side kites' holding up each end of the antenna. A smaller 'pilot kite' was used to raise the stack of coax lifters' out of the lee of surrounding buildings. The tether of the main stack consisted of 6mm nylon rope.

The great day dawned, but unfortunately the omens were anything but good. When the crew arrived on site at 7am there was no wind whatsoever. However, there was plenty of rain and fog! Not even the unweighted pilot kite would stay airborne. By mid-morning a breeze was beginning to blow but a thunderstorm was then reported to be nearby; all operations had to be put on hold for obvious safety reasons. After that, the wind dropped again! In the meantime, some contacts were being made from the demonstration station to keep the public interested; an HF antenna was strung between some suitable lamp-posts.

Finally, well after noon, the wind picked up to a whopping 9 knots. This was well below the design value for the kites of 11-15 knots but it seemed worth a try. Three of the big kites were rigged in tandem; commanded by the 'pilot' they rose to 100 metres AGL on 200 metres of tether, half of which was then walked back down. The balloon with coax attached was then hooked on to the tether at the half-way point. Similar operations were carried out with the ends of the antenna and their kites.

The coax was paid out slowly and the tethers were manoeuvred to stabilize the antenna at 50 metres. PI4ARA was now in business! More coax and rope was released in stages and the tethers were continuously adjusted to keep the antenna straight and level. However, the height of 100 metres which we wanted for the Guinness Book of Records seemed to be just out of reach in the existing wind conditions. It was decided that drastic measures were required, and an extra kite was run half-way up the main tether (which was now 350 metres long) in order to carry some of its weight. That did the trick; at 6:06 pm the balloon was reported to be 102 metres AGL and we had a new record. The excellent HF performance, with strong 3.5MHz signals all over Holland and Belgium and some super DX on the higher bands (including a K6H on 28MHz in mediocre conditions) seemed to be almost an anti-climax!
Active mountaineer and keen amateur John Linford, G3GWG and his friend and colleague Tony Giedhill, G6MCI – both of Reading & District Amateur Radio Club – came on the air from the top of Ben Nevis on 5/6 August 1988. John sent in a short piece about their exploits, which makes interesting reading for those of us whose idea of a DXpedition is taking a handset with them on a walk to the local... Ben Nevis, Britain's highest mountain, was on the air over the weekend of the 5th and 6th of August. The Ben, at I076LS, is on the west coast of Scotland near the town of Fort William; it is surrounded by mountains of similar stature, so the radio potential was unknown and suspected to be rather poor. The "Roof of Britain" station was manned by G3GWG and G6MCI, in what is believed to be the first time a full-scale 144MHz station has operated from the summit.

The basic idea was conceived after drinking too much of the local brew one evening. The task would be to get 25W of SSB/CW with a reasonable antenna, sufficient battery power and the necessary survival equipment to the top of the Ben, using the combined carrying capacity of two people. In the end this necessitated both of us carrying loads of about 60lb each. The equipment line-up included an FT290 and 25W Microwave Modules amplifier, a 9-element portable Tonna with UR87 feeder and a 20' telescopic mast. The heaviest item of all was the battery, which for 12W at 24Ah weighed in at 18lb. In addition, a 'Force 10' tent and full camping and survival gear including some 15lb of water were carried up the 4460' mountain.

Prior to the event – which was organised literally at the last moment – some attempt was made to publicise the expedition by sending a message over the packet network to 'ALL' in the UK. We were too late even to think about including it in GB2RS news! The drive to Fort William, the nearest town, took some nine hours and we pondered the fact that it would only take the radio signals about 2ms to make the return trip to I091-Land - if indeed we would be heard at all. A morning was spent arguing about who would carry what and testing the set-up before setting off into the blue (well, murky-grey) yonder.

The route up Ben Nevis was straightforward enough. There used to be an observatory at the top, and a good path has been made from the nearest access road to the summit. However, it still took about five hours to cover the five miles to the top. You should have seen the looks and heard some of the questions we got from others on the way up! Once on the top, the next problem to overcome was how to pitch our tent - given that there is not a scrap of grass anywhere above the 2000' contour. Ben Nevis was volcanic and the summit is covered in rocks of all shapes and sizes - but no grass. A slightly less lumpy section about 50' away from the trig point on the summit plateau was chosen, and by dint of pieces of string and pieces of rock the tent was persuaded to stand up. Fortunately it wasn't too windy since otherwise we would have emulated GB2CAAN/A and taken off! After that, putting up the 9-element Tonna was very simple and we were soon on the air calling “CO from Britain's highest radio station”.

Operations began at 1745 on the Saturday, with a real DX QSO to GM7CMC/P, who turned out to be staying at our 'base camp' in the valley below! However, we were soon getting calls from further afield, helped by the (hitherto unknown to us) low-power contest going on. I think we gave a few stations a rather nice bit of DX from an unusual square. The going was fairly slow, though, and we felt decidedly out of things compared with operating in the Reading area. By 0100 we had run out of people to talk to, having worked about 20 stations down as far as Salisbury and Northern Ireland. So we decided to get some sleep and see what the morning had to offer. But almost as soon as we had settled down, the rain started! There was torrential rain all night but the tent did its job and we remained nice and dry. Believe it or not, we were woken by noises suggesting the distinct prospect of some competition. Some other mad amateur had come up to the summit (at 8am, no less) and was tuning around with a 50MHz handheld. I was so surprised that I didn't even get his callsign; I suppose it must have been a bit of a shock for him too.

The morning brought much better conditions than those of the previous day. We could now hear GB3YHF at Wrotham at a steady 52, so we all needed was some activity - and that's precisely what we got. There was a steady stream of calls from as far south as Northampton and Birmingham, and in the course of an interesting few hours we managed to work G, GW, GI and GO as well as a large number of GMs. We even got a mention at the end of one of the GB2RS broadcasts, which resulted in quite a pile-up for a while. Sadly, the lack of stations in publicity including some friend who didn't we get calls from the far south, where we would have been rather weak and missed by most. But we did hear some Frenchmen - too weak to work but undeniable there.

We were expecting battery power to be the limiting factor but this proved not to be the case. By 1500 we had to start dismantling the station in preparation for the long haul back down the hill, but the battery was still going strong. We could have run more power after all! The descent was somewhat quicker but no less exhausting with the heavy loads. We got down in time for a necessary sewer, followed by some much-needed refreshments at the Nevis Bank Hotel. In all, we worked about 100 stations; we would have worked many more if we had made any attempt at publicity beforehand. The location was clearly unusual, since it appears that many people

**Radcom Postal Survey**

Please help us to conduct a survey into the delivery of Radio Communication! We have received a number of Complaints that Rad Com has been unnecessarily delayed in the postal system, and we are endeavouring to find out just how long it takes you to receive your copy. Once we have this information, we can then go to the post office with hard evidence to back our suspicions.

To help us to gather this information, please write on the address label, the day and date which you received the October issue of Rad Com. Please mark your envelope "RADCOM POSTAL SURVEY".

**GB400LIZ - QSL Cards**

Due to an administrative problem some QSL cards for the operation of GB400LIZ in July 1988 were returned by the bureau as invalid. Anyone requiring cards for this operation is asked to apply directly to Mr LE Wilkes G3KJK, enclosing a stamped addressed envelope.
News from Waterloo Bridge House

At a meeting on 17 August, the Society and the DTI discussed the Novice Licence; the Department appear to be enthusiastic to progress matters. Initial discussions centred around the licence document. The Society is producing a first draft, which it will have sent to the DTI by the time this is read. We are also undertaking work on the Novice Licence course and examinations.

Following representations from the Society, a number of improvements are likely to be made to the amateur licence with effect from 1 January 1990. These will include the availability of 1299-1300MHz for unattended digital communications. Also of interest to packet enthusiasts will be the addition of two frequencies at 70MHz and also 432-675MHz to those available under the mailbox Notice of Variation system administered by the Post Office on behalf of the DTI. This should have the effect of lessening the processing times for applications for mailbox ports on these bands, and will also help reduce congestion on 144-65MHz.

WARC in 1992

A recent ITU Plenipotentiary Conference has scheduled a full World Administrative Radio Conference for the first quarter of 1992. The last full WARC took place in 1979 and led to the allocation of 10, 18 and 24MHz to the amateur service, amongst other things. A full agenda hasn't yet been set, but the American Radio Relay League (ARRL) thinks that some clues to what’s on the cards are contained in the conclusions of recent WARCs dealing with the HF broadcast bands and others. The HF WARC in 1987 and the Mobile WARC in the same year referred to the possibility of extending the amount of HF spectrum allocated exclusively to the broadcasting service and revising allocations between 1 and 3MHz for mobile and space use. ARRL seems to be taking the view at this stage that the amateur spectrum in most jeopardy are the portions between 3 and 30MHz, 500MHz and 3GHz and everywhere above 12GHz.

Obviously, the RSGS will be working hard on preparations for WARC 92 and we’ll keep you posted in these pages.

£927 raised by Wimbledon club in appeal

On 23 April - which was of course St George’s Day - Wimbledon & District Amateur Radio Society ran a special-event station, G80SGH, at St George’s Hospital, Tooting, in aid of the NMR Scanner Appeal. The station raised £927 in sponsorship, which was presented to St George’s Hospital Medical School at the Club’s Annual Summer Camp in Chessington.

The photograph shows (L to R) David Whiteman, G1ADW, W&DARS Chairman; Nikki Browne, the Bursar of St George’s Hospital Medical School; and Jim Todd, G4XLM, the W&DARS Treasurer.

You never know where you’ll meet one

Neil, GBXYN and Roy, G4XYN, were recently travelling from the Soviet Far East city of Khabarovsk to the Siberian city of Irkustk, near Lake Balkal. The 2,000-mile journey on what is often (and inaccurately) known as the Trans-Siberian Railway took two and a half days, and the carriage attendant for the journey turned out to be Michel, U23TZ. Michel comes from the city of Gorky and is a keen member of the U23TYA club contest station. His normal workload is two weeks on, two weeks off, but he said that he was working solidly throughout the summer so that he could have the autumn free for the Russian contest season!

The Trans-Siberian rail journey takes seven days to travel between Moscow and Vladivostok. Michel made a request to the railway authorities to be allowed to set up an amateur radio station on the train, unfortunately this was not forthcoming, although he said that permission would be given for a special occasion. Neil and Roy were the first radio amateurs Michel has met on his train - they hope to be able to make contact with him later in the year when he returns to Gorky.

All fixed up

A silly article by a normally sensible journalist appeared in the 19 August edition of New Scientist. With the sensational headline 'Radio hams eavesdrop unchecked on cell phones' (wish we could write headlines like that and get away with it) the piece said ...

...Cellnet, controlled by British Telecom, and Vodafone, owned by Racal, started offering a cell phone service in January 1985 on the 900MHz waveband. Licensed radio enthusiasts or "hams" soon found that they could easily listen in...

Hams know that the Wireless Telegraphy Acts carry heavy fines and jail sentences for misuse of the airwaves. An lease on and so forth. Written by Barry Fox, a freelance whose work we normally have a lot of time for - he's the scourge of some of the daintier claims of the hi-fi and satellite TV fraternity - this was a very good example of sloppy non-journalism.

Memo to Mr Fox. Most of those using scanning receivers to listen to various interesting things aren't 'licensed radio enthusiasts'. The proportion of 'licensed radio enthusiasts' who have receivers capable of listening to cellular radiotelephones is probably a tiny fraction of one per cent. The usual word for a 'licensed radio enthusiast' (a radio amateur), the average British amateur uses the word 'ham' for something he eats in a sandwich. I don't have sales figures handy but there must be hundreds of scanning receivers sold every year in the UK. The vast majority is bought by people who like to listen to anything they can find, and you don't need a licence to own one. Oh, and as a matter of fact there are very few scanners on the UK market which will receive what you quaintly refer to as the '900MHz waveband'. The MHz is a unit of frequency, not wavelength; perhaps you should have called it the '33 centimetre waveband'.

Memo to all journalists. Next time you want to write an article like this, why not pick up the phone and check your facts beforehand? That way you don't risk blowing your credibility and alienating 50,000 odd radio amateurs at once. We're on 0707 59015.

(EDITORIAL NOTE: Upon contacting Mr Fox and amidst a certain amount of embarrassment, we were told that the errors were due to:...heavy sub-editing... a complimentary copy of RadCom goes to Mr Fox for the quote of the month!)
Amateur radio helps in rescue

Elsewhere in this issue you'll find a little item about how two intrepid gentlemen operated from the top of Ben Nevis. We stay in the hills for another piece, which was sent in by Michael Marsh, G4GGG; hope you're sitting comfortably...

The day started normally enough, although it must be said that the weather was fine, hot and sunny, which is perhaps not so normal for the Lake District! A group of six schoolchildren all aged 15 or 16 from Sudbury in Suffolk set off from Little Town, near Keswick, with two members of staff for a day's fell-walking in the Derwent Fells area. A similar group from the same party had started from Buttermere, and they were all planning to meet at Dale Head Tarn for lunch.

By early afternoon both groups had reached the summit of Dale Head at 2473' ASL and were making their way down to the tarn. The temperature was high and everyone was hot and sticky, looking forward to a dip in the cooling waters of the tarn below. The ground was stony and steep and a couple of the girls had already slipped and sat down rather more firmly than anticipated. Suddenly one of the boys - perhaps moving a little too fast - also slipped and fell awkwardly, knocking his arm, shoulder and head on some rocks. As soon as help arrived at his side it was quite apparent that he had broken his arm and would need rescuing from the hillside.

One of the staff was the author, who had borrowed an FT202R handheld to take on the trip with him for just such an occasion - plus, of course, the ability to chat to local amateurs in the area. I climbed back to the top of Dale Head (since a valley in the Lake District is not particularly conducive to getting out very far with a CRP handheld) until the town of Keswick appeared in the distance and then started calling 'CO Emergency' on S20. Unfortunately no-one came back; presumably every amateur in the area was out enjoying the lovely weather. Eventually, having got right back to the top of the hill, my call was answered by a signal from G6VGH/M. Ivan had left his camera in the car and had gone back to fetch it, only to discover that he had left his rig switched on. As he leaned over it to switch it off, he heard my call for help.

Map references and details were passed to G6VGH, who fortunately had a radiotelephone in his car; unfortunately it wouldn't work in the narrow confines of the valley where he was located! Instead, Ivan set out to find a telephone with which to summon help. Since both of us were running low on power, communication between us was difficult as Ivan drove from his location near Buttermere up through the Honister Pass with steep overhanging cliffs on either side. To me on top of the hill awaiting developments, time seemed to be standing still. I must have been even worse for the injured lad and the group with him, who - being well down the mountain from where I was - were out of contact with what was going on. In the event Ivan came across some members of a Mountain Rescue Team working at Gatesgarth before he found a telephone, and they quickly swung into action. The Team leader was able to confirm details with myself directly by radio, thanks to the lifting of restrictions in the licence which now permit such an interchange to take place.

Incidentally, the Team were quite impressed with the communications which were made possible by amateur radio, despite the simplicity and low power of the equipment being used at both ends of the contact.

As the Mountain Rescue Team assembled at Honister House Hostel at the top of the Pass, they were joined by another; in fact, both Keswick and Cockermouth teams were involved since the incident was on the borders of both their areas. A doctor in the team checked the details with myself before setting off up the hillside on the rescue mission with his fifteen colleagues. The need for such a large number was to become apparent later. By the time I had got back to the scene of the injury, three of the advance party of rescuers had already arrived and were comforting him and dressing some of his wounds. A few minutes later the rest arrived with the doctor and the rescue stretcher, on to which the patient was strapped. The doctor suspected a fracture of both the radius and the ulna and gave the boy a shot of morphine to ease the pain; it also did something to allay the discomfort of the rather bumpy trip which was about to start.

By now it was about 90 minutes since the accident had occurred. Shoudering the stretcher's carrying straps, the party moved off down the mountain. In the heat of the day, even the best porters would only carry the stretcher for a few minutes before changing with other members of the team - hence the reason for the large number of them. When the slope became steep enough, however, the stretcher was slid down on its runners like a sledge. Soon everyone arrived at the topmost point of Honister Pass, where the Mountain Rescue ambulance was waiting to take the patient to Keswick hospital.

From Keswick, the lad was transferred to the Cumberland Infirmary at Carlisle. X-rays showed that only the radius was fractured, although in a difficult direction, and there was some dislocation of the wrist. By midnight the bones had been reset and plaster applied; he stayed in hospital for a further two days before being taken home to Suffolk. He is continuing to make progress.

Sincere thanks are offered to the Keswick and Cockermouth Mountain Rescue Teams for their swift and efficient action in the rescue, and also to G6VGH for his help, both with communications and in finding the team in the first place.

Central Lancs at Leyland

3 June was a day to remember in the history of Central Lancs Amateur Radio Society. It was the day of the Leyland Festival - one of the largest annual fesitvals in the UK. 1989 was also its centenary, and CLARS was requested at short notice to run a special-event station. Although this coincided with the club's NFD, it was decided that both events could be managed - and the Festival turned out to be very successful.

The RSGB allocated GBJLCF and John, GUSM; Berni, G6EHW; Shaun, G7AFH and Jeff, G7BWD handled all the organisation. Two HF stations and a VHF station were put on the air; the main antenna was carried on a 100' tower kindly loaned to the Club by the North West Water Authority. More than 300 contacts were made with over 30 countries. One of the more interesting ones was with an amateur in Kenya whose home G7TH was no more than a mile and a half from the site of the special-event station. The Club also arranged to make contact with Leyland's twin town in Germany. This allowed the Mayor of South Ribble, Councillor George Woods, to exchange greetings with the Bürgermeister of Schleswig-Flensburg, Kriepspreisent Andreas Franzem. The German operator at the other end of this contact was Johannes Hassler, DKL4U.
We hear that the administrators of Atlantic Awards £2.50. The address is still Awards. Each award must now be these awards have revised the charges slightly; applications for each award must now be accompanied by 10 IRCs, US$5 or £2.50. The address is still Awards Manager, PO Box 2, Ascension Island, South Atlantic.

**WAB news**

To coin a cliche, ZS6XJ has really swept the board on 50MHz. Conditions to South Africa were very good last winter and ZS6XJ has won several WAB awards at once - all of which are firsts for stations operating outside the UK on 50MHz. First of all, he gained the Overseas Introductory Award for working 25 areas and 10 counties. Then he took the Basic WAB Award for working 50 areas, followed by the WAB Bronze Award for working 100 areas. He is also the first non-UK station to gain the Counties Award for working 55 counties on 50MHz, together with the first Overseas Bookholders award for working 100 of them. In recognition of this outstanding achievement, ZS6XJ has also been awarded a Certificate of Merit.

Since conditions on 50MHz this autumn and winter are expected to be even better, WAB hopes that all British stations will give their WAB area when working the DX and also put it on their OSL cards.

This would seem to be a good point to mention this year's remaining contests, which include a 50MHz event. Contest rules and log sheets are available from the WAB Contest Manager, who is Ian Webb, G6TNW. His address is Cornerways, Orchard Road, St Neots, Huntingdon, Cambs PE19 3AN. Please send an SASE (9" x 4") and three first-class stamps if you require log sheets. Remaining contests are 50MHz Phone on 8 October between 0900 and 1200 GMT, LF CW on 5 November from 1400 to 1800 GMT and the HF Mixed Mode on 12/13 November 1200 to 1200 GMT. Note that UK stations may operate for a maximum period of 9 hours.

Other WAB this month are SWL Roger Sheppard, who received the 90 and 100 Overseas Bookholders heard, G0GQR, who has worked 10 Overseas Bookholders on 3-5MHz; and G1NRM, who has claimed the first Bookholders Award for 430MHz having worked 100. He was also the first to work 100 3rd-series bookholders on 50MHz.

Information about WAB matters may be obtained from Brian Morris, G4KSO at 22 Burdell Avenue, Sandhills Estate, Headington, Oxford OX3 8ED. Incidentally, the new and fully-revised Fourth Series WAB Book is now available from G4KSO at a cost of £7 including postage and packing.

**Correction**

On page 16 of September’s Rad Com we gave details of the modular kits available from Jandek. Unfortunately, a couple of bugs crept in, and G3ZOM has asked us to point out that Jandek’s correct telephone number is 0384 288900. Also, if you’re writing for details, please enclose an SAE.
Operating overseas?

New legislation introduced by the Government of Greece now allows visiting radio amateurs from EEC countries to operate portable and mobile stations for up to three months. No further formalities are required for holders of licences issued in line with CEPT Recommendation T/R 61-01. The permitted transmitter power is "not greater than the limits specified for Greek amateurs" and only frequencies allocated to the amateur service in Greece can be used. The callsign to use is of the form Sv/own call/M or Sv/own call/P. (Tx G3FPU - more info from MSD if you need it).

New Zealand has recently introduced new regulations allowing visiting UK licensees to operate on bands above 144MHz using handheld equipment only without the need for prior permission. Again, MSD has full details.

Finally, a reminder that the DTI has asked UK amateurs not to operate in Turkey under the terms of the CEPT agreement for the time being. More news soon.

Straight Key Day 1989

The third RSGB Straight Key Day will take place on Saturday 14 October 1989. Because of the poor conditions on 3-5MHz last year and the need to ensure communication between participants from both north and south of the UK, it has been decided to use the 7MHz band for this year's event.

Operation between 7010 and 7030kHz is suggested, with QRP stations staying close to the higher frequency. Start and finish times are 0900 to 2000 GMT, which should give enough time for propagation to be useful to all areas of the UK.

Remember that this is not a contest - the only requirement is to be active with a straight key and to demonstrate your skills. Information given to other participants some details of the key you're using should be passed. Once again, the HF Committee will be interested in seeing any pictures of the keys used, and would also like to have nominations for 'Best Fist'. Please send comments and pics to G3VTT OTHR. A small prize will be awarded to the owner of the 'Best Fist'.

New products

Want a new front-end for your IC202? Well, muTek is now producing the RPCB202ub, which is a complete replacement front-end for any of the '202 series. The press release says that it "...has a signal path designed for minimum noise and high dynamic range. A low-loss nitrogen-filled relay replaces the diode antenna switching system used by the manufacturer. This is followed by a very-low-noise RF amplifier using a modern silicon dual-gate MOSFET. The noise figure of this device is of the order of 0.6dB. However, since this order of sensitivity is unnecessary for terrestrial communications where the limiting factor is external noise, the design trades some of the noise figure for extra dynamic range. Following the RF amplifier, a very high-performance three-pole Chebyshev bandpass filter provides image rejection and feeds the mixer via a resistive pad. Considerable care has been taken to ensure that the mixer terminations are adequate, since failure to do this will result in a considerable degradation of potential mixer performance. A high dynamic range MOSFET amplifier with negative feedback follows this mixer and is also matched for low noise. The output from this stage drives the original crystal filter and noise-blanking circuitry'. Sounds just the job for owners of the IC202, which is still praised for one of the cleanest transmitted signals on 144MHz (other manufacturers please copy). muTek quotes the following spec: noise figure 1dB, image rejection 70dB, intermod-free dynamic range better than 90dB (one tone of two to generate a third-order product at 0dB wrt noise floor) and 0.5µV for an S9 signal. muTek are at PO Box 24, Long Eaton, Nottingham NG10 4QG. HRS Electronics sent us a colour brochure and spec of the new Ten-Tec Omni V HF transceiver, which looks exceedingly posh. They said that "In the interests of first-class performance, Ten-Tec has combined the advantages of the crystal mixed oscillator with the convenience of all the digital features, the result is a transceiver which is amateur bands only with superior phase-noise performance, dual VFOs, 25 memories, fast and slow tuning and many more features."

More info from Fred Rendall at HRS Electronics on 021-789 7575, or fax them your order for one on 021-789 8040. Something we haven't seen for years is a 'resistance box'. Maplin have now got one available, and very nice looks too - wish they'd sent us one to play with. It'll produce any resistance you like between 1f to 999,999 f in 1 steps; select it by pressing push-buttons and the value is displayed on the decade switches in ohms. In the Maplin one they've added the clever touch of providing an additional tkf resistor between one of the terminals of the resistor network and a third stand-alone terminal. This means that the box can be used as a very accurate potential divider.

Get yours from Maplin for £79.95 - stock number is JL83T. There's also a live-decade capacitance box, which will do 100pf to 9.9999uf in 100pf steps - this one costs £9.95 and the stock number is YT55K.

Mayor visits club

This photo (taken by Ray Knighton, G0GGER) was taken when the Mayor and Mayoress of Wyre, Councillor & Mrs R C Williamson, and some members of their family visited Thornton Cleveleys Amateur Radio Society during its 20th anniversary celebrations. It shows the Mayor accompanied by TCARS chairman John Ward, G8YOK, listening to the HF station operated by Roy Ellison, G4WFY. Also seen listening (l to r) are Ricky Johnson, G4XNH; the Mayoress; Harry Shepard, with Mayor's daughter in front; Arthur Pilling, G6DCM; the Mayor's son; and Ian Cobbe, G3RHZ.
New VHF records

We gather from the excellent Westlink newsletter that four new world VHF/UHF DX records were established last July. Between the 13th and the 15th of July, Paul Lieb, KH6HME on Mauna Loa Volcano in Hawaii and Jack Henry, XE2GXQ in Baja established new records for 144, 220 and 430MHz and 2.3GHz. The new 144MHz record of 2.659 miles was set on 13 July at 1046 by Paul at Mauna Loa and Jack at Rosario. About 640 miles south of San Diego. Reports of 5 and 2 were exchanged on SSB, KH6HME was running 80W to a pair of 7-element stacked Yagis and XE2GXQ ran 160W to a single 18-element Cushcraft ‘Boomer’.

The 430MHz record was established on the following day at 1547, with a distance of 2.573 miles between the two operators. On the same day at 1754 the 2.3GHz record was broken by a contact between the two stations at the same distance. The Hawaiian station ran 10W to four vertically stacked loop Yagis. The 220MHz record was established at 0755 on 15 July. Congratulations to all involved.

Famous callsign reissued

As of 1 August 1989, the Appledore & District Amateur Radio Club’s callsign became G2FKO, latterly the callsign of Mr Tom Ward. Tom was a very well-known local amateur who sadly passed away earlier this year; he was always keen to assist new clubs and amateurs in the area and was prominent in RTTY and computing circles. It was one of his last wishes that the local radio club should take over his old callsign, and the Appledore Club is very honoured to keep G2FKO on the air.

Want an American ticket?

There will be a testing session for the issue of American amateur radio licences (should that read ‘licences’?) in London on 25 October. Examinations will be offered for all classes of licence, from Novice to Amateur Extra Class, and you don’t have to be American; anyone can apply. A Stateside callsign would certainly be useful if you visit the USA often – it’d save having to renew your reciprocal licence every time you go – and would also give you access to reciprocal privileges which aren’t currently available to UK licence-holders, such as the ability to operate in Japan. The test costs $4.75 or the sterling equivalent, and examination preparation material is available from the Membership Services Department at RSGB Headquarters. The written tests are multiple-choice and you’ll need to know some CW for all American licence classes – for a USA novice licence you need a whooping 4 wpm!

Further information is available from Robert Wright, G4XDD/NV3Y, on 01-221 4399 during the evenings.

Sussex Fair

The Sussex Amateur Radio & Computer Fair took place on 16 July at Brighton Racecourse. Talk-in via GB2SMR started at 0600, and 146 mobile stations requested directions during the day; almost 2000 people attended overall! The Rally Committee wishes to apologise to those who made the only complaints of the day, which were concerned with the catering arrangements. The Committee mentions that the catering concession is granted by the managers of Brighton Racecourse to Messrs Leheby & Christopher as sole on-site concessionaires; outside caterers are not permitted and the caterers make no donation or other payments to the Rally Committee. Discussions will be taking place to try and ensure that complaints do not arise at future rallies.

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John Nelson, GW4FRX, goes behind the scenes to visit the RAF's 'ORM Wing'

You may remember that history was made a few months ago when - with the blessing of the DTI - an airborne special event station came on the air from a Royal Air Force Canberra aircraft whilst it was carrying out its training mission. GB2CAN/AM was marking the 40th anniversary of this classic aeroplane, and a great success it was too. To many radio amateurs, however, the normal task of 360 Squadron - which operates the Canberra T17s and T17As from RAF Wyton, near Huntingdon - is just as fascinating as the prospect of working an aeronautical mobile station, and a number of people asked us for more information.

So to make something of a change from our normal fare, we thought we'd look a little closer at the activities of the very few groups of people in the UK whose daily job is jamming!

'RADAR' IN NATURE

Most people know that bats in flight emit a series of high-pitched squeaks. If your hearing is keen enough you can even detect them. These sounds actually have a very complex structure and without them the bat wouldn't eat; they are reflected by prospective prey such as an insect and analyzed by the bat's 'software' so as to provide information about where it has to go in order to capture the tasty morsel. It's a highly precise system. On a still summer evening in the country you can throw small pebbles into the air and watch the bats swooping towards them, twisting and turning at very high speed until they break off as returns from the pebble are swamped by reflections from the ground as it falls back to earth.

No doubt as a result of millions of years of evolution, the bat's 'sonar' or 'acoustic radar' is extremely effective. However, one Central American moth - the Meleasa Laodamia Druce, to be precise - doesn't care for the idea of being a bat's breakfast and has evolved a clever counter-measure to its sonar. The moth has receptors which are very sensitive to the sounds emitted by predator bats: it also has an acoustic generator operating on the same frequencies but with the added refinement that it can vary them slightly. When the moth picks up signals from an attacking bat, it switches on its generator and then gradually reduces the frequency of the 'transmissions'. Since the moth's 'transmissions' are much stronger than the reflected signals from the bat's radar, the bat's 'receiver' is 'captured' by them; the change in frequency is interpreted by the bat to mean that the moth is flying away from it at high speed. So it breaks off the attack and the moth lives to fly and fight another day. Some other moths have also evolved counter-measures to bats; they transmit acoustic signals with random repetition rates, or make such a racket that the bat temporarily doesn't know which way is up, so to speak.

ORIGINS OF RADAR

You'll no doubt be aware that radar works on a very similar principle to the bat's breakfast-detector. As early as 1900, Nicola Tesla wrote that with radio waves 'we may determine the relative position or course of a moving object, such as a vessel at sea, the distance travelled by the same, or its speed'. Three years later a gentleman called Christian Hülsemayer took out a patent on his 'Telemobiloscope' which used principles very similar to those found in modern radar. Unfortunately for him, no one took the slightest interest in Hülsemayer's invention. By the First World War the cathode-ray tube had been invented, and the first magnetron for producing very short wave-lengths appeared in 1921. In 1925, two American scientists, Breslin and Tuve, used pulsed RF energy to measure the height of the ionospheres. Late in 1933 Dr Rudolph Kühnold, then head of the Communications Department of the German navy, obtained from the Philips company in Eindhoven a device capable of generating the then unheard-of power of 70W at 600MHz; by 1934 he had produced a working radar capable of detecting ships at a range of a few miles.

At about the same time in England, the Superintendent of the Radio Department of the National Physical Laboratory, Dr Robert Watson-Watt, was asked by the Air Ministry whether anything resembling a 'death-ray' - a common obsession of inventors at the time - could be produced using radio techniques, with a view to incapacitating the crews of enemy bombers. Watson-Watt replied that radio-based death-rays were not practicable but that reflected radio waves could be used to detect aircraft, if that was of any interest. He added that it was also possible to use a cathode-ray tube to display the range and bearing of a target from the transmitter.

At this period the Air Ministry was greatly exercised by the problem of how to detect enemy aeroplanes coming in Britain's direction, and Watson-Watt was invited to demonstrate the truth of his assertions. In a historic memorandum dated 12 February 1935, Watson-Watt described the basic principles of radar and how it could be used as part of a formidable air-defence system. He also supplied complete theoretical calculations to back up his case. Some experiments on 26 February 1935 with one of the BBC's short-wave transmitters used for the 'Empire Service' from Daventry and a mobile receiver in the back of a van a few fields away quickly proved that he had been correct, and the rest is well-known history. By 1936 the first Radio Direction-Finding (RDF) station - the name changed to 'radar' in 1944 and is the American acronym from 'Radio Detection And Ranging' - was on the air, grossly overrunning valves rated at 10kW peak pulse power to produce almost 200kW pulses on about 6MHz. The RDF stations which were operational in time for the Battle of Britain in 1940 and formed the 'Chain Home' or CH, used about 150kW on frequencies between 26 and 29MHz; with their 320ft masts and four-wide collinear arrays of full-wave dipoles and reflectors, they were - to say the least - rather large. Later in the war, as it became possible to generate and control much higher frequencies, radar equipment shrank sufficiently in size to be carried on board aircraft. The turning-point was the invention of a radically new microwave generator by J T Randall and A H Boot at the University of Birmingham. Development began in November 1939, and on 21 February 1940 power was applied to the world's first 'cavity magnetron'. Whereas in previous years the available devices only permitted power levels of a few milliwatts to be generated at frequencies of several gigahertz, the new device did rather better. As one noted author put it: "The fact that it worked was obvious. Indeed, if one brought one's hand near the output lead, that hand soon became uncomfortably hot. As power was increased, the output began to be seen and heard as a sizzling violet arc dissipated into the air.
of the lab. A nearby garage supplied a succession of 6V bulbs as each in turn was burned out, and soon the output was blazing forth from large neon floodlights. This was obviously not milliwatts but hundreds of watts. On the second day a crude measuring device, hastily rigged up for a totally new task, measured 450W at a wavelength of 9.6cm; three months later a properly designed pre-production magnetron was delivering 50kW at 9.1cm! It was a breakthrough that ranks alongside mankind's greatest technical accomplishments. It had a profound effect on the war and on man's subsequent ability to navigate the skies and oceans” (Bill Gunston, *Night Fighters*).

The so-called 'radio war' began in about 1940, when both Britain and Germany began to jam each other's radar and radio-based navigational aids; the history of this form of warfare has been well outlined in the books *Instruments of Darkness* by Alfred Price and *Most Secret War* by Dr R V Jones, amongst others. Nowadays, of course, radar is predominantly used for peaceful purposes, and as such it has become indispensable. However, it also has various military uses, largely the obvious ones of knowing where an enemy is coming from and how close they are. It can also be used to guide missiles to their targets. Given the modern emphasis on electronic systems, what is now known as the science of 'electronic warfare' is an important part of present-day military operations. In particular, radar in various forms has been a major component of air-defence systems since the Second World War, and it's obviously necessary in times of war to be able to render it ineffective; conversely, it's mandatory for military radar operators to have some idea of what happens when an enemy starts jamming and how to deal with it.

On that basis you probably won't be surprised to hear that the Druce moth which we mentioned earlier forms part of the badge of the Royal Air Force's 360 Squadron — since interfering with the function of radar in various subtle (and not so subtle) ways is its main job. The Squadron's motto, 'Confundemus' which is translatable as 'We Shall Throw Into Confusion' also gives a nice clue to the nature of its activities. 360 Squadron's formal role is to provide flying effort for trials and to give realistic training to members of NATO and all three Services in the UK; it takes part in virtually all major air and sea exercises mounted by United Kingdom and NATO forces. To carry out its mission it has six Canberra T17 aircraft, together with another six of the slightly different T17A.

**360 SQUADRON**

To learn a little of how 360 Squadron goes about its business and also to have a closer look at the equipment used for GB2CAN/AM, we visited RAF Wyton recently by kind permission of the Station Commander, Group Captain R McKendrick. We spent a highly enjoyable day in the company of the operator on the GB2CAN/AM trip - Flight Lieutenant Rod Angel, G4ZUP — and the first stop was the well-equipped shack of the RAF Wyton Amateur Radio Club, G3MMH. The Club has 12 members currently on the books, with about four short-wave listeners. Of the licensed members, three hold Class B licences. Despite being run on a shoestring and relying very heavily on the time-honoured military technique known as 'scrounging' the Club has a shock to be proud of. It was beautifully laid-out and extremely tidy; there was a large area set aside for working on equipment, and an FT101 and Pye UHF base station, together with an Icom 144MHz FM rig, took pride of place in the operating room. The HF antenna was most impressive; someone had obviously been 'scrounging' on a large scale, since one end of the long-wire was supported by an official-looking lattice tower painted in regulation green and giving the strong impression that it was part of an important RAF installation! The Club receives very little in the way of financial support from the Royal Air Force and relies heavily on the ingenuity and generosity of its members. I was informed that the most unlikely items had been sold at junk sales to raise money for the Club; however, 360 Squadron still seemed to have its full complement of aircraft when I counted them later...

After that it was time for a thorough briefing on their aircraft's capabilities. The 360 Squadron Canberras carry a crew of three — pilot, navigator and a specialist electronic warfare officer whose sole function is to operate all the interesting equipment. In his time with the Squadron Rod Angel was an EWO; not only did he operate the radar jamming but it was his job to carry out various other misleading tasks which we'll come to later. As a matter of interest, 360 Squadron is the youngest in the Royal Air Force, having been formed in 1956. It is unique insofar as it is manned jointly by RAF and Royal Navy personnel in a 3:1 ratio, and the Naval element is reflected by the Trident forming the other component of the Squadron badge.

**JAMMING EQUIPMENT**

There are several main items of jamming gear in the aircraft; collectively they are known as the ECM (Electronic Counter-measures) equipment. The first is the JS903, which deals with 'X-band' radar on wavelengths around 3cm. Another X-band jammer, the Plessey repeater, handles a similar part of the RF spectrum. There are also jammers covering 10cm and 30cm radars; an alternative fit includes a UHF jammer. Just the thing for causing mayhem on VHF Field Day! In addition, the T17A carries something called the Sylvania Dragonfly, which is a programmable high-power communications jammer.

There are various jamming techniques which can be used. The obvious one is to generate and transmit noise; this can be done over a variable bandwidth and can also be made to 'blank' on and off in such a way as to fool some radars in a particularly nasty way by changing their receiver's AGC threshold. 'Spot' jamming is the transmission of noise on a particular frequency, whilst 'barrage' jamming covers a wider frequency range to cater for more than one radar at once. There are then some extremely devious methods which are similar in principle to those used by the Druce moth, only more so. Many modern radars use the Doppler principle for various purposes, and a technique called 'velocity gate pull-off' totally confuses them! Another tactic is to emulate the moth directly with 'range gate pull-off' thus fooling the radar into thinking that you're somewhere other than where you really are. A technique known as 'wobbulation' sounded even more evil; I was told that in the hands of a good operator, wobbulation can cause the radar dish antennas in
All this equipment obviously needs quite a lot of power to make it work. The Canberra has twin Rolls-Royce Avon gas-turbine engines and each one drives a 28V DC generator; regulation is performed by a carbon-PILE system similar to the ones which disappeared from motor cars many years ago! In addition, bleed air from each engine drives a 3-phase 400Hz 115V AC alternator. These apparently trip off-line when the engines are throttled back, as on final approach, and since the HF transceiver is driven from this power source it suddenly ceases to work. This is why GB2CAM/AM went off the air rather abruptly at the end of the flight as the Canberra was preparing to land at Wyton.

SCATTERING CHAFF
One thing that doesn't need any power at all, however, is a jamming technique called 'chaff'. Chaff consists of strips of metal foil cut to half the wavelength of the radar which you wish to jam. When you're ready, you just dump some overboard and the enemy radar reacts in one of two ways. Either it interprets the result as an enormous number of hostile aircraft or it simply gives up and paints a large blob on its CRT; the chaff thus forms a sort of 'electronic screen' behind which your aircraft is effectively 'disappearing' from the enemy.

Even in an age of sophisticated electronic techniques, chaff is still very handy to form a screen if enough of it is used and the Canberra carries some in pods mounted at the wing tips.

Finally, it was time to make our way out to a T17 parked just outside the hangar and have a look inside. The aircraft sits low on the ground and you have to wriggle through an entrance hatch on the starboard side of the nose and then slide backwards in a rather undignified manner on your derriere in order to reach the rear compartment. The navigator sits on the left, with the EWO on the right; the jamming equipment is in front of him and on his right-hand side. The rear accommodation in the Vulcan bomber used to be likened to a coal mine with switches but it was rather cozy in the Canberra although you couldn't see a great deal of the outside world. Rather a nice mobile shack, I thought. Interestingly, the Collins 618T HF transceiver is right at the front of the aircraft and is fully remotely controlled. I gather that despite the bumps and bounces it receives in normal service, the rig is very reliable and doesn't often give trouble. The modular construction makes it easy to work on, and those who work on them seem to like them very much.

At the end of the day I asked Rod Angel what he liked about his job. He said that it was technically demanding and very satisfactory; Rod remarked that military activities are usually governed by very strict rules, especially in the area of rules and procedures for the operation of radio and radar but that, as far as the latter was concerned, it was his job to break them! As well as being professionally very rewarding, Rod said that it had sometimes been very good fun. It certainly sounded like fun to me, and I can think of worse things to do if you have an interest in electronics and a bent for flying. Mind you, if I'm operating on VHF Field Day in a few years' time and 1296MHz gets wiped out, I'll know who to blame...
SPECTRUM
ANALYSIS

HF
JOHN ALLAWAY G3FKM

Recently I received a copy of a book produced by DARC and written by Hans Schwarz, DK5JJ. This runs to some 196 pages in A4 format and is the most complete source of information on callsigns that I've ever seen. In the first chapter the fundamentals of callsign assignment are presented.

The use of callsigns, the method of assignment and their formation is described in both English and German. The allocation series by the ITU is given within the main part of the book. For each series all identifiers, prefix numbers and suffix series used are described in detail. For each prefix or prefix/suffix combination, the DXCC/WAE country is indicated if applicable - as well as the continent and the zone number for ITU and WAZ. The main list is followed by a complete DXCC/WAE countries list with notations of all callsign series in use as well as beam direction (this is from DL, however), local time, continent, ITU zone, WAZ zone, and ITU region. Callsign entries may be made for each country on all nine HF bands, together with VHF, satellite and different modes.

Deleted countries are also listed. The book ends with a list of ITU allocations and index. The Call Sign Directory (4th edition) costs DM 16.80 from DARC Verlag, Postfach 11 55, D-3505 Baunatal, F.R.Germany - highly recommended.

AWARDS

The Peace and Friendship Games Championship

This is being organised by the Kuwait Amateur Radio Society to mark the games of the same name which are taking place there. It is open to licensed amateurs and listeners, and covers 3.5 to 28MHz and any mode. Contestants must work or hear two different Kuwaiti stations or the KARS station 9K2RA during the period of the games (between 0000 30 October and 2400 12 November). Entrants should send certified log details including date, time, station worked, and serial number received from the Kuwait station, together with six IRCs (or US$3.00) to Award Manager, 9K2MJ, Kuwait Amateur Radio Society, PO Box 5245 Safat, 13063 Safat, Kuwait.

60 years of Amateur Licences in the Netherlands

The first amateur licence to be issued in the Netherlands went to PAOBZ in 1920 - and to celebrate the fact, VERON has obtained permission for Dutch stations to use special prefixes between 1 October and 29 November 1989. During this period they may add a figure '3' before the number in their normal prefix - so PAOs will become PA6Os, for example. This special certificate will be given to all, including listeners. European stations need 30 special prefixes, and listeners need the same on a 'heard' basis. The standard certificate is for mixed modes and covers HF, VHF, UHF and SHF. Special endorsement will be made as required and for CW, SB, and listeners. Send log extract, certified by two other licensed amateurs, to reach PAOB3 through the normal QSL channels by 31 March 1990. During this period the HF Traffic section of VERON will be making special efforts to promote action on the WARC bands.

DDR 40 Award

This is being issued by RSVDOR to celebrate the 40th anniversary of the foundation of the GDR on 17 October 1949. It is available to licensed amateurs and listeners and requires a minimum of 40 points gained within October by working 30 European stations. Each station counts two points on HF and four on VHF. Europeans must work at least ten GDR 'counties' as indicated by the last letter of the callsign suffix. The special station Y4DOR may be used in place of a missing county. The award is free to blind and disabled amateurs but costs 7 IRCs to others. Send confirmed log details to Y2 Award Bureau, P.O.Box 30, Berlin 1055, GDR, by no later than 28 February 1990.

DXCC ON 10MHz?

It is almost certain that by the time this is being read there will have been a change of policy in Region 2 concerning the issuing of awards on 10MHz. This as a result of a paper being presented by ARRL at the Region 2 Conference in early September. It says "... after careful consideration we have concluded that the Amateur Service in Region 2 would benefit from the slight relaxation in the absolute prohibition on 10MHz awards credits. If Region 2 accepts this change in policy, it is the League's intention to accept 10MHz contacts for credits towards the Worked All States Award (basic, CW, RTTY, packet, and QRP endorsements) and DX Century Club (CW and digital contacts for the mixed, CW and RTTY awards, but not Five Band DXCC)... ARRL believes that single-band awards and endorsements for 10MHz operation should continue to be avoided."

CONTESTS

CQ WW DX SSB Contest

1989 20 October to 2000 29 October

All bands 1.8 to 28MHz (excluding WARC). Single-operator, single and multi-band, multi-operator single and multi-transmitter and QRP categories (the latter allowing up to 5W output). Exchanges are RS and CO Zone (UK is 14). Contacts count one point within continent and three with others. The multipliers are the CO Zones and DXCC countries, plus WAE countries (eg Shelland). Own country may be contacted for country and zone credit only but no QSO points are allowed. Final score is total QSO points times total multipliers from each band added together. Use separate log forms for each band and give date, time, station worked, numbers out and in, and mark multipliers the first time they're worked. Logs must be checked for 'duplicates' and those making more than 200 QSOs on any one band must provide a cross-check sheet for that band. QRP stations must mark the fact on their summary sheet and state the actual power output. All entries must be postmarked by 1 December 1989 and mailed to CQ Magazine, 76 North Broadway, Hicksville, NY, 11801, USA. Sample log and summary sheets are available from CQ in exchange for a large sae and one IRC. I'm sorry that I don't have any to offer this time.

RNARS Activity Contest

0600-1800 15 November (SSB) 0600-1800 16 November (CW)
3.5 to 28MHz centered around 3-74, 7-05, 14-335, 21-54, and 28-833 MHz (on SSB) and 3-520, 7-02, 14-052, 21-052, and 29-052MHz (CW). Open to all, including listeners. Call "CQ naval" and exchange RS/T plus RNARS, INORC, MF, or MARAC number and serial QSO number (from 001). Copies of rules available from me - SASE please. In the RNARS members section of the 1988 SSB contest, G4AMN (45,980 points), GOCB/20 (27,300), and LA1E (24,160) led the field. In the CW event, GM4CMK scored 641,280 points, G3LJK 401,460 and I4YTE 381,600.

ON Contest

0700-1100 1 October (SSB) 0700-1100 8 October (CW)
Exchange RNARS number and serial QSO number with Belgian and DA stations. The latter will give their club code. Each QSO counts three points and each club is a multiplier. Listeners may enter and log time, callsign of station heard, code given and call signs of other station. Send logs within three weeks of the contest to Welters Leon, ONSWL, Borgstraat 80, B2880 Beerzal, Belgium.

DARC FAX Contest

0800 20 October to 2000 29 October.
Copies of rules available from me - SASE please.

Lion City Award QSO Party

0000 - 2400 21 October
3.5 to 28MHz (now WARC bands), CW and SSB. Send RS/T plus QZ Zone. Singapore stations send RS/T and serial QSO number. Stations working five 9V stations during the QSO party may claim the award by sending full log details plus three IRCs. At other times the Lion City Award is available to amateurs and listeners who have confirmed QSOs/reports with five 9V stations. Applicants should send a certified log extract plus five IRCs to Awards Manager, SARFS, Maxwell Rd, P.O.Box 2726, Singapore 9047.

DX NEWS

Maurice French, G3ZXD, writes that after two and a half years in Saudi Arabia in the amateur radio service, he has returned to Wellington New Zealand. Maurice is ZL2BNJ again. He noticed lack of 2L activity in contests when in NZ, and after talking to members of the NZAA CW WW group Maurice decided to form a contest group in Wellington. The result is a dedicated band of about 12 who are...
known as the 'Kiwi Contest Group' and use the callsign ZL2NX. They will operate from the coast east of Masterton and hope to be on all bands 3.5 to 28MHz with 4-element monobanders for 14, 21, and 28MHz and loops for LF. Maurice sends his regards to all who know him as G3ZXD.

AH2BE/KH9 will be a five-man contest station on Wake Island during the CWDXW Contest at the end of this month. NB8Q/KH9 will also be on before and after the contest, mostly on CW and on all bands 1-8 to 30MHz.

OH2s, RY, BZ, G9D, and VB are due to mount an expedition in the Pacific between 19 October and 23 November. Y0JRY will be on during the CQWW SSB Contest and there may be operation from Fiji and Wallis during the same time. The Conway Reef is a prime target and they should be on from there between 3 and 13 November as 3D2RY.

SM7PK leaves Sweden on 16 October for a 4-6 month visit to the Pacific area. He hopes to be on from 3D2K9 (Fiji), 5W1HK (W.Samoa), K5B/SM7PKP (American Samoa), and also from T30 (W.Kiribati), ZK3 (Tokelau Is), and ZK1 (S.Cook Is). Frequencies to look for near him are 5kHz above low band edges (CW) and the usual expedition spots on SSB. QSLs go to his home call, but please don’t mix cards for different callsigns in one envelope since each one will be dealt with by a different person.

CEOZAM is said to have been given the callsign CE6XXD to use during a visit to Ambrosio Is, which may take place soon. T1BCBT and other Costa Rican amateurs may visit Cocos Is as T8QCM in the not too distant future. P8EUX will be on from SL6estatlas on 16 November for 24h. The PJ5 prefix has been reserved for residents on the island and there are now three amateurs settled there.

A fascinating comment in DX News Sheet quotes a report from a reader who heard SR1JD on 28MHz and at the same time a group of people in a net on 21-33MHz were also giving and acknowledging ‘3X3 reports with him! weird...

S8J/DQSLs do not count for DXCC since he only has verbal permission to operate. 5H3TW now has a licence in Djibouti where he is J2OTW. J52/DC is on most days near 21-28MHz around 1300z. W7JZC will be on 5W2CW around 28-35MHz from 1430. G4VYZ is on Ascension Is as Z6DV for a six-month stay and promises all-band activity, mostly on CW. FT4ZJ on Amsterdam Is can be found on 14-16MHz between 1000 and 1300z. Peter, G3PL, is in Masoro, Lesotho and is one of the two active CW operators there. He will be there for two years as 7PBE. WASINK, who operated recently as SU1EE, is now in Zaire, probably with the callsign 9Q6E.

Also according to DX News Sheet, B24RDX said that he is the first individually licensed amateur in China and that he received his licence in August. Another individual licence holder is Kang, B24SAA, who often operates from BY4SZ - he was one of the operators who took part in the Mt Everest expedition last year, I have heard from Phil, V8BCT, who has...
now moved into a new flat but is off the air because he has no antennas. His mail box is very small and he asks those writing to use his PO Box address (see CTH Corner).

The 15MHz band was expected to be released to Class G licence holders in Japan on 1 July, and 24MHz was made available to all. JARL is planning to prepare special awards to celebrate the release of the new bands.

1989 is the 20th anniversary of the foundation of the Singapore Amateur Radio Transmitting Society, and this year the SEANET Convention will be held there from 17 to 19 November. To celebrate the two events, Singapore Telecommunications has given permission for the use of their call sign 9V0/M. During the SEANET weekend an official station – 9V0SEA – will be on the HF bands and special 50MHz tests will be carried out by 9V0IE – closed VHF resonator. This column please note that 9V0/GT2 is in Malta until 19 October as 9H3ER and will be on HF as well as 50MHz, mostly using SSB. UA0BAZ/UA10 will be on the air from Alexandria in the July

**PROPAGATION**

This month’s contribution from GB8K reads as follows: “The full in solar activity during July ended in the first days of August and indices then climbed steeply. On 12 August the daily solar flux peaked at 265 SFU and it was still above 200 at the end of the third week, while the 27-day average had risen from a July low of 182 to 220 SFU and was still rising.

“Seem possible that the average solar flux for August will be in the vicinity of 225 SFU – perhaps a monthly sunspot number around 180 – in which case Cycle 22 will again be very close to the position of Cycle 19 at the same age, and 28% above the corresponding value for Cycle 21. It is hoped to be able to review this in more detail next month.

“Takes advantage that exactly when a solar cycle will reach its peak, which means that it could have been reached by the time this appears in print though it equally well many months away. Whatever the case, we can expect HF band conditions this winter to be at least comparable with those of the 1975/76 season and possibly approaching if not exceeding those of 1957/58.”

**BAND REPORTS**

This month’s reports came from G25, AKK, HLU, GM51CM, G3s GVW, K1SH, VUR, YRM, G4EHW, W24KGR, G4MUM, G4NKG/M, GM4OBK, G4ZYQ. G6s BXS/M and CKW. CW stations are in italics.

3-5MHz

0300 CY0DXX

7MHz

0000 ZDB8J

0200 CYU0DXX, TA1E2

2300 XT2CW

14MHz

0000 TG0FACAP, TR8CJ, ZF2AZ

0100 CE0MTY, F0SLZ (Marquesas), V31BB

0600 TJ1KI/J/L

0700 AS3A, C21RK, FK8FG, P02GC, SO1A, T30AC, T32O, ZLTTZ, W1GY

1700 HS0YDJ

1800 ZS8MI, M6HF

1900 V8SM

2000 AT1BK, T7T7, 9N11M

2100 CV8SP, CY0DXX, H5LD, T5YD

2200 ZY0TX, 4LFS

18MHz

0500 TA7/1KJU

1400 9M2RI

21MHz

0700 BY5HZ, KL7XO, T32O, UA1QY

0800 BY5RY, FOSLU, JT1BC, T32PO, 3DAQ, 3DXV, 5W1V

0900 AS5SY, PY0FF, V85AM

1000 AK5ZK, TA7/KUJU, 3DSI

1100 3DR2

1200 T5MF

1400 H5OA1T, UA1OT

1500 KL7XD, ZS3/DK2WH, 9V0RH

1600 BV5VZ, T32AB, 5R8JQ, 9M6JR

1700 KT2CW

1800 HL5BDS, KHS/WB6PZF, 3X1SG

1900 CY0DXX, 6V1A, 807AC

2000 H5OA1T, L4J0

2100 HL5BJ, P07GAMMST2, V28A0

2200 F1AS, W6N7

2300 JA, ZL3GQ

28MHz

0700 S79MX

1900 BY5RA

1100 FY4FM, PY0FF, 7P6EL

1300 J52US, T5YD, Y11BQG

1400 ZD7YVC, 9G5UN

1500 ZT2OMAR

1600 ZD8J8, 3X1SG

1700 XT2CW

1800 VP8BF, 9V0RH

1900 V4AK1

2100 OT6G, 9BYVU

2200 FG89/FD1MPT, ZL40D (p)

Thanks go to the following information sources — DXpress (P332), CO Magazine (W1WY), the DX Bulletin (VP2ML), DXNL (DL3RK), the Long Island DX Bulletin (W2IVY), DX News Sheet (G4DQY), the Ex-Grid Club Magazine (W5BAE), DX Report (VRNS), and the LYNX DX Group Bulletin (EA2JG).

Closing date for items for the December issue is 24 October.

**VHF/UHF**

**NORMAN FITCH**

As we approach the peak of Cycle 22, the sun has become increasingly active. Things were quiet during the last week of July, the solar flux averaging 174 units and the geomagnetic A index 11. During the first week of August Old Sol was quite active, with 210 units average and 233 peak being recorded; the A index averaged 6. There was a surge in activity the following week with many proton flares and ionospheric disturbances, polar-cap absorption, magnetic storm alerts and auroras. The solar flux averaged 240, with a peak of 256, while the A index averaged 16, peaking to 37 on 10 August.

The third week of August saw a massive increase in solar activity, with some mind-boggling figures. On the 15th a ten flare of 19000 flux units triggered off a magnetic storm, which peaked with a huge proton flare at 0154 on the 16th. This event produced particle energies of more than 100 Megaelectron-volts and the neutron monitor on the island of Kerguelen (MF cell) recorded a very rare auroral event between 0100 and 0800 on the 16th. The SF averaged 258, peaking to 278 and the A index averaged 33, peaking to 63 on the 15th.

The more northerly stations, such as Andy Steven, GM4MPK (SLD), have observed many auroras resulting from this hyper-activity. In more southerly latitudes a few have been rewarded, if not spectacular. Anywary, auroras in August are a bit of a bonus and helped to offset the generally mediocre tropospheric conditions on the VHF/UHF bands.

**BEACON NOTE**

Calum MacPherson, GM0EWS (HLD), passed over the news from O19JD that the A16VHF beacon is now QRV again from the Faroes on 144-856MHz, running 25W. Autumn, mid-July, weather permitting, it was planned to erect two 4-element yagis, one pointing south east, the other north east for auroral studies. I assume it is still at IP62NA.

**DX NEWS**

Dave Court, G3SDL (KNT) has received permission from the Turks and Caicos to call 9A in the 28 and 50MHz bands from Antalya (KM56) on the south coast of Turkey. Operation was due to start on 30 September and end in the week beginning 8 October, using the call T4A/G3SDL. This is a business trip so activity will be limited to 1000-1100GMT and evening periods but more intense operation during the 7/8 October weekend. QRG 50-11 and 50-13MHz, with the possibility of a beacon on 50-959MHz. Paul Turner, G4JUE (CSX) will be ‘anchorman’ over her monitoring 50-11MHz and the 80m information net on 3718kHz.

Dave Gascoigne, G4OSY (YSW) hopes to be QRV on 50MHz from Bermuda (FM72) between 15 and 29 October using the call G4OSY/P. Paul Turner, G4JUE (CSX) will be ‘anchorman’ over her monitoring 50-11MHz and the 80m information net on 3718kHz.

Ian Stewart, G1MMS (HFF) will be on Lanzarote over the Christmas period. He has an apartment there, so he’s applying for a special licence to operate from EA8. Local amateur EA8VI, who works in the Air Traffic Control department at Areicole airport, doesn’t think Ian will have any trouble. The local amateur radio club’s call-sign is EA8RL, but its members weren’t aware that many European countries now have a 50MHz allocation. So if Ian gets a temporary licence, hopefully the other EA8s on the island will apply.

**DX EXPEDITIONS**

Keith Talnall, G4ODA (LCN) has sent the results of the Five Belts Contest Group’s operation from North Rona (I07P) in July, using the call sign GB4XT. This DXpedition was no less than nine months in the planning stage. They boarded their small chartered
fishing boat on the 9th, the journey taking over eight hours in gale-force winds. Landing on the north east of the island the next morning went better than planned, but they had a two-thirds of a mile walk up a 300ft escarpment to reach the site!

Operation started at 2121 on the 11th on 144-215MHz. At 2350 they QSYed to 144-028MHz, their MS frequency, and worked two PAs on random to check out the station. After some sleep, they recommenced activity at 0600 on the 12th and were on continuously till 1130 on the 19th, via tropo in the day-time and on MS at night. Tropo conditions were not spectacular; there were no usable auroras and only a couple of brief ES openings to F and EA4.

116 of the 158 MS tests (mainly CW) were made, many around the 2000km distance. Countries worked on all modes in 575 QSOs included D, EA, E, F, G, HB, HG, I, LA, OE, OH, OK, OZ, PA, SM, SP, Y and YU. Notable contacts were O5FF on tropo, DF8U, probably via tropo-scatter and FBKDW, mode unknown. The station comprised an FT-225RD with mTeR HF stage, a home built 3CX400 PA and four 9-element Yagis.

50MHz operation commenced at 1340 on the 12th using an FT-736, 25W PA and 4-element Yagi. A few Gs were worked on MS but the bulk of the 94 QSOs were via Es to CT, F, GJ, PA and SV. They closed down at 2131 on the 19th, 430MHz operation was limited to four days from the 14th and resulted in only 22 contacts, best being with G3LOR (SKF). The gear was an FT-736, home built 3CX800 PA and four 17-element Yagis.

The departure from the island took place in two stages and resulted in some publicity in the local press and on the local radio - but that's another story! The operators were John, G4NPH; Julian, G4YHF; Dave, G4YTL; Chris, G11UC; and G4ODA, to whom we are all indebted for putting on a fine show from an uninhabited and inhospitable island.

David Johnson, G4DHF (LCN) was unable to join the XT team due to work commitments but did manage a one-man, two-site DXpedition to Scotland. Between 11 and 18 August he operated from a 600ft hill at XS40g (I07SWN) on the Sutherland coast, and endured four-and-a-half days of 50-60mph gales.

He caught the tail-end of the Perseids and completed with 13 stations between the 11th and 13th, all but one on the random MS frequency of 144-200MHz. Countries worked were D, G, I, L, OE, OK, UR and YU. The main highlight was three auroral sessions. The OY6/HF beacon was copied at 1200 on the 14th and OZ, SM and OYs were worked on CW between 1525 and 1538. The next event was from 2246 on the 15th to close-down at 0302 on the 16th, and the final affair was from 1411 on the 17th to close-down at 0205 on the 18th. Countries worked were D, El, G, GJ, GM, LA, OH, OK, OY, OZ, PA, SM, SP, UR, Y and GW0KZG/MM (J005). Most QSOs were on CW. On the way home, David stopped off at X080d on the 20th for about five-and-a-half hours of tropo operation.

About 200 auroral QSOs were made, the final tally for the trip being 16 countries and 39 squares worked. At XS40g the station comprised of a modified IC-202S with digital display, BF388 front-end with SRA-1 mixer, home-built 200W solid-state PA and four 9-element Yagis at 20ft on a trailer-mounted mast. 80W and two 9-element Yagis were used at XQ80d. He used a 12kW propane-powered generator.

Stewart Cooper, GMA4FF (GRN) email-d the account of his group's activity in August from the small island of Foula (IP30X/D or YU70d), 44km west of the Shetland mainland. Operation was between the 9th and 15th to include the Persied showers. For various reasons they had to move their operating site three times, so missed some earlier MS skeds.

The 144MHz station comprised a TS-780, 40W driver, Tempo amplifier and 19-element MET antenna. For 50 and 70MHz they used a TS-430 with Microwave Modules transverters, 100W solid state amplifiers and a Jaybeam 4-element dual-band Yagi. All antennas were mounted on a 22ft mast.

The other members of the team were Allan, GM4ZUK, and Roger, G3CHJ. The MS equipment was handled by Frank, one of the 42 residents of Foula - who helped them move equipment - and regular visitor Terry Robinson, G3WXJ, who lent them a hand on 50MHz.

RS-444444

Most of the Summer Newsletter from the Kent Repeater Group is devoted to the minutes and report of the AGM held on 26 May. It was the first effort by its new secretary Tony Young, G1AJY, who managed to squeeze in a half-page of news of the group's repeaters. The seven relays mentioned all seem to be working satisfactorily, even though the very hot weather did cause G3BCK to drift a bit. The secretary is Kelvin Fay, G3AMZ, who is QTHR.

The Summer issue of Talkthrough, the newsletter of the UK FM Group (Western) runs to 32 pages of diverse material, including the odd 'Heard on the Repeater' anecdote, viz: One G7 to another: "There must have been a lot of passes in the last exam, George. I worked a G8 the other night. Have you heard one yet?". There is plenty of information about the group's repeaters and a list of the 493 paid-up members at 30 July. PO Box 73, Crewe is no longer available, so if you want details write to either G3LEO or G4WSS, both QTHR.

WORKED ALL BRITAIN

In its September press release, the WAB Group mentions the award of a Certificate of Merit to Leroy Dale, 2BSXJ (KG53) for his outstanding 50MHz achievements. He has won numerous awards for the band and has probably worked most of the European DX-chasers on 50MHz. The new and fully revised Fourth
### ANNUAL VHF/UHF TABLE

**January to December 1989**

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Do not include Ei countries. British countries are the 79 listed in the January Radiom. Up to three different stations allowed in all GM regions. Countries are the usual DXCC ones.

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**SPECTRUM ANALYSIS**

"is hopeful of receiving a permit, according to Hal Lund, ZSEWB."

Byron Fletcher, G6HCV (SD), used MS to work the Foula expedition, GMMFRT/P, on 12 August, completing in a single two-minute burst. He entered the table with 143 'legal' squares. Ian Harwood, G8LHT (YSS), found PA3DYY/MM in JN01 on 27 July. On 8 August he worked 9H5AB and TK/PAPAER, and the next day, FS5N and FC1GHI, neither of whom are on the list of French permit holders.

Eila Marty, G6HMK (ESX), has made the magic 'ton' thanks to FC1JBA (JN15) on 6 August. Prior to that she worked LUs SAEA and 2EIO and CX4Hs on 27 July; Z3JU on 2 August, followed by Z66WB, 9H5s AB, and O. She caught the aurora on the 17th but only worked GMMOE1 (IO77). LU6DLB (GF05) was contacted on the 19th, while auroral Es brought QSOs with OH8RJ (T22) and also GB3UW (KPI5) later that evening.

Steve Damon, G8YPY (DOR) worked a rare 'local' on 23 July, G/PAA3UC/P (IN79), F2L0/P (IN88) was contacted on the 28th but is another apparently self-licensed station. Es across Europe and MB3DY/MM on 2 August. G4KTJ (BKS) logged GMs 40GT and 3Y0R on CW in the 17 August aurora and confesses, "I wish I had the guts to use the key." Well, why not have a go? We all had to start sometime!

It was a pleasure to hear from George Ripley, GO3AHV, who I first worked 30 years ago when he was VG2WR in Northern Rhodesia. He worked CX4Hs on 7 July for the first time, and G3JUV (T22) for the first GD/2Z OSO on the 27th. Other notable QSOs were EAB/G3JUV on 8 July, SV1DH on the 14th and three LUs on the 23rd. He also mentions assorted CT, FA, and OH activity.

Geoff Brown, G4JICD, claims the first GJ/2Z OSO at 1546 on 23 July. LAs were around at 1740, followed by CXs and LUs from 1800 until 1928 when he went QRT. Z3JX was up to 40dB over S9 from 1700 on the 29th. Many DX stations were from 1600 on 2 August, plus several LUs from about 1900 to 1300. On the 12th, he had tropo QSOs with GB2XR and GM0EXW.

Like many others, Geoff is getting fed up with those who use the inter-continent DX calling frequency, 50-110MHz, for working locals and rag-chewing. He cites GM6Q2N working Gs and Fs via Es. French stations have no authority to be there anyway, since their permits are for 50-200-51-200MHz only! PLEASE stick to the band plan
which can be found in the RSGB Call Book. G4UPS and I have it on disk, so if someone wants a copy, I'll printed off an SASE to either of us will get it to you.

At a recent meeting of the VHF Committee, we discussed the band plan and endorsed the idea that 50-200MHz be designated a 'dead band calling frequency.' This was proposed to try to prevent the problems caused by the 'call and QSY' technique when the band is busy.

Michael Thomson, GM4JEJ (TYS), has reported a lot of DX north from F, OH, CX, ZS, ZB, etc. but he wrote in his letter of 27 July, "Still no auroras or openings to the USA. Perhaps you could explain why, with so much solar activity, there is a lack of auroral activity?"

The general trend is for there to be fewer auroras in the summer months and for auroral activity to peak 12 to 18 months after the sunspot peak. GM4PK has reported numerous events from Shetland since Michael's letter, so I hope that GM4JEJ has now made some auroral GSOs, perhaps during the 14-18 August period.

70MHz+

Ray Parrish, G0DMV (CHS), reports that there are about eleven stations QRV on FM in the Macclesfield area. Most use Pye Westminsters on 70-45MHz, though some have 70-256MHz as well. There is usually some nightly activity on 70-45MHz. The only other reader to mention 70MHz is G15W, who worked E96/PK (I051) on 9 August and again in IO54 on the 24th. On the 21st he found GM4ZAP/P (I064) for a welcome Western Isles GSO.

144MHz

Andrzej Kaleta, SP6GVLU (I080/LC), worked some fine DX in the Es on opening on 21 July, using an IC-205S, 30W amplifier and 17-element Toyota Yaqi. Between 1556 and 1626 he lists 20 GSOs with Russian stations, seven of them over 1900km. Best DX was U4VHN (LO43), UA4CFV and UA4CAJ (LO32), UA4API (LO20), U6WHN (LN04), UA4ABX (LO33) and RA6AX/UI6YP (LN03). Most signals were 59 plus 20 dB. At 1342, SP6GVLU and SP6GVA (I081) worked U6GAD (LN20E).

Colin Morris, GOIUX (WMD), used four modes to bring his squares tally to 327. Es on 22 July brought Italians between G076 and G06L, a gotaway being IASPL (UN53) from Elba. Tropo on 31 July provided G0WQK/GM in J015 and J005, and on 10 August at 2330 EA1TA and EA1ACO (IN53) who were 59. The only activity in an aurora on 10 August was GM4PK (I099) but the one on the 16th was better, yielding SM5CBN (J078), GM4DHF/P and GM4GUL (I078) and SM6KYN (JO78) between 0400 and 0100. The effort laved away by 0140.

Best in the Perseids were LA6HL/TF (IP14) on 6 August and in 112P on the 10th, TK4MS (JN42) on 20th, and on the 4th CT/ F1DDA (IM59) on SB9, EA3BEW7 (IM77) and OH2AUK (K019). Colin completed seven other GSOs, but thought the shower not as good as in 1988. The peak was 0600-0800 on the 12th, as he had calculated by adding six hours to the previous year's peak time.

GOLF worked two ILOs via Es on 7 July, while MS brought IW1AJZ (JN35) and GM4CAN/P (IP80) on 12 August. G1KDF claims random SB3 MS GS with OS3PC (JN68), IK3CBU, DJKL and I0C8O(JN63) on 12 August. Auroral GSOs on the 17th were with GB2XS and GM4DHF/P and on the 23rd with GM6QRN (SLD). Bob operated portable from I083PD in the Low Power Contest on 5 August, his 182 GSO successfully multiplies bringing 0240 points. G3MV thought the Perseids quite good. The longest burst was from H1G5 in the early evening of the 12th; although 150 seconds long, they didn't complete. Four new squares were TK4MS, SP6ASD/8 (K010), SP6ATS/7 (KN19) and OH1AYQ (KP12). John has worked GW0KZ/GM in several wet squares and thinks Andy is to be congratulated for his efforts. His 1990 provisional schedule has been published showing the North Sea operation from the Challenger, plus some from the Atlantic, west of Scotland.

Peter Atkins, G4DOL (DOR) worked three lOs via Es on 6 August from 1756 and a couple of EA7s around 2005 on the 11th. He thoroughly enjoyed random SB operation in the Perseids on 12 August, completing with YUSAN, FC1JJG, IKPKV twice, OEOBC, I05AVM, EA6FB (completed in a 3-second burst at 1155), EA6VD, EA2ADW and OE3DLC. On 17th he worked I0F2IH (JN44) on tropo. At 1752 on the 21st, GM0EXW (I067UL) was the only station worked in an aurora.

It took John Pallrey, G4XEN (NHM) 37 minutes to work GB4XT on MS on 18 July and he wonders what region North Ronas is in? My guess would be Orkney but don't take that as gospel (Our Bartholomew Gazetteer of Britain, "of the Western Isles - Ed.")

John caught the early morning Es to Italy on 22 July but best DX came later, to U050IW (KN48XX). Shift work resulted in his missing the best of the Perseides, but when he did listen the bursts didn't seem very long.

Mark Holloway, G4RYR (DOR), runs an FT-290, 80W amplifier and two 14-element Yagis. He worked Italians in the 0-25 call areas in the 22 July Es between 0732 and 0737 and heard 14XXC at 0830. G6HKM worked GW0KZ/GM in J014, 15, 24, 25 and 35 for five new North Sea squares. Ele monitored the random SS SB frequency on 12 August and found it most interesting, so she might be tempted to have a go sometime. In the 17 August aurora she worked GB4AKS and GM4DHF/P and worked David again on the 20th when he was in IO78.

Perseids successes on SB for G6HCW were GM4CAN/P on 11 August, Y22C (J083) on the 12th and LA5ZV (J059) on the 13th - all completed within four minutes. I0W5ML (JN52) was the only station heard in the Es opening on 22 July at GB8LH. Between the 24th and 31st, Ian had QSOs with GW0KZ/GM in JO55, 12, 13 and 15 for four more squares. Other QSOs of note were with G4NPC/P (OKE) on the 29th, GM3ZME/P (SCD) on 3 August and GM4ZAP/P (WIL) on the 7th.

G4JICD missed the peak of the Perseids. Geoff sat on 144-200MHz from 1300 on 12 August to 0600 the following morning and claims QSOs with OK3BL, YU3ZY, YU3ZW (who was 59 plus for three minutes), YU2KK, YLJ6DC, IK5SHEH, IK5S6H, IW5AVM, ISFDX, OEOAP, ISJ1UX, I4CCX, INSTWX, YU2ZETA and IK5SHEH.

John Pallrey, GM4GUL (HLG), worked in the auroras on 15, 17 and 21 August, working the usual Europeans and UK countries. Notable contacts on the 15/18th were GW0KZ/GM/MM (J005), G4CIV (I090) and DJ8UX (JO41); on the 17th DJ8FRA and on the 21st DJZ6L (J056). One gotaway was GB2XS, all of 60km away yet never worked on tropo.

Keith Kerr, G4MYX (DGL) has been one of the most reliable signals north of the Bordie good, particularly on 12 August. New squares included LA6HL/TF (IP25), TK4MS, LA/DK8QP/Y (JP78), SM6CMU/2 (JP96), SM6CMU/3 (JP82), UR1RWE
TROPO AND AURORAS: A CONNECTION?

In the June VHF/UHF column I included some observations on VHF propagation by John Eden, G3MOKX (HLI), who wondered whether there could be a connection between solar activity and tropo propagation. He has since written to say that "all the repeaters in the Borders region and northeast of England are detectable again on a regular basis." He also feels there is a "connection between certain particle input from the sun, or magnetic or electrical field effect influence, on what we call tropospheric propagation."

Geoff Grayer, G3NAQ (BRK), is a member of the Society’s Propagation Studies Committee and has sent us a two-page mini-treatise on tropo matters. He begins by stating that "no long distance contacts (several hundred kilometres) on 144MHz, which we attribute to ‘tropo’ are not the result of smoothly refracted rays such as illustrated in all the text books with the caption, ‘Super refraction’.

For that to happen, the refractive index would have to be just the right value over the whole path to follow the curvature of Earth. He suggests “this would be an astonishing coincidence if it ever happened. Under these conditions signals would suffer only free space attenuation, i.e. they would be very strong.”

Long distance, high level signals result from ducting when the waves are guided between layers which follow Earth’s curvature. So what of these regular, middle distance contacts we regularly make? Geoff says, “Beyond the relatively short refraction zone the (line-of-sight plus one-third hypothesis) signals propagate by a combination of diffraction over ground-based obstacles and by forward tropospheric scatter. The refractive index of the atmosphere changes continuously from point-to-point due to differences in the temperature, density and most important – humidity. So the wavefront is continuously undergoing small changes in direction, and hence spreads out.

“For this reason, I believe the model of tropospheric scatter normally adopted – of relatively large angle scatter arising from a small common volume (Ref. J. N Gannaway: ‘Tropospheric scatter propagation’ RadCom, August 1981, p1 71-79 114) — does not represent the true situation except, perhaps, where there is a massive obstacle in the path. Most important, each deviation of direction is very, very small, so the wavefront proceeds coherently (with the same phase) and hence the many scatters reinforce each other. This is not true for large angle scatters, where phase incoherence produces the frequency warble heard on tropo backscatter signals. Remember that phase modulation is equivalent to frequency modulation."

“The amount of forward scatter obviously depends critically on the size and frequency of the irregularities in the atmosphere, and it is this which gives the day-to-day variations of conditions when there are no abnormal openings. It is the size of these irregularities which gives the differences between the bands; after all, the refractive index of air is not frequency-dependent at VHF/UHF wavelengths. Rain is very effective at equalizing the condition throughout the lower atmosphere, which explains why it generally depresses tropo-scatter propagation.

So where is the connection with aurora? Well, tropospheric irregularities are not the only source of forward scatter. Ionospheric irregularities can also perform the same function. Normally, these are far too small to be effective for any but extremely high-ERP stations. However, auroral particles precipitated before a full aurora develops cause enhanced ionization on the HF bands, prior to the adverse effects of D-layer absorption and magnetic disruption of the layer.

Geoff concludes, “This auroral precipitation and magnetic disturbance could well create sufficient irregularities in the lower ionosphere (D and E-layers) for ionospheric scattering to become an effective propagation mode. This — rather than tropospheric scattering — may be the mechanism noted by your correspondents.” He mentions that support for this conclusion comes from a paper, Simultaneous VHF Rimeter and Forward Scatter Observations by L A Maynard.

Geoff corrects a statement by Charlie Newton, G2FKZ, in the July VHF/UHF that noctilucent clouds are around 40km high, which would be in the D-layer. Their altitude is around 82km and as Geoff says, “The amount of energy carried by auroral particles is very great indeed: an estimated one million Amps flowing along the auroral curtain at E-layer height. Hence it is hardly surprising that enough heating results to evaporate these very tenuous clouds formed of ice-coated meteoric debris.”

(K038) and YU1ADD (K039) all on CW, and CT7F1DA (IM59) and OH1AYO (KP12) on SSB.

Andy, GM4IPK, now has his LDF-5 feeder and is working on getting the 4X 15-element Cue Doo up on the tower. With a single antenna he worked EA2 LV (IN80), CW (IN83), LU (IN82) and AGZ (IN91), and at 1821 Andy had a QSO with GB1ARV in IN70. The Spanish station was working into East Germany at the time and Andy had to beam at YZ2 to make the contact. Andy commented that he saw his best-ever display of noctilucent cloud on the same evening. He listed auroras on the 10th, 15th, 16th, 17th, 18th, 19th and 21st of August. On the 22nd Andy worked SM2CEW (K151) via EME with his single Yagi and 350 watts on the feed point. Signals were good enough for rebroadcasting on the 14MHz VHF Net! 430MHz

GOCUZ reports the “only interesting thing worked for a long time was GM0ZME/P on Tivre on 4 August.” (How about a square entry for this band, Colin?) G1KDF took part in the Low Power Contest on 6 August and made 50 contacts with 39 multipliers for a score of 13104 points from the home OTH. Apart from that, activity seems to have been nil. G15WH lists GB4XT (OKE) on 15 July and G8DDY/P (IOW) on 6 August as recent new ones for the table.

Highlight of the month for G6HFM was working G13JL (ALD). Both Ela and G8LHT commented adversely on the RSGB’s choice of the day of the Woburn Rally for the Low Power Contest; “A fine piece of planning” as Ian commented. Did any readers submit an entry for the August Activity Contest? If not, just what can we do to generate more activity on the band?

THE MICROWAVES

No microwave activity news this month apart from G6HKM, who reports only one 1GHz QSO in August, and "that was a struggle with PE1EWR on the 8th." Perhaps the September Activity Contest and the forthcoming Cumulatives might persuade people to actually operate!

DEADLINES

Some contributors are still sending in reports too late. We all work to a very tight schedule to make Spectrum Analysis as topical as possible, so please make sure you get your input to me before 21 October for the December issue and by the early date of 11 November for the January 1990 RadCom – Christmas and all that.

SPECTRUM ANALYSIS

SWL

BOB TREACHER BRS2525

October traditionally marks the start of the HF DX season, where we move away from short-hop summer conditions into the expeditions and contests which herald the beginning of the ‘New Season’. This year, as we head for the peak of the current sunspot cycle, we can expect some very good conditions – especially on 21 and 28MHz. The experts are also predicting great things for 50MHz, with a good deal of F2 propagation to look forward to. Will we hear any activity from the Pacific? Only time will tell, although there should be plenty of 50MHz DX on offer from the Caribbean.

With all the increased activity which winter conditions should bring about, I look forward to lots more reports from readers which can be used to form this portion of my monthly offering. However, let’s have back look now over what happened in August.

HF REPORT

We start with a report from Malcolm Harrington, BRS20249. Malcolm’s radio activity has to fit in with his shift pattern, and when he wrote he was finding that ‘his late shift’ allowed him an hour at the rig between 0630 and 0730. Nice results, too, judging by the information provided in his letter. Some good loggings included J9T7 on 28MHz CW and FOSJ on 21MHz CW, and J79C was noted on 14 and 21MHz SSB. Malcolm also accounted for KH6UJ, V31BB, P92CG and HZ22 on 14MHz SSB, all in the space of 15 minutes. Brad Bradbury, BRS1066, apologized for missing a couple of months. He hasn’t been too active but did come across two new OIasts - 02 and 174 – making a total of 180 heard so far; 161 have been confirmed. Also in the log during August were KU1SS on 14MHz CW (for country number 302), CY0DXX (Sable Is) on 21MHz CW, LU1ZA (South Orkney) on 28MHz CW and ST0SA. Brad notes that the Russians are now mounting many internal DXpeditions to rare parts of the USSR.

On the presentation of rare OIasts, Stan Williams, G3L0I, wrote on the subject of Arthur Miller’s comments concerning lack of activity from UABT. Stan has been licensed since 1955 and had never heard one until 2860 on 21 July this year, when PZ8/UA4AFDS appeared; he was

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one morning, KH6JJK put in a ones. On another wise dead logged ZYOTX and CYODXX for new TF7 (Westman Is) and 3D2SI SPETRUM ANALYSIS.

On 28 MHz Robert (Isle of Pines), YB9ZDA (first YB Pacific, together with CM2AW/4, JH1MAO/JD1 (Ogasawara Is), FO5MC, KH6IMB, 3D2XV (Rotuma Is) and FW/IN/TH, all in the Pacific, together with CM2AW/4 (Isle of Pines), YB2ZDA (first YB active from East Timor), DL1SCF/TF (Westman Is) and J3OSI (Conway Reef). On 28 MHz Robert logged ZYOTX and CYODXX for new ones. On an otherwise dead band one morning, KH6JK put in an appearance. Other highlights included VP6BWT, ZD7VC, ZD8PJ, SH3TW and GZ2E (Liberia).

Pick of the HF news from David Whitaker, BR52S49, was that he had heard 9M6HF and 9M8STA on 14 MHz. Like Robert Small, David found 23 MHz poor, with only TJ1MW, AS08E, BY4AY and BQ7AC heard during the entire month.

Finally, a quick look at 18 and 24 MHz. David Whitaker sent a detailed report of his findings on 16 MHz. As of 15 August he had heard 87 countries including 9M2RJ, YN3CB, VP9LP, J6LPS (OSL via W2GKB), HP3FL, YB6LD, CE0CCD, VP2VM, G6ARC, HI4MC, FR5EL, HC5K, T210I, 8P9FU and ZD6JW. On 24 MHz Robert Small mentioned AL7H, HC1HC, HK7/M4HJ, HZ1AB and VP2EHP (direct QSLs only). QSL cards reported from a number of sources included BY5NC, KC6WV, DX1CE/KH8, VP6BUB, Z6GF, 3C0A, 3B1DB, 3C2CR, 3WOA, 3BDX, 5V7WD and 9X5AA.

VHF REPORT

Martin Parry, BR52S43, sent in a brief update before leaving for a holiday in the sun. 22 July was a good day, with SM6PJU (J067) heard at 0608 on 50 MHz. Between 1346 and 1423 Martin logged a variety of OH stations in KP01, 11, 20, 24 and 26. On the 23rd he caught CX4HS (GF17), CX8BE (GF15), LU2EIO, LU1DMA and LU6DLB (all GF55). On 144 MHz Martin noted six Italians between 0712 and 0726 on an unspecified.

Up in Harrogate, David Whitaker had no success with the Perseids - he says he doesn't have the patience! On 50 MHz he mentioned 23 July as being a good day, hearing LU8YUD, LU4DMX, LU9AEG, LU1DMD, LU6DLB, CX4HS and CX8BE. David heard Z5SE on the 27th, Z5SLN (KG46) on 2 August and Z23JO on 5 August. On the European scene David logged some Frenchmen, PA3DYY/MM in JN00 and TK/PA0ER in JN41.

Mick Toms, BR31976, actually mentioned some tropo on both 144 and 430 MHz - a rare event these days - although he added that he hadn't been at the rig at the right time. Mick had more success at finding G0WKGZ/MM than your scribe and heard him in JO12, 13, 25, 34 and 35. On 430 MHz some Scandinavians were logged on 19 June. In the Perseids Mick copied good bursts from LL116WX (KO29), E68FB (UM18), 9H2AK, EA7AJP, SP6A7T78 and HB0/H9BOO in JN47.

Here in London, VHF has been quite poor. On 50 MHz, CX4HS was logged on 23 and 27 July. PASYYY was MM in JN12 on 23 July and in JN00 on 2 August. Some LUs were heard around 1900 on 27 July. Z56WB and LU7DZ were heard on 2 August, whilst Z23JO, Z3SE and the tail-end of a CQ from ‘...B’ at 1726 were heard on 5 August. I thought at first that it might have been 7X5AB but it seems that ZD8MB is on the band that night, so it may have been him. SV1OE (KM17) and SV1AB (KM18) were logged about 1720 on 6 August.

In the Perseids, two new ones were heard on 70 MHz – Q5M5WOJ (IO77) and E9FKP/7 (IO43). On 144 MHz, OH5L5K (KP30) and OY6FRA (IP61) were new. Elsewhere, there were plenty of bursts from the ‘regulars’ in the course of the year’s best MS event. Stations identified included IC8COF, IW5BML, YU1WP, YU2CAU, IJ5UX, HG5PT, YU1AFS, IK4DCO, SK3LH, YUSC, H9B8CE, YU3AN and YU1LR. That’s it for this month – keep those reports coming!

SPECTRUM ANALYSIS

599 and had a mega-monster pile-up. Stan hoped that Arthur was listening at the time and crossed him off the ‘wanted’ list with a flourish. If anyone needs it, the OSL route is Box 555, Penza 44061, USSR.

Next, a report from Robert Small, BR58841. Robert felt that midsummer conditions had been quite good, especially on 21 MHz where there were many openings to the Pacific. 28 MHz was disappointing, however. As usual for Robert, most DX was on 14 MHz during early morning or late evening hours; nothing much was heard during the middle of the day. Highlights were CEDONK (Easter Is), FP/KU2W, ZF2BO, YN3RD, FP99DX, BY4AY, TSYD, ZYOTI, ZD8XZ and JT16R. Here’s Robert’s list of best DX on 21 MHz - KH6LW/KH7, 3D2XK, T32PO, JH1MAO/JD1 (Ogasawara Is), FO5MC, KH6IMB, 3DZKV (Rotuma Is) and FW/IN/TH, all in the Pacific, together with CM2AW/4 (Isle of Pines), YB2ZDA (first YB active from East Timor), DL1SCF/TF (Westman Is) and J3OSI (Conway Reef). On 28 MHz Robert logged ZYOTX and CYODXX for new ones. On an otherwise dead band one morning, KH6JK put in an

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Please refer to article on loop construction in February 1989 edition of Rad Comm.

FEATURES OF LOOP ANTENNAS

• Has a very high q
• A radiation resistance of 300 kilohms to never more than 0.8 ohm at an ohm
• Has a bandwidth from 300 kHz to 50 kHz
• It has an S/N of 1:4:1:1 at the very least.
• It operates at virtually ground level
• The loop has a vertically polarised radiation pattern containing both very high and very low angle radiation (ideal as a DX antenna)
• Does not require an Antenna Tuning Unit
• Depending on the model it only occupies up to 80cm² on 1m² of space
• It is a compact, light and waterproof
• Planning permission is not necessary

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Enquiries to Frank G4PDZ on 0533 553293
Le roi est mort. Vive le roi!

We have always felt it a privilege to be the sole appointed distributor for Kenwood in the UK, but never more so than right now when we see the introduction of a major new HF transceiver from them. The TS-950S continues Kenwood's policy of introducing new models only when there are significant improvements which can be brought to the end user, and this is demonstrated by the long product life of the Kenwood transceivers in the past. In the belief that a picture can tell you more than acres of text, we thought that you would appreciate a big 'un. This is the biggest we could manage...

For more information on the TS-950S and its likely delivery schedule, contact your approved Kenwood dealer soon.
25 years in amateur radio

S. WALES (BARRY) Telephone 0446 721304, LONDON Telephone 01-429 3256 BOURNEMOUTH Telephone 0202 577760
The OMNI V is a Paragon with a 12 band crystal mixed local oscillator in place of the general coverage synthesized oscillator. The result is receiver cleanliness like the legendary Corsair and Omni series. The OMNI V local oscillator is a new ultra low noise 5.0 to 5.5 MHz PLL design. Phase noise is simply eliminated as a significant variable. Dynamic range is maintained right up to the edges of the crystal filters, even under the most adverse conditions.

Many of the nifty features made possible by digital technology are included. Dual VFO's with A-B split select, the frequency stability of a PLL, 25 tuneable memories, VFO to MEM, MEM to VFO and the SCRATCHPAD feature. RS-232 interface is standard and includes remote band switching for the HERCULES II amplifier. The memories are nonvolatile RAM and are retained until you change them. The status registers and clock are backed with a lithium battery (2 year life) so that when the rig is powered up, the status is the same as when you turned it off.

The OMNI V operates USB, LSB, fast or slow OSK CW and real FSK. FM is optional. All bands from 160 through 10 meters are push button selectable. Each band position covers 500 kHz plus 30 kHz over-shoot at the band edges. The four 500 kHz segments of the 10 meter band are switched automatically as you tune through the segment limits. Tuning is in your choice of 10 Hz or 50 Hz increments on SSB, CW and FSK. With the FM option, tuning is in 100 Hz or 500 Hz increments. Up/Down buttons tune in 10 kHz or 50 kHz increments.

An auxiliary frequency tuning system is available and plugs into the rear panel. This allows you to remotely tune the frequency from the most convenient and comfortable position. It takes about 10 ms to fall in love with this option.

A noise blanker and audio speech processor are standard equipment as is the CW sidetone and speech monitor. The rear panel has a full complement of inputs, outputs and controls for the convenience of the all-mode operator, including an auxiliary RX antenna input. High speed key lines are provided for QSK control of a fast switching amplifier, such as the TITAN or HERCULES II. Changeover in fast OSK is less than 30 ms, great for CW and the digital modes.

The front panel is spacious and friendly. The vacuum fluorescent display uses large, bright, easy to read elements. The frequency display doubles as the 24 hour clock display when the CLOCK button is pressed. Other elements indicate VFO status and warn when the memories are full. All four of the 6.3 MHz I-F crystal filter positions are push-button selectable, independent of mode. A second filter socket is also provided, in series, behind the standard 2.4 kHz filter in the 9 MHz I.F. This may be used for an optional 2.4 kHz, 1.8 kHz, 500 Hz or 250 Hz filter which is selected with the "NARROW" button. This adds six or eight poles into the crystal filter network and even further reduces the impact of adjacent strong signals. Most impressive!

If you do not need a general coverage receiver in your HF rig, the elegant OMNI V is a great choice. If you are also a serious DX'er and/or contest, the OMNI V is the best choice.

**GENERAL SPECIFICATIONS**

**Frequency Range:** Transmit and receive on all ham bands from 160 through 10 meters in their entirety. Twelve 500 kHz segments plus 30 kHz over-shoot at the upper and lower edges of the segments.

**Frequency Control:** LO generated from a crystal oscillator mixed with a low noise 5.0 - 5.5 MHz phase locked loop.

**Frequency Stability:** Worst case, 1 PPM per degree C at 29.999 MHz.

**Frequency Accuracy:** $+100$ Hz @ 25 degrees C.

**Antenna Impedance:** 50 Ohms, unbalanced.

**Printed Circuit Board:** G-10 epoxy glass.

**Power Required:** Receive = 1.5 A, Transmit = 20 A, 12-14 Vdc.

**Dimensions:** HWD 5/4" x 14/4" x 17", 14.6 x 27.3 x 43.2 cm.

**Net Weight:** 16 lbs, 7.25 kg.

**TRANSMITTER**

**Modes:** USB and LSB (J3E), CW (A1A), FSK (F1A). Optional FM (F3E).

**DC Power Input:** 200 watts maximum.

**RF Power Output:** ALC stabilized, adjustable from 20 watts to 100 watts (50 Ohm load) with front panel RF OUT control. Microphone Impedance: 200 Ohms to 50k Ohms. Bias voltage for elctret mic is provided in front panel connector.

**CW Sidesets:** Internally generated with rear panel level and tone adjustments, independent of front panel audio level control.

**SSB Generation:** 9 MHz, 8 pole crystal ladder filter, balanced modulator.

**Carrier Suppression:** Greater than 60 dB.

---

**HRS Electronics Plc**

HRS Electronics Plc., Garrets Green Lane, Garrets Green, Birmingham B33 0UE. Tel: 021-789 7171

Ring 021-789 7171 for your nearest dealer. Ask for Fred Rendell!
Impressive from either end... but it's how we make ends meet that really delivers the difference.

SEE OMNI V AT LEICESTER — STAND 11 — EXHIBITION HALL

Unwanted Sideband Suppression: Greater than 60 dB at 1.5 kHz AF input.
Harmonic Emissions: Greater than 45 dB below peak power output.
Third Order Intermod Products: -30 dB from two tones at 100 watts PEP.
Metering: Switchable forward power, SWR, collector current or audio processing level on SSB.
CW Offset: 600 Hz.
FSK Shift: 170 Hz.

RECEIVER
Modes: LSB, USB, CW and FSK. FM with optional board.
Sensitivity: .15 uV for 10 dB signal to noise ratio at 1.8 kHz AF input. With FM option, .3 uV for 12 dB SINAD at 15 kHz bandwidth.
Selectivity:

<table>
<thead>
<tr>
<th>Standard 2.4 kHz</th>
<th>2.4 kHz</th>
<th>3.36 kHz</th>
<th>1.87:1</th>
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</thead>
<tbody>
<tr>
<td>Opt. 1.8 kHz</td>
<td>1.8 kHz</td>
<td>2.59 kHz</td>
<td>1.50:1</td>
</tr>
<tr>
<td>Opt. 9 kHz</td>
<td>9 kHz</td>
<td>1.49 kHz</td>
<td>2.82:1</td>
</tr>
<tr>
<td>Opt. 250 Hz</td>
<td>250 Hz</td>
<td>.83 kHz</td>
<td>3.40:1</td>
</tr>
<tr>
<td>Opt. FM</td>
<td>15 kHz</td>
<td>30.00 kHz</td>
<td>2.00:1</td>
</tr>
</tbody>
</table>

Attenuator: -20 dB.
I-F Frequencies: 1st I-F 9 MHz, passband tuning I-F 5.3 MHz.
Image Rejection: +100 dB.
I-F Rejection: +50 dB average.
Noise Blanker: Switchable on/off with width adjustment.
Dynamic Range: 97 dB, measured with standard 2.4 kHz filter at 20 kHz spacing, 100 dB + with cw filters.
Third Order Intercept: +10 dBm.
Noise Floor: -133 dBm @ 2.4 kHz bandwidth.
Squelch Sensitivity: Less than 6 uV.
Receiver Recovery Time: Less than 30 ms.
Pass Band Tuning I-F Shift: +2.3 kHz.
Audio Output: Speaker, 1.5 watts @ 8 Ohms.
Fixed level 1 mw @ 600 Ohms.
Nebel Fitter: 250 Hz to 2.2 kHz, greater than 50 dB notch depth.

Audio Bandpass Filter: 4 pole, variable center frequency 220 Hz to 1.7 kHz, 35% bandwidth @ -6 dB.
Tone Control: Variable 15 dB roll-off @ 5 kHz.

PHASE NOISE PERFORMANCE OF THE OMNI V
-127 dBc/Hz @ 250 Hz offset from carrier.
-146 dBc/Hz @ 5 kHz offset from carrier.

Here is a graph of the phase noise performance of the OMNI V receiver. These measurements can only be made under laboratory conditions and, even then, our test equipment is at the limit of its ability to measure the noise at the narrow offsets. The significant measurements are those close-in. Note that this graph does not even go out to 25 kHz offset where many of the published measurements are made. Certainly, we invite comparison.

Contact your local Ten-Tec dealer for further details of this truly remarkable high performance transceiver. Also ask about the rest of the amazing range of Ten-Tec 'professional' amateur equipment now available throughout the U.K. Call Fred Rendell on 021-789 7171 for details of your nearest stockist.

The DX and Contesters No. 1 choice.
Can you really afford not to have one?

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- IC 4SET 70CM
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Kenwood TM701E
ICOM IC2400
ICOM IC3210
Standard C5200 10 watt
Yaesu FT7000

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ICR 7000 VHF/UHF
ICR 71E HF
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Jupiter
Uniden
AOR

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(The one on the right)

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1-3 in — 15-25W out £59

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2 metre BD for 767
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Yaesu Mics
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MHI 9A2B
MDI B8
MHI B8

PHONE 01-997 4476

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LP 432/3/50
LP 432/10/50
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RAIIO COMMUNICATION October 1989
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YAESU FT1000 HF TRANSCEIVER

HX240 2m to HF TRANSVERTER

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HX240: 2m to HF Transverter
Frequency Coverage: 80m, 40m, 20m, 15m, 10m
Output power: 30-40W PEP (SSB/CW)
RF Drive: 2.5W/10W Selectable
Rx Preamp Gain: 8-10dB
Power Requirement: DC 13.8V, 7A

Additional features: Carrier operated switching or by remote socket, power output meter, switchable preamp Hi/Lo output selectable, visual indication of antenna mismatch.

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The FT-747GX is a compact SSB/CW/AM and (optionally) FM transceiver providing 100 watts of PEP output on all HF amateur bands, and general coverage reception continuously, from 10kHz to 30MHz. A front panel mounted loudspeaker and clear, unobstructed display and control layout make this set a real joy to use. Convenient features include operator selectable course and fine tuning steps optimized for each mode, dual (A/B) vfos, along with twenty memory channels which store mode and skip-scan status for auto resume scanning of selectable memories. Eighteen of the memories can also store independent transmit and receive frequencies for easy recall of split-frequency operations. Wideband (6kHz) AM and narrowband (500Hz) CW IF filters are included as standard, along with a classiﬁable, switchable 20dB receiver attenuator and noise blanker. User programming for more advanced control by an external computer is possible through the CAT (Computer Aided Transceiver) System. The transmitter power ampliﬁer is enclosed in its own diecast aluminum heat-sink chamber inside the transceiver, with forced-air cooling by an internal fan allowing full power FM and packet, RTTY, SSTV and AMTOR operation when used with a heavy duty power supply.

FT747GX HF TRANSCIEVER

Yaesu have upgraded this popular HF and VHF/UHF base station transceiver. The improved version is now available with enhanced synthesiser performance and VFO tuning rate. Read Chris Lorek’s review in “Ham Radio Today”.

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*Subject to status

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$699.95

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**COMET & HOKUSHIN ANTENNAS**

New from Hokushin, are exciting range of high performance antennas, the WX1 has been a best seller for some time now, available are its bigger brothers the WX2 and WX4. Both are multi section 2m/70cm coillers and the mechanical construction the best we have seen yet. On the mobile side from a new nini dual band, mobile, the HT-72255S, very similar to the Comet CHL21, and tests with our network analyser confirms its compatibility with our existing range of gutter and mast mounts. Also available a low profile hatchback mount and cable, the SS-81. Two new dual band antennas, the very slim VM-72255S and the exact HT-72255S. Both are suitable replacements for the 70MN. For the HF enthusiast a compact 10m HB1RCV dual driven element antenna that is extremely light and very cleverly constructed.

<table>
<thead>
<tr>
<th>Antenna Type</th>
<th>Description</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>HT-72255S</td>
<td>Dual band mobile</td>
<td>£325.00</td>
</tr>
<tr>
<td>HT-72255S</td>
<td>Dual band element</td>
<td>£195.00</td>
</tr>
<tr>
<td>SS-81</td>
<td>Hatchback mount and cable</td>
<td>£34.95</td>
</tr>
</tbody>
</table>

**MOBILE ANTENNAS**

- **WX2**
  - 2m 1/2 wave £4.95
  - 2m 1/2 wave £6.95
- **WX4**
  - 70cm 1/4 wave £11.25
  - 70cm 1/4 wave £13.00
  - 70cm 1/4 wave £13.75

**DUAL BAND BASE ANTENNAS**

- **CHL21**
  - Dual band mobile £14.95
- **CHL2J**
  - Dual band mobile £16.95
- **CA20MK**
  - Small dual band mobile £39.05
- **BR**
  - Small dual band mobile £37.05
- **HS-7715**
  - Dual band mini antenna £11.60
  - Mini gutter mount £10.05
- **HS-72MN**
  - 2m 1/2 wave £24.95

**CARAVAN BASE ANTENNA E7-50, MOBILE ANTENNAS £44.00, CABLES AND MOUNTS £3.50**

---

**ROTATORS**

Superb engineering standards combined with pin sharp setting accuracy means new technology from Rabo create Kemptra Hygain

<table>
<thead>
<tr>
<th>Rotator Model</th>
<th>Description</th>
<th>Price</th>
</tr>
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<tbody>
<tr>
<td>AR2025X</td>
<td>Offset type 3 wire</td>
<td>£38.50</td>
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<tr>
<td>G-200</td>
<td>Bell type 1/2 wave</td>
<td>£59.50</td>
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<tr>
<td>G-500</td>
<td>Bell type 1/4 wave</td>
<td>£119.00</td>
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<tr>
<td>G-800C</td>
<td>Bell type 1/8 wave</td>
<td>£192.00</td>
</tr>
<tr>
<td>HAM IV</td>
<td>Bell type 1/16 wave</td>
<td>£327.75</td>
</tr>
<tr>
<td>12X</td>
<td>Bell type 1/32 wave</td>
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<tr>
<td>G-900X</td>
<td>Bell type 1/64 wave</td>
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<td>G-1000X</td>
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<tr>
<td>G-5000X</td>
<td>Bell type 1/256 wave</td>
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</tr>
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**STRUMCH MEX VERSATOWER**

```markdown
<table>
<thead>
<tr>
<th>UNITOWER 104/10 Series</th>
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<tbody>
<tr>
<td>104/10P300FT POST MOUNTING</td>
</tr>
<tr>
<td>104/10P200FT POST MOUNTING</td>
</tr>
</tbody>
</table>

STANDARD 10M20 SERIES

| 10M20P300FT POST MOUNTING | £250.00 |
| 10M20P200FT POST MOUNTING | £253.50 |
| 10M20P000FT POST MOUNTING | £300.00 |

HEAVY DUTY 20M20 SERIES

| 20M20P300FT POST MOUNTING | £360.50 |
| 20M20P200FT POST MOUNTING | £317.00 |
| 20M20P000FT POST MOUNTING | £367.50 |

ALL TOWERS EXCEPT MOBILES ARE AVAILABLE FROM STOCK.

---

**MORSE KEYS**

<table>
<thead>
<tr>
<th>Morse Key</th>
<th>Description</th>
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<tbody>
<tr>
<td>MK3601</td>
<td>Straight key £4.95</td>
</tr>
<tr>
<td>MK3611</td>
<td>Straight key £5.95</td>
</tr>
<tr>
<td>MK3621</td>
<td>Straight key £6.95</td>
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</tbody>
</table>

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**DATA TERMINAL**

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POWER SUPPLY COMPROMISES

Power supply units remain an area where home design and construction continues to interest many amateurs even in this era of black boxes. But it is an area where care is needed, particularly if the PSU is to be used to drive an expensive transceiver or linear amplifier without inducing a gnawing fear that one day it may inflict costly damage on itself or its load. Protection against excessive voltage output (transient or sustained), over-current and short-circuit protection, switch-on transients and current surges, including safety guards against all likely fault conditions are important, while always paramount should be the safety of users, their family, pets etc. The degree of voltage regulation and ripple filtering may vary widely according to the intended load (transceivers intended for mobile operation will include in-built voltage regulation). Then again, for some applications questions of size and weight and the desire to counter the rising cost of what we used to call the 'ironmongery' — mains transformers, smoothing chokes, metal cabinets etc — will need to be taken into account. In many areas of electronics, the 50Hz PSU is being superseded by switched-mode units and inverters with the tendency for these to function at ever higher switching frequencies and involving the need to counter radio-frequency-interference (RFI) problems by the use of good EMC practices. For 50Hz and higher frequency units the toroidal transformer has become established (see TT March 1986, p 186-7) for a summary of the advantages of toroids based on information stemming from John Brown, G3EUR as an alternative to conventional laminated-core transformers.

To meet all the requirements outlined above with a high-voltage or high-current transmitter/transceiver PSU is neither easy nor cheap, and in practice many of the designs published in TT and elsewhere tend to include compromises that reflect the designer's belief that, despite Murphy's Law, particular fault conditions are unlikely to befall him. A PSU designed to function perfectly under all fault conditions may in fact be over-designed and not truly cost-effective. Most of us only partly believe in the validity of Murphy's Law and comfort ourselves with the thought that sustains all those who live dangerously, 'It won't happen to me.' Thus most of the PSUs published in the amateur press tend to be based on units that have worked satisfactorily over a reasonable period of time rather than designs that would fully satisfy a top professional designer (though the same could be said for some factory-built PSU's). However, if compromises are to be made, it is highly desirable for those concerned to know and recognise what they are for. For that reason it is my practice to publish constructive comments on TT designs, without this implying that the original design would not prove satisfactory in practice. Perhaps the main problem for the amateur designer is analysing what may happen in the event of a sequence of component failures and deciding what are the chances of particular components failing.

The components count of high-current PSUs can be significantly reduced by the use of specialised and over-rated components; unfortunately these may not be readily available in the UK to those not working in the electronics field. An interesting example of such a design is the 13.5V (adjustable), 20A maximum PSU described by John-Luc Barraud, FC1JKE (Radio-REF, Nov/1989) using SGS and Thomson devices: Fig 1. The BUXX1 series regulator is rated at 40A, 250W (alternatively BUXX20, BUXX22) is mounted on a heat sink at 150-200nm (0.5°W) and forced air ventilation of the unit by means of a fan is strongly recommended. The diode bridge can be mounted on the side of the metal cabinet or on another heat sink. Capacitors should be mounted very close to the SGS L200 regulator (alternative Thomson TDB200) which also requires heat sinking, for example by mounting the top of the cabinet. The use of a 6A miniature circuit breaker as switch and 'fuse' is another feature. The design is included here primarily for interest rather than duplication.

John Brown, G3EUR, with much professional experience, offers some useful comments on several recent PSUs that have been shown in TT, including the two in the July issue: Fig 2 (p35) G4WAS's 13.5V high-current supply with crowbar over-voltage protection; and Fig 4 (p35) G4IDES's 600V/400V unit for the 50MHz valve amplifier. Both raise questions of the protection arrangements.

G3EUR writes: "In the event of a catastrophic failure of the series regulator in G4WAS's unit, due to collector/base-emitter short, the voltage across C2 (39,000 uF) will rise until THY1 fires, turning on THY4 to blow the fuse F2. But the coil of RL1 in series with C2 will present high impedance to the current, with a series cut-off. Feedback of RL1 to the junction of the regulator and RL1 would give much faster turn-off and could permit a smaller value for C2. This is advisable since a large-value C2 could deliver a lot of destructive energy to a short-circuit in the transceiver etc, although not as much energy as from a hefty 12-volt battery. I consider that several fuses are desirable at strategic points in the rig. For example, I found the scale lamps on the VSWR meter and the 12V outlet for 'accessories' on my rig were fed from the same 20A fuse that 'protected' the PA. For my peace of mind, I have added 20mm by 5mm holders and 500mA fuses. I have never experienced a breakdown in a series pass transistor, perhaps because I always use conservative ratings and like to keep devices cool. Many years ago, in a professional capacity, I found that different makes of 2N3055 transistors when operated upon would exhibit a more than 10% variation in chip area, often with poor thermal coupling between chip and header. I decided that cheap chips are poor insurance. The firm I was with encapsulates many types of regulator using 2N3055 devices and has had almost zero fault records for a decade."

Fig 1. FC1JKE's 20A PSU based on relatively high-power components. Shown for interest rather than duplication as some components may not be readily available in the UK. MCB is a miniature contact breaker combined switch and 'fuse'. (Radio-REF)
TECHNICAL TOPICS

“But it has been my experience, more than once, that if RF gets into the control circuits of a regulated PSU, it can raise the output voltage sufficiently to turn on crowbar protection. This happened recently at a Duxford (part of the Imperial War Museum) demonstration when another transmitter was being tuned up.

In connection with the above notes, an average linear regulator has a source impedance of the order of 10millions from DC to about 1kHz and is usually less than the impedance of the cable connecting the PSU to the load. The impedance rises with frequency to tens of ohms at say 10kHz, hence the need for a bypass capacitor, but not 39,000μF. More important is low equivalent series resistance (ESR). A 100μF capacitor has a reactance of 0.16 ohms at 1kHz, adequate for bypassing audio, but the series-resistance may be higher, especially in old ‘surplus’ types. A new radial type, for 5mPS use, will have an ESR of around 0.1 ohm at 1kHz and stay low up to tens of kHz. A mica or ceramic bypass for RF should then keep the PSU source impedance lower than the cable impedance, so that large values of C in this position represent only excess energy storage.

PSU design should be related to need; the load variations in an SSB transmitter are relatively slow, modulation envelope sized; in CW there are last square waves with a change in mean current related to keying speed (wpm). If the circuits prior to the final amplifier are voltage sensitive, it is better that they should be stabilised or decoupled at their own low-current level, which also gives some protection and time for the main-PSU protection circuits to work. This also applies to a receiver. Over-kill is not good design; costs money and space, and adds problems.

Questions of protection also arise in the G4IDE PSU (July Fig 4). C9, C10, C11 together store about 15 joules of energy and in the event of a short-circuit in the power amplifier (and there are at least five points in the PA circuit which could break down to chassis) the destructive energy would probably explode the 500μA fuse (F1) unless this was of the specially-designed, high-voltage, sand-filled type. 16 watt-seconds in 1ms is 18kW. Hence the bang on ac-over.

“Then a common failure in such designs: most resistors of 1W or less are rated at 350V DC maximum, regardless of their value and would not recommend a single 10meg resistor (R16) for the 100μA meter unless it was of the 500μm spiral track type rated at 1kV continuous working.

Then one must question the use of half-wave rectification for the bias supply. Admittedly, the resulting small amount of DC in a big mains transformer will not saturate the core but a bridge-type rectifier is cheap (38p) and could save one of the 10μF capacitors (36p) yet providing less ripple. I frequently see designs using toroids with half-wave rectification; clearly it is not always recognised that the gapless core of a toroid means that it can be easily biased by DC, and then blamed for core noise and excessive switch-on spikes.”

SSB LINEARITY: THE MOVING GOAL-POSTS

The recent series of references in TT to the question of the linearity of amateur transceivers and linear amplifiers continues to attract comment. It was noted in the June TT that for many years the specification for most professional SSB/ISB transmitters has called for a third-order IMD performance of at least -42dB relative to PEP output (equivalent to -36dB relative to a tone), whereas few factory-built amateur rigs come within 100dB of this figure, and some are appreciably worse than this.

It is worth recalling that many years ago, Les Moxon, G6XN pointed out in TT that the design and operation of high-power linear amplifiers requires a high level of good engineering practice, particularly where any degree of speech-compression is used. Apart from the actual amplifier stages, including the exciter, the PSU must be able to handle the current peaks without clipping, including the increased duty-cycle found with compressed speech and with frequency shift keying (FSK) as used for RTTY, AMTOR and digital data.

Paul Essery, GW3KFE writes: “My I pick up on...”

ANTENNA TOPICS

From a number of antenna ideas recently received from readers, this month’s selection includes an ingenious 3.5/14MHz wire antenna from C W Farrell, G8GS and a method of ensuring resonance of narrow bandwidth HF mobile antennas from Charles Wilkie, G0CBM.

G8GS writes: “After improving signals to VK2/LZ on the long path by using a four-element wire beam comprising two collinear horizontal dipoles, each with a director, it was desired to incorporate a 3.5MHz facility into the system. This has been done and the arrangement works successfully on both bands. The method is shown in simple outline in Fig 2, utilising the voltage node points, switching being achieved with a 14MHz acceptor circuit fitted into the bottom of the quarter-wave stub. The array is compact, measuring approximately 50ft in length, the mast height being 30ft. No deterioration of the out-going 14MHz signals has been detected.” The illustration does not show the 14MHz director wires.

G0CBM required an efficient mobile antenna for 3.5MHz and recognised that the key to efficiency with electrically-short (high Q) antennas is achieving accurate resonance when changing frequency. He writes: “The usual way of achieving resonance of mobile antennas is by means of a tapped loading coil, thus resonance occurs as a series of steps through the band with maximum efficiency only when the operating frequency coincides with the resonance of a tapping point. On the lower HF bands, bandwidth is often only about 10kHz or less, and would entail the use of some 30 taps on the loading coil. I found that by placing a variable capacitor at the base of the antenna, resonance could be achieved at any point in the band. Matching the antenna to a 50- ohm output of a transmitter is achieved by inserting a 4.5μH inductor between the variable capacitor and ground. In practice, I have found that the twin requirements of resonance and unity VSWR can be achieved with only three taps and a 365μF variable capacitor. In operation I simply peak the variable capacitor for maximum signal on a field strength meter. Dimensions shown in Fig 3 are for guidance only.”

John Hays, G3BDO reports some very successful DX operation using a three-band (14, 21 and 28MHz) and a two-band (3.5 and 7MHz) inverted ground-plane antennas (see TT, May 1989 and many earlier references) based on the standard multiband dipole principle of parallel wires of suitable resonant lengths. His tri-band unit (fed at the top of the three vertical radiators by means of tuned 300μm BOFA ribbon feeder) has the 14MHz wire inductively loaded 3.5MHz radiator with the bottom ends of both 3.5 and 7MHz radiators folded back so that the total support height is only 34ft (lower part 21ft above ground). This is end-fed to a single wire radiation feeder to an ATU which then also allows the antenna to be tuned up as form of long-wire antenna for any DX. G3BDO hopes to publish an article on them before long.

Fig 2. (top) G8GS’s dual-band (3.5 and 14MHz) antenna.

Fig 3; G0CBM reduces the need for multiple loading-coil taps by adding a variable capacitor to peak for resonance while maintaining near-unity VSWR.

Dimensions of his 3.5MHz mobile antenna for guidance only.

RADIO COMMUNICATION October 1969
you point recently about non-linear lines?

Whilst I agree that many people overdrive lines, some points need to be stressed; firstly that by-
and-large valve lines perform satisfyingly given
reasonable design and subject to not being
overdriven. However, in my humble opinion by far
the biggest cause of problems is the fact that
designers have moved the goalposts. In the early
days of SSB — viz. APRL's SSB for the Radio
Amateur for instance — it was accepted that a
minimum of -30dB represented the figure for
spurious output products. Nowadays, if you look
at manufacturers' literature covering equipment
with solidstate output stages — let alone solid-
state 'big boot' amplifiers — you find specification
figures for their IMDs of around -25dB at rated
output.

"So where in 1989 is the problem with lines?
Overdriving is a running problem of course,
although ALC can at least reduce this tolerably.
But with the present design specifications, a linear
to perform adequately at 400W PEP output needs
to be rated at much higher output so that they
cannot be overdriven accidentally. It is surely
to be better momentarily 'over the limit' cleanly
than to be plastering the band with spltter at legal
limits.

"Secondly, and so few people seem to realise
this, whatever the type of linear, as soon as the
input impedance changes the driver stage senses
this and distorts. Thus to obtain adequate linearity
one needs a low-pass filter (to provide a constant
impedance) between a blackbox transceiver and a
factory-built linear more, possibly, than at the
output of the linear if this is feeding an ATU. I had
handsome proof of this at my former QTH. Woe
betide me if I did not have an LPF between linear and
rig; the second LPF merely cleaned up the
slight increase in spurious output due to the linear
itself. For more than two decades, I have had a TV
set built into the shack and switched on whenever
the rig is in use. The problem was noted with Clax
AB2 and Class B lines, but nobody realised, it
seems, that AB1 lines with ALC had the same
problem. The point is that if the transceiver output
stage is forced into distortion the linear faithfully
reproduces that distortion.

"With solidstate, designers seem to have
compounded the problem by selling what in effect is
a PA tank circuit as an optional extra called
'automatic ATU'. In my opinion, the right way to
go, in the long term, is to use FET's as transmitter
amplifiers. But I still believe that many problems
arise because the market demands 'modern solid-
state technology' regardless of its suitability for a
particular application. Leaving things to the mar-
ketplace means in practice that 'fashion' rather
than 'technical merit' is everything. It is fashion
that puts all those confusing buttons and knobs on
current transceivers. So many, that even after
several months of use, it can be a problem to
'drive' the rig. A few old-style controls would be
infinitely easier to operate. Similarly the handholds
are virtually impossible to use with gloved hands,
as might be necessary in an emergency."
**TECHNICAL TOPICS**

Fig 7. A triple-voltage, regulated supply using the twin-windings usually found in modern toroidal and laminated core transformers. With the back-to-back half-wave rectification of the two 12V outputs it is advisable to ensure that the loads are balanced to avoid a DC component in the output of a toroidal, it necessary by adding loading resistor(s). The top section uses a bridge and provides about 100V DC across the 470uF capacitor. This is rather high for a 5V IC regulator and the heat dissipation can be reduced and smoothing improved by adding a low-value resistor as shown (1.8 ohms in this example) which drops about 3.6V at the full load of 2A with the second 470uF capacitor giving extra smoothing. (Q31EUR, Mercury, November 1985).

**HF PACKET RE-THINK?**

Without this month, pursuing the CW/AMTOR debate, which arouses strong feelings on both sides, it seems worth drawing attention to an article by Paul Rinaldo, W4RI, the Editor of QST, 'The Great 1989 HF Packet Design Quest' (QST, May 1989) in which the 'dragons' of HF packet operation — multipath, intersymbol distortion, group delay, QRM, QRN, bursty errors, contention and retries — are given an airing. W4RI believes that the time has come for amateurs as well as the increasing number of professional users to rethink the AX.25 protocol for HF operation, for which it is clearly far less satisfactory than AMTOR. He introduces his appeal for a quest to find a less vulnerable protocol as follows:

'Medieval mariners knew that the earth was flat. As they sailed near the edge of the earth, it was commonly accepted that 'beyond this place there be dragons.' Hams now know that amateur packet radio works well on VHF/UHF, but not too well on HF. Sure many of the HF bands are buzzing with packet activity. The problem is efficiency: i.e., too many retries to get past the dragons. Because the AX.25 protocol includes an error-checking feature, packets with even itty-bitty errors are shunned by the receiving station. Then, the automatic repeat request (ARQ) feature of AX.25 takes over and keeps on retrying until a packet runs the iconospheric gauntlet of monsters completely unscratched... Why not just use AMTOR? Of course, it is a partial solution that's here today. There are even packet-to-AMTOR gateways. However AMTOR has its problems. AMTOR is based on the older Baudot character set rather than the newer ASCII character set which is repeat with upper and lower case, more symbols and computer control characters. At best, even when band conditions are perfect, AMTOR has a maximum efficiency of 50 per cent, as only three characters are sent at a time, then the sending station must get an acknowledgement (ACK) before proceeding with new characters. While the symbol rate is 100 bauds, the throughput is between 0 and 50 bauds depending on band conditions. When the concept on which AMTOR is based was first conceived some years ago, designers didn't have the luxury of today's microprocessors and other digital integrated circuits. Whether or not AMTOR is used as a point of departure for a new HF packet protocol, it nevertheless sets a standard for comparison.'

If I were an AMTOR operator, which I am not, I would not be entirely convinced by W4RI's structures on its efficiency. There is little doubt that in reasonable (and not so reasonable) conditions the throughput of anything between say 30 and 50 baud can shift a lot of words, at least in upper case letters! Even on VHF, AX.25 packet can involve a large number of retries which can bring its throughput tumbling down. Meanwhile I intend to keep plodding along with hand Morse!

**BATTERY CHARGER CONTROLLERS**

Recent items in TT have stressed that lead-acid and nicad rechargeable batteries can have their active lives shortened by subjecting them to frequent overcharging, sometimes at attempting to keep them fully charged by continuous trickle charging. The August TT included some suggestions on the use of timers designed to reduce greatly the charging rate after a fixed period of time. This approach is well suited to nicad batteries which have a fairly 'flat' voltage charge/discharge curve that makes it difficult to use a voltage-sensitive controller. However, for lead-acid batteries, where the voltage increases significantly as the battery approaches the fully-charged state, it is easier to use a voltage-sensitive controller which can be either an add-on unit or built into the charger.

Ron Wilson, G3DSV draws attention to a charger-controller of this type that was described by J P Bell, G4LSA and E J Barker in Practical Wireless (June 1985, pp20-21, 53). He writes: 'I use a 12-volt vehicle battery for running my HF rig and had been following the notes in TT with some interest. You mention chargers taking batteries up to 13.8V. In practice, most of the chargers I have come across will take a battery up to 14.4V and indeed this is the voltage found on many cars, my Volvo for one. This voltage is a bit too close to the 15V maximum of some older rigs (although most newer rigs are now rated at 16V maximum). The policy of watching a voltmeter is sound but it is so easy to forget to adhere to, as I well know. I would like to draw readers' attention to the controller described by G4LSA. This cuts the charger almost out, in practice down to about 100mA, when the voltage reaches 13.5 to 13.8V (this can be adjusted and mine is set to 13.6V). The controller is simple and inexpensive to build, and can often be built within the charger enclosure.'

The G4LSA controller was intended for use with lead-acid vehicle batteries (charging rate about 4-5A) used to power SSB transmitters with an output of up to about 100W requiring 13VDC at up to about 250VA. When set to 13.5V it cuts out, reducing the charging current to a very low value, when the battery is roughly 85% fully charged and greatly reduces any tendency for the battery to 'gas'.

In the PW article, G4LSA pointed out that modern vehicle batteries of the 'low maintenance' type can be topped up with distilled water in the traditional manner. Plates now contain less antimony than before; this reduces the amount of gassing and the batteries require less topping up. With modern 'sealed for life' batteries, the plates have very little antimony or may replace this altogether, by the use of calcium. The sealed batteries cannot be topped up (without drilling into them) but since a small vent is provided to prevent the pressure is only a short plume behind the aircraft. "In the tropical stratosphere, where the lowest temperatures are to be found, persistent contrails are formed by the aircraft exhaust gases. These contain sublimation nuclei so causing supersaturation with respect to ice with radio signals possibly bouncing off the resultant ice particles formed in the contrails. "Therefore, it appears that the forward scatter propagation researches of VK2ZAB and VK3UJM which found that the signals from VK1BG at Canberra (roughly midway between Canberra and Melbourne) 'lasted from just a few minutes to tens of minutes,' clearly point to the creation of contrails in low-level or high-level saturation conditions where contrails were either a short plume or of a long, persistent nature. It appears to me that the discipline of meteorology, flight and Amateur Radio need to come together in this debate and research."Sydney/Canberra/Melbourne are roughly at latitudes that correspond in the northern hemisphere to the Mediterranean area (eg Spain/Morocco)
building up if the battery is overcharged, frequent venting will make the battery unusable. Since most cars are now fitted with alternators rather than dynamos, the primary task of a car battery is to provide the initial heavy surge of current (hundreds of amps) and are not designed to be deeply discharged.

The G4LSA controller (Fig 6) is designed to charge the battery when this discharges to about 12V. Initially a partly charged battery should be connected since a fully discharged battery will not enable the controller to function. With a battery voltage of about 12V but less than 13.5V, ZD1 conducts and TR1 and TR2 are 'off'. The thyristor THY1, with its gate voltage derived through R5, will be 'on', effectively passing the charging current. When the voltage increases to about 13.5V (or as set), ZD1 conducts, turning both TR1 and TR2 'on', thus clamping the gate of THY1 to its cathode, switching the thyristor 'off'. Where a substantial load is being drawn from the battery, the effect will be to switch the charging current quite rapidly on and off.

THY1 requires heat sinking and this could be the metal lid of a small dicecal aluminium box (114 x 54 x 30mm) with the thyristor mounted on the underside of the lid. With the specified device an insulating washer is not needed and the anode is bonded via the mounting tab to the box. Note however that the DC output terminals of the charger must be independent of the mains earth, otherwise the controller may be bypassed.

A full-size overlay and PCB track pattern is given in the PW article together with notes on setting up and testing, but construction should not be critical and operation is quite straightforward. Perhaps the most important point to note is that if the battery is fully discharged ZD1 may not conduct and the battery will not be charged unless a switch or shorting jumper is added across THY1 (anode to cathode).

The July 77 included a warning on the importance of using battery clamps that cannot result in the full voltage from a charger reaching the equipment. G3DSV points out that "available from caravan shops are snap-on/snap off clamps suitable for batteries with round posts. Inside each clamp are two fixing screws, one for the charger and one for the rig. The clamps are rated at around 100A and make a very positive connection." Personally, I feel one would need to be fully convinced that the clamp could not under any circumstances become detached from the battery lug, since this would create just the situation that must be avoided. G3DSV also reminds us that a breakers yard can be a useful source for "economical batteries: "My son and I have purchased batteries for £8-£10. The main point is to look at the date on the battery. We have managed to purchase batteries less than a year old, from crashed cars."

Vincent Evans, G4AVT is another 77 reader who uses a lead-acid car battery and charger for his 14.4MHz and HF transceivers. To avoid continual checking of voltages, he, like G3DSV, uses a voltage-sensitive controller but instead of a thyristor he uses an electro-magnetic relay: Fig 7. Full details of his 'Automatic Battery Charger' appeared in Ham Radio Today (September 1988, pp42-44). The action of his system is basically similar to that of the G4LSA unit in that the charger is left on continuously but is switched through to the battery only when the battery voltage is between about 11.5 and 13.5V after setting the cut-out adjustment RV1 with the aid of an accurate voltmeter. The relay must have heavy-current contacts, the specified unit being a 12V SPDT 3A, 240V contacts, PCB mounting, Maplin type YX97F. Full constructional details are given in the Ham Radio Today article. G4AVT adds: "The device is self-contained so that no alteration has to be made to the charger, and it is a reasonable DIY project. The charger is always on but current consumption is negligible. The more experienced amateur could very well build the device into a simple charger, and perhaps experiment by putting the relay contacts in the mains lead, although caution would be necessary since switching the transformer in the mains lead would cause a current surge, giving a momentary high output voltage and misleading the voltage-dependent switch. A resistor in the line to SW1 might provide an anti-surge device but this has not been tried.

Peter O'Keefe, VK3YF, in Amateur Radio (VK). April 1989, discusses the various types of lead-acid batteries now on the market, including various forms of 'Deep Cycle' batteries intended for non-vehicle use but imposing various charging constraints and often carrying only a six-months guarantee. He also notes that the sealed gel-type batteries sold for automobile use are intended strictly for engine-starting purposes and have a very limited stationary capacity. For conventional wet lead-acid batteries, he advises: (1) Keep the electrolyte up to the required level. (2) Check the specific gravity of the cells periodically using a hydrometer — cells should have a gravity of at least 1.230 when the battery has been left overnight. (3) Charge at about 14.4V, 4A for nine plate batteries, 5A for eleven plate batteries, for about 12 hours. Four hours after gassing begins you can assume the battery is fully charged. The specific gravity will then depend on the condition of the battery.

Those who recall such books as the classic Admiralty Handbook of Wireless Telegraphy of the 1930s, with its stress on the care of batteries, may feel wryly that it all goes to show that technology often moves in circles. But then, it has long been evident that it is often easier to generate RF power than the necessary DC!
Switched Mode Power Supplies (SMPS) can often be picked up cheaply at rallies, but what is a switched mode power supply? How does it work, how does it differ from a linear PSU and what are the advantages and disadvantages of such types of power supply? The aim of this article is not to advocate one or the other, but to describe how linear and switched mode power supplies work and lay out the various design criteria together with the pros and cons of each.

A power supply is a unit that accepts power from a source and converts it into a form which is suitable for a particular application. Throughout the sphere of electronics there are many such applications and typical inputs are the mains at 240V AC or DC supplies at unsuitable voltages. Typical DC outputs from such power supplies are 5V, 12.5V, 12V and 24V. In the majority of cases the radio amateur is interested in the conversion of the AC mains into a low voltage DC output suitable for running 13.8V equipment. It should be noted that, with either type of PSU, two processes are carried out - the AC to DC conversion and the change to a different voltage level.

**LINEAR SUPPLIES**

In the conventional linear power supply the changes will occur in the order shown in Fig. 1. A voltage level change followed by AC to DC conversion. The level change is usually accomplished using a transformer and the AC to DC conversion by means of rectifier diodes, smoothing capacitors and regulators. For a heavy duty DC power supply such as 13.8V at 25A (345Watt DC output) the transformer must capable of handling the total load power including losses. When the supply is provided at a frequency of 50Hz this requires a sizeable unit due to the materials and laminated structure of a suitable transformer. Also, because of the low mains frequency, the number of turns required on the primary winding is quite high and this in turn necessitates the use of thick, heavy-duty enamelled copper wire in the secondary winding. Whilst the rectification process causes little problem (rectifiers are cheap and readily available), smoothing and regulation are inter-related and these factors usually require a fair amount of space and cooling. As a rule of thumb, the regulator typically requires a 3V drop across it in order to function correctly - hence the lowest input voltage allowable must be at least 3V above the desired output when the unit is on FULL load.

Fig. 2 shows a typical arrangement for the DC side of a linear power supply. Smoothing is accomplished by electrolytic capacitors and the ripple depends on the value of capacitance and the current being drawn. With low current supplies, eg less than 2A, the value and physical dimensions of the capacitor are not too formidable, but these increase drastically when currents of more than 10A are required. One approach for keeping the minimum 3V differential between input and output of the regulator is to use a transformer which has an increased secondary voltage output but the power handling capabilities of the transformer must also be increased in order for the regulated DC output current to still meet the desired specification. This would allow use of fans in order to provide adequate cooling. Some manufacturers minimise the heat dissipation requirements (and hence costs) by designing units for intermittent use, relying on a low continuous current demand combined with an ability to provide current peaks for short periods, such as is found with SSB transmitters.

**SWITCHED MODE POWER SUPPLIES**

A different approach is the switched mode power supply. The SMPS is generally smaller than its linear counterpart but introduces other problems. As in most engineering solutions the final choice is made by weighing up the pros and cons so as to determine which is the best option.

The switched mode power supply exists in various forms but the isolation between input and output is still provided by a transformer. The size of the transformer is dramatically reduced by operating at a high frequency (eg 50kHz) and carrying output part of the smoothing at high voltage where the current requirement is smaller. High frequency transformers are not made from laminations (such as for 50Hz) but are made from ferrite materials. The reason why laminations are used at 50Hz is to keep the eddy current losses in the transformer core low - with ferrite the losses are much lower and so the size of the transformer core is considerably reduced. All of this reduces the size of the overall power supply but at the expense of complex control circuitry and the possible production of radio interference (RFI). Typical efficiency of these units is around 75% whereas a linear supply is closer to 60%.

A typical block diagram of part of a switched mode power supply is shown in Fig. 3. The unregulated DC input is converted to a high frequency AC supply (eg 50kHz) and a transformer provides the voltage translation and isolation. The AC is then rectified and the resulting DC is then smoothed (filtered). A sample of the smoothed output voltage is fed back to control the high frequency switch so that the output voltage is well regulated. The unregulated DC input can come from a battery, generator supplies or rectified mains with some smoothing (as in Fig. 4).

**HIGH FREQUENCY SWITCH**

The high frequency switch is in essence a power oscillator with rectangular output pulses. Fig. 5 shows a simplified view of the high frequency switch and transformer arrangement. Control circuits drive the switch with rectangular pulses (Waveform A) which cause Waveform B to appear across the transformer primary. This induces a voltage in the secondary of similar shape but of an amplitude which is dependent upon the turns ratio N1:N2 - Waveform C. The electronic switch may be either a bipolar transistor or a power FET which must be capable of withstanding high voltages. The power FET has advantages in that it is voltage driven and not current driven as for the bipolar transistor. As the devices switch on the high voltage side of the transformer the current switched is low, normally a few amps in a 500W supply.

The electronic switch can take various forms and Fig. 6 shows two more arrangements. Note that in Fig. 6b the capacitors must be of a...
type which are suitable for handling current at the switch operating frequency (low equivalent series resistance and inductance). In both these cases the drive waveforms 1 and 2 are in anti-phase and are generated by control circuits which are now available as dedicated integrated circuits (ICs). To provide a regulated DC output voltage, a sample is fed back from the DC output and compared with a reference voltage to produce an error signal. A common way of providing the regulation is to allow this error signal to alter the mark:space ratio of the drive waveforms whilst keeping the frequency constant. This produces waveforms as shown in Fig. 7 and is known as Pulse Width Modulation (PWM). This is not the only form of control but is the most commonly used at present.

In systems using two electronic switches (Fig. 5) the drive waveforms must be in anti-phase and never capable of switching both devices ON simultaneously - if they do an explosion usually results! Typical waveforms generated are shown in Fig. 8 and these introduce the concept of ‘dead time’ a period during which it is guaranteed that both drives are zero thus allowing the electronic switches to turn OFF. The actual drive waveform across the transformer primary is shown in Fig. 9 and this is reflected, of course, in the waveform of the transformer secondary.

In the dual switch circuits, since there is current flowing in opposite directions on different half cycles, the magnetic flux reverses and prevents magnetisation of the core. With a single switch, the current only flows in one direction and so steps are required to de-magnetise the transformer core. In the circuits of Figs 5 and 8a, the back EMF produced by inductive action dictates that the switches are rated for at least twice the maximum DC supply voltage, whereas in Fig. 6b the devices need only be rated at the maximum input DC voltage. This means that for a 240V RMS input (peak value 340V) the devices should be rated at 680V and 340V respectively. It is always good practice to be conservative with the voltage ratings and devices with minimum ratings of 800V and 400V respectively are commonly used. For example an IRF40 has a voltage rating of 400V, a maximum continuous current of 10A and maximum drain to source resistance of 0.55Ω when ON. This means that even at a maximum current of 18A the maximum continuous power dissipation would only be 55W - and in practice the mark:space ratio is less than 50%, being spread between two devices. For a power supply with a 2xW output the heatsink requirements are quite moderate. For a typical 500W output supply driven from the 240V AC mains, the drain current is about 2.5A on average; thus for a maximum 50% duty cycle, the power dissipation per device is about 3.5W maximum.

**OUTPUT TRANSFORMER**

The transformer is quite small - typically 70 x 88 x 17mm for a 500W output. It is made from ferrite for the reasons stated earlier and takes the form shown in Fig. 10. The transformer would weigh about 1 kilo, as compared to an equivalent transformer for a linear supply which would not only weigh between 7 and 10 times more but also be considerably more bulky. The number of turns required for the primary winding is significantly reduced from that required by a 50Hz transformer, and this also applies to the secondary which is advantageous in that the secondary winding requires quite thick wire because of the current requirements.

**OUTPUT RECTIFIER**

The output rectifier used (see Fig. 3) must be of a type which will switch ON and OFF very last - i.e at 50kHz or more. The type of rectifier used at 50kHz is wholly unsuitable as it cannot switch fast enough. The output rectifier will be of a type described as a 'fast-recovery rectifier diode' which may be packaged as discrete units or often as two diodes in a single power encapsulation such as T03 or SOT-93. The rectifier does get quite warm during operation and therefore must be mounted on an adequate heatsink.

**OUTPUT FILTER**

The output filter acts as an averaging device and usually consists of an inductor and a capacitor, the former being about the same size and weight as the transformer but with a gap in it, a typical arrangement is shown in Fig. 11. This includes a bleed resistor to allow the capacitor to discharge when the power supply is switched off and also to provide a small minimum load.

**CONTROL IC**

As mentioned earlier, the control circuit is now generally in the form of a dedicated IC, such as the SG3525 by Motorola and Silicon General. A representative block diagram of a typical control IC is shown on Fig. 12 and will serve to describe some of the functions offered.

The IC incorporates an internal oscillator circuit, the frequency of which is set by an external R-C network. In association with the oscillator there is an external resistor which allows various dead-time values to be set. In order to minimise the in-rush currents when the switched mode circuit starts up, there is a soft-start arrangement. The period for which this is operative is determined by an external capacitor and is typically for the first few seconds.

For the voltage comparison the IC produces a reference voltage (e.g 5V) and this is fed to one input terminal of the comparator amplifier, a sample of the power unit’s DC output being fed to the other input. The resulting output error signal from the amplifier is then used to control the...
amount of the generated pulse signals which are used to drive the output circuitry. The output circuitry consists of two drive circuits which are fed with anti-phase signals so as to allow either single-ended (Fig. 5) or double-ended (Fig. 6) switching arrangements.

Most of the controller integrated circuits contain some form of protection. Typical of these are dynamic current limiting and shut-down. Dynamic current limiting is achieved by monitoring the current supplied to each of the electronic switches. Circuit components can be arranged so that the control circuit tries to shut down if a preset value of current is exceeded on each supply pulse, thus protecting the power switch. Remote shut-down is explained in the next section.

REFINEMENTS
Refinements consist mainly of additional monitoring circuits which will try to shut down the control circuit when excess output voltage is detected or if the safe output current is exceeded. The shut-down signal required by the IC is a logic signal which indicates if the above parameters have been exceeded. A typical block diagram of the arrangement is given in Fig. 13.

PRACTICAL SMPS
Fig. 14 gives a typical circuit diagram of a switched mode power supply but without over-voltage and over-current protection. The diagram splits horizontally, with the power circuits being in the upper half and the control circuits in the lower.

The mains is supplied, via a fuse F1 for protection purposes, and is then full-wave rectified by BR1. This feeds smoothing capacitors C1 and C2 via resistor R1 which limits the inrush current to C1 and C2 on switch-on. Note that the only reason why the smoothing capacitor is in two sections (C1 and C2) is that the circuit can easily be modified to allow 110V operation. Because C1 and C2 are in series, resistors R2 and R3 are necessary to equalize the voltage across them. The unregulated DC appears across the combination C1, C2, R2 and R4 as shown in Fig. 4.

The basic power switch is of the half bridge type and is essentially C3, C4, T3, TR1 and TR2. There are additional components in this area and their function is as follows: R4 and R5 ensure that the centre point of C3 and C4 is at half the supply voltage and networks R6/C5 and R7/C6 are 'snubber networks'. With fast switching waveforms in inductive circuits there is always the risk of voltage spikes occurring at the switching edges, especially if the magnetic circuit is not perfect. The 'snubber networks', together with the inherent drain-source diode of the power FETs, are used to reduce these spikes to within acceptable limits. Transformer T5 is part of the dynamic current limiting as explained earlier and is fed to R16 et al (see later).

The power transformer T3 uses a centre tapped secondary and D1a and D1b are the fast rectifier diodes, R8/C7 and R9/C8 being snubber networks. The output filter is formed by components L1 and C9, with a bleed resistor R11 whilst D2/R10 merely form an output indication and C10 provides decoupling at radio frequencies.

The control circuits are built around an SG3526 integrated circuit and as isolation is required between the mains input and the DC output of the power supply, steps must be taken to ensure this. There are two basic choices. a) have the control circuits connected to the mains side and isolate the feedback voltage or b) have the control circuits directly connected to the output and drive the power switches via isolating transformers. In this circuit the latter course is chosen on safety grounds as there is no problem posed when using an oscilloscope to examine waveforms on the control circuits.

T4 is a small mains transformer and with C11, BR2 and REG1 this forms a regulated DC power supply for the SG3526 IC (typically 12V). A feedback voltage is taken from the main power supply output via a resistive potential divider R13, R11 and R14 with C20 removing unwanted disturbances from the feedback voltage. It is necessary to use the divider chain since the internal reference of the SG3526 is 5.0V and the feedback voltage should equal this. Potentiometer RV1 allows slight adjustment for component and output tolerances. R15 feeds back the reference voltage to the comparison amplifier and C19 is for decoupling.

The soft start capacitor is C13, whilst R22 and C15 are the main oscillator timing components, with R18 defining the dead time. Dynamic current feedback is from current transformer T3 loaded by R16. The dynamic current feedback is rectified by diodes D3 and D4, slightly smoothed by C14 to remove some spikes and applied to the voltage divider RV2/R17, with RV2 being used to set the level at which dynamic current limiting occurs.

Output drive to the power switches TR1 and TR2 is via C17 and C16. These anti-phase outputs drive the power switches via isolating transformers T1 and T2 which are small ferrite cores wound with bifilar wire giving a 1:1 turns ratio. Resistors R20 and R21 ensure that the gates of the power FETs are biased to ground to prevent them accidentally switching ON. Back to back zener diode combinations D5/6 and D7/8 are to clip any dangerous voltage spikes and limit the voltage applied to the gates. R12 and C12 are compensation to ensure that the internal comparison amplifier does not oscillate and R19/C18 provide decoupling on the output drive circuits of the control IC.

RFI
Switched mode power supplies can be prone to causing RFI on nearby receivers. This is because of the frequency at which they operate (eg 50 - 200kHz) and the sharp switching waveforms which generate harmonics well into the RF spectrum.

When building a switched mode power supply one should ensure that it is in an earthed metal case, which not only affords good screening but also prevents interference via the mains wiring when the necessary RF input filter is used. When using an RF filter take note of the advice given as some of these need to be earthed.

SAFETY
When making, repairing, modifying or using
switched mode power supplies do take care as dangerous mains voltages are present in some of the circuits. In many instances an oscilloscope cannot be connected directly to the unit as it will be earthed. If the mains input side needs to be examined then feed the SMPS via a 1:1 mains isolating transformer (not an auto-transformer) of suitable rating. If the earth becomes detached from the metalwork, this may float up to half supply voltage.

IN CONCLUSION

This article has tried to describe the operation of switched mode power supplies in simple terms. As in most electronic circuitry there are variations on the theme and so it is not possible to cover them all in an article such as this.

Readers may be interested to know that we hope to publish a constructional article in the near future for a 12.5V, 20A supply based on the circuit in Fig. 14.

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**REVCONE**

The UK's favourite discote composed of traditional Brush quality engineering.

The REVCONE works well without exaggerated advertising claims; it is designed to cover 50 to 500MHz, and thousands of satisfied users will testify to its efficiency. Unlike some manufacturers we do claim a wider frequency coverage, and we do not quote inflated figures for gain. A gain figure is meaningless unless the reference point is stated.

Optional vertical whip feature: It is possible to fit a vertical whip section to a discote. We do not want to give you the “hard sell” where this vertical element is concerned but there is some evidence that it may improve the performance of the antenna around the resonant frequency of the whip. That's why we make it an optional feature.

Another option is a ribbed connector instead of the popular S0239 N-types give a better UHF performance, but they cost a bit more. The choice is yours.

Because the REVCONE is British-made by a Company which has been in business for 30 years, you buy with confidence knowing that there is back-up should anything go wrong.

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**RADAC**

The Wide-band antenna offers an interesting alternative to the discote. It is simply an array of dipoles, but the clever bit involves arranging the dipoles to maximize bandwidth and minimize interaction.

The RADAC can be set up for a range of frequencies from 27MHz to 500MHz, and because very good impedance matches can be obtained the user can specify any frequency bands in this range for optimum performance, either for receiving, or more usefully, for transmitting. For example, all the amateur bands from 10MHz to 70CM can be covered in one antenna. If you are in the SWB business, the RADAC can be customised for your needs (Air) listening enthusiasts can specify VHF & UHF aerial coverage. What a versatile antenna! Design and engineering excellence from REVC0!

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**WIDE-BAND PRE-AMPLIFIERS**

The problem with omni-directional wide-band antennas is their lack of gain.

The REVC0 PA3 range of wide-band pre-amplifiers complement the antennas and compensate for their shortcomings.

The basic specification of the products is as follows: coverage 20MHz-1GHz, at 1GHz minimum gain 13dB, noise factor 5.5dB. Choose from a mast-head version (PA3) or a standard die-cast box style (PA3). Best results are normally obtained from the masthead model which gives a boost to weak signals which would otherwise have been lost in the feeder cable. Also feeder cable noise is not amplified which is the case if the amplifier is mounted at the base of the feeder. On the other hand, the die-cast box version requires no special installation and is ready taken out of the circuit. The masthead model is supplied with a special power unit which leads the DC supply into the antenna feeder. No psu is provided for the PA3, as any 9-15V DC source is suitable (current requirement about 25mA)

The PA3 lends application in wireless work, e.g. input to spectrum analyzers, boosting the output from signal generators to give a low-power T.s

The standard version of the PA3 has BNC sockets and is designated "PA3/B" available as special order N-type sockets ("PA3/NI") or SO239 ("PA3/S")

An special feature of the PA3 series is a high-pass filter to attenuate frequencies below 20MHz, high-power HF & MF broadcast stations can be very troublesome!

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**ON-GLASS ANTENNAS**

This type of antenna mount has been around for a long time, but they are very difficult to produce successfully in UHF. The Cellular Radio industry has popularised the glass-mount, but there are lower problems at 900MHz, because the coupling assemblies are small. REVC0's extensive experience in making the UK's best Cellular On-glass has lead to the production of superior quality VHF and UHF models. Here are a few facts which you should know:

Coulping efficiency: apart from the question of having the power to the outside world, you don't want too much RF heating around the cell, do you? Not healthy for vehicle electronic systems, and possibly not good for humans either. REVC0 glass mounts feature very efficient power transfer.

Sticking power: no good if they fall off half way home. A properly installed REVC0 stays on. Should you change your car, a retg kit is available.

Simplicity: some of the competitors have a multitude of loose components: the REVC0 has 2 pre-assembled parts inside and outside. What could be simpler?

Weather-resistant: REVC0 antennas are made from corrosion resistant materials so you can leave them out in the rain with confidence. It is not necessary to plaster the product with silicone rubber to keep the water out.

The REVC0 glass mounts do cost a bit more, which reflects these superior features.

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REVC0 also make a full range of mobile antennas for frequencies from 27MHz to 550MHz, and new products are constantly under development.

Contact your local Dealer or in case of difficulty write, phone or fax. Trade enquiries welcome.

Revco Electronics Ltd, Old Station Yard, South Brent, S Devon TQ10 9AL Tel: 0364 73394 Fax: 0364 72007
BEANTIN ANTENNA

BEAN TIN antenna

S Sutherland, GM4BKV, shows us how to re-cycle our rubbish and produce a cheap and effective 15m antenna into the bargain

Aerial projects have, from time to time, been initiated by some rather strange events and this project is no exception — in fact this particular design arose as a consequence of updating our bathroom! One of the items left over from this epic event was the shower curtain rail, comprising two aluminium rods which fitted inside one another a la telescopic aerial.

RAW MATERIALS

One of the two rods had a spring and disc assembly which locked it into place, the combination being designed so that it could be fixed horizontally between two walls by means of spring tension. Having decided that a spare length of aluminium tubing must be useful for something I had kept it, never imagining that it would one day take the air!

The project was prompted by hearing the numerous Soviet radio amateurs who operate on the 15m band with nothing more than a simple ground plane aerial — probably because they are cheap and easy to build — so it was decided to home-brew my own version.

CONSTRUCTION

The components needed are simple, inexpensive and easy to obtain, consisting of:

1. Jubilee clips
2. Exhaust system 'hangers' for Ford cars
3. Lengths of aluminium tubing, each piece of different diameter
   - 170cm length of copper tube
   - 1 Baked-bean tin
   - 1 Co-axial chassis socket
   - 2 Metal L-brackets
   - 1 Piece of wood 150 x 15 x 6cm
4. Wire for radials
5. Pegs to hold the radials

Take the widest of the aluminium tubes first. Cut six to eight equally spaced slots down into one end and then do likewise with the second widest tube. Insert one tube inside the other and place the jubilee clip over the slotted area as shown in Fig 1 and attach the remaining aluminium tube in the same way. Next, adjust the overall length of the assembly so that it measures exactly 3.3 metres in total, then lock the tubes together by means of the jubilee clips.

Take one of the car exhaust system hangers, place it on the base of the empty baked-bean tin and draw around the outside. Now cut a hole in the tin which is slightly smaller than the circle you have just drawn, then ensure that all the ragged edges are rubbed down using a suitable file. Push the hangers over the end of the copper tube and then push the bean-tin over the hangers. When completed, this assembly serves to electrically isolate the vertical element from the rest of the aerial and provides a degree of weather protection for the feeder termination.

The next job is to connect the centre pin of a co-axial chassis socket onto the bottom end of the copper tube. This can be achieved in a number of ways — such as using a (very) large soldering iron to connect the two together, or alternatively by attaching a piece of stout copper wire to a suitable solder tag (the other being soldered to the co-ax socket centre pin) and then bolting the solder tag firmly on to the tube. In either case the metal should be cleaned thoroughly before operations begin, in order to make a satisfactory join. Regardless of the fixing method, it is also advisable to fill a static bleed resistor across the inner and outer of the co-ax socket — a 100k, 2W component being perfectly adequate.

The next step is to attach the six wire radials to the bean-tin, first cut the wire into 3.3m lengths. Make six equally spaced marks around the outside of the can, as near to the bottom as possible, tin the can at these points to aid attachment and then solder each radial wire into position (see Fig 2).

MOUNTING

Cut two 10cm pieces from the length of wood for use as stand-off brackets, then measure the width of the lowest aluminium tube and cut two slightly under-size holes in each of the stand-offs — the fit should be tight enough to support the aerial.

Screw a metal bracket to each of the wood stand-offs and then secure these to the large piece of wood. Push the copper tube through the bracket holes (Fig 3) and then attach the rest of the aerial to the tube using a jubilee clip.

Dig a hole about 20cm deep, place the mount in it and retile the hole, pressing the earth down with your foot. Then, using suitable pegs, spread out the radial wires and secure them firmly as these not only fulfill an electrical function but also serve as supports for the antenna structure. When correctly installed, the base of the antenna should be about a metre above ground so that the radials are at an angle of 20° to the horizontal.

AERIAL TUNING

Tuning is achieved simply by varying the overall length of the vertical element, this is done by loosening the lowest jubilee clip and sliding the two tubes inside one another. SWR measurements will reveal when the antenna is presenting the best match and in practice I was found quite easy to obtain a 1:1 SWR.

CONCLUSION

The original antenna was fed with ordinary 50Ω co-axial cable, and using 100W I have been able to work DX as far afield as Chile, Japan, India, Tasmania, Canada and several parts of the USA. Apart from the satisfaction of working distant stations there is no doubt that a great deal of fun and pleasure can be obtained from such a home-brew project — after all it is one way of getting rid of old bean tins!
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### LANGUAGE AND MORSE INSTRUCTION AIDS

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*Newsletter subscription rates are for those subscribers in the UK and countries in the EEC. For those desiring to order subscriptions please contact the Circulation Department at RSGB, from where free sample copies of newsletters can also be obtained.*

### RAYNET SUPPLIES

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*Members visiting HQ are advised to telephone first to confirm availability of goods – 0707 59015.*
Raynet Badge Clip | £0.50 | £0.45
Raynet Car Sticker - Circular | £0.65 | £0.55
Raynet Identification Sticker | £0.51 | £0.45
Raynet Poster | £0.98 | £0.83
Raynet Tie | £5.83 | £4.96

Hardware, PCBs & Laminates
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- G4DDK 8MHz Local Osc. Source PCB (RC 2-3/87) | £3.87 | £3.29
- CBT-40 Mounted Termination, 40W, 50ohm | £22.79 | £18.95
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- CuClad 233 PCB, 0.005", 2 x 1 inch block | £1.46 | £1.24
- Regulator PCB (RC 10/81) | £2.50 | £2.13
- UHF Source PCB (RC 10/81) | £7.06 | £6.00
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Capacitors
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- MG1302 GaAs FET | £8.16 | £6.95
- uPB581C 2GHz Divide by 2 Prescaler | £6.02 | £5.82
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HOW TO ORDER

NON-MEMBERS: Use left hand price columns. Note that members’ sundries are only available to members of RSGB.
MEMBERS: Use right hand price columns. It is essential that you quote your call sign or RS number so that you can be recognised as a member.

PRICES: These include postage, packing, and VAT (where applicable) and are subject to change without notice.

AVAILABILITY: Goods are available less postage and packing from RSGB Headquarters between 9.15am and 5.15pm Monday to Friday. However you are advised to confirm availability of goods by telephone before visiting Headquarters. We attempt to keep ample stocks of all our sales items, however as this list has to be prepared several weeks in advance we cannot guarantee that any item on this price list is immediately available.

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Simple 20m beam antenna

F Webb, G0CEK, and W Johnson, G4CNK, put their heads together to produce this simple yet effective 3-element 20m beam

Many projects today seem difficult and expensive. This one is neither and can be built by anyone whether an experienced constructor or not. All that is required is some 300Ω slotted ribbon feeder, ordinary wire, perspex sheet, nylon (or polypropylene) rope, and some lengths of timber.

The average amateur usually cannot improve his station's performance by modifying modern, efficient transceiver equipment. However, worthwhile improvements can be obtained by attention to the antenna system. If a 50ft tower and commercial beam is not available, this project could provide a good substitute. The antenna's performance will be interesting, and possibly exciting compared with the usual dipole or ended wire! Although the beam is fixed in one chosen direction, it will take a very long time to work out all the stations along that bearing. The bandwidth of the antenna permits operation over the whole of 20 metres without adjusting the ATU, unless very low VSWRs are needed at the transmitter. The beam can be designed for other bands using the design formulae shown below.

SPACE REQUIRED, ELEMENT LENGTHS AND HEIGHTS

Our 20 metre antenna was erected in the back garden which is 36ft long and 28ft wide. With the elements stretched between the house facia board and a rope suspended on posts fastened to the boundary fence (Fig 1). It is a full-size beam, with a driven element length of 33ft for 20 metres. The reflector and director are 35ft and 32ft respectively, and the effective boom length is 24ft. No actual boom is used, and if the available space is small, the length could be reduced to 14ft (element spacings of 0.1 wavelength). The element ends could be bent downwards. In our case, the facia board was about 15ft above the ground, but any increase in height would be an advantage.

CONSTRUCTION

If the beam is to point parallel to the house, the two support posts should be fixed to the fence or other suitable supports at least 24ft apart (27ft if you want to reverse the direction of the beam), and at least 36ft from the house. The support rope is stretched between the posts on pulleys so that the antenna can be lowered for easy adjustment. The elements are fastened with insulators to halliards running through loops tied in the support rope. The position of these loops sets the element separations as shown in Fig 1. The halliards will work more smoothly if plastic rings are fastened to the rope in place of the loops, but this is not essential. Screw eyes are run into the house facia board for the halliards or short ropes which support the other end of the elements, again via insulators. As the elements are not the same length, these ropes are used to set the centres of the elements in line before tensioning them with the halliards at the support rope end.

The driven element is a folded dipole made from 300Ω slotted ribbon feeder. The perspex centre insulator is shown in Fig 2. The two slots in each end are made to be a tight fit for the 300Ω ribbon element. Pass the ribbon through the end slot, then double it back through the inner slot. Anchor the top two leads to the centre bolt and solder in place. Similarly fasten the lower leads to the remaining bolts, using solder tags if required, and fill the slots with glue to make a strong mechanical joint. Twist the far ends of the element together and temporarily fasten them to the insulators until resonance checks have been completed. Put a short wire link across the terminals A-A for coupling to the grid-dip oscillator. The ends of the other elements are simply passed through their insulators and made secure.

RESONANCE CHECKS

Hoist the driven element on its own to a height where the centre is still accessible with a step-
BEAM ANTENNA

ladder. Couple the grid dip oscillator to the centre link and tune carefully for a dip. Check the frequency against the station receiver, as this is much more accurate than the grid dip oscillator. If the frequency is low, trim a little off each end of the element until resonance is obtained at about 14.15MHz, which will provide a good compromise for both CW and SSB operation. In our installation, the final length was exactly 3ft, and if resonance checks cannot be made, an element cut to exactly this length should be suitable. When all is correct, permanently solder and glue the ends of the elements to their insulators. Remove the link from the centre of the driven element.

IMPEDEANCE MATCHING ARRANGEMENTS

Whilst a folded dipole at least a half wavelength above ground should theoretically provide a good match to a 300Ω feeder, in this case the antenna is low, which with the presence of the other elements greatly reduces the input impedance of the dipole. One way of achieving a match is to tap the feeder on to an open-circuit stub, which has the advantage that the input impedance need not be known as the match can be obtained experimentally. Fig 3 shows the current distribution on a quarter-wave open-circuit stub. The impedance is low at the antenna and high at the open end; and somewhere along the stub there will be a 300Ω point to connect the feeder for a good match. Antenna reactance can be compensated for by adjusting the stub length as described below. The stub can be of any convenient (high) impedance. Our stub was made from 22swg wire spaced about 2 inches apart with perspex spreaders held in place by small bolts of wire soldered to the stub. The impedance was about 600Ω, and a quarter-wave length stub of this type is around 17½λ long for 20 metres. Solder the stub to points A-A (Fig 2) and bind the wires to the insulator with cord passed through suitably placed holes.

Any length of 300Ω twin feeder can be used to connect the antenna to a balanced antenna tuning unit at the transmitter, as the antenna is matched to the feeder. Details of our ATU are shown in Fig 4, where C1 was 100pF per section, although a 50pF unit with wide spaced plates will do. The whole capacitor must be carefully insulated from ground, and the tuning knob connected to the spindle by an insulated shaft or other arrangement. C2 can be 200 to 300pF, and the plates need not be wide spaced. L1 was a 12 turn centre-tapped coil about 2 inches long on a 2½ inch former, with 3 turns of well insulated wire wound around the centre of the L2. The centre tap of L1 should be connected to the centre earth, as the antenna has no other earth leakage path to prevent the buildup of static electricity.

ATU AND STUB ADJUSTMENTS

The antenna tuning unit is first adjusted for a match into a 300Ω dummy load. A low wattage carbon resistor with crocodile clips will do if suitably low powers are used during tuning. Place an SWR meter between the transmitter and the ATU and connect the load resistor to taps which are equally spaced either side of the centre tap on L1. Tune the transmitter to 14.15MHz then adjust C1 and C2 and the coil taps in equal steps either side of the centre until a match is obtained. Note the dummy load tap positions on L1, remove the load and connect the feeder to the same taps. Using crocodile clips, connect the other end of the feeder to the tuning stub about 2½ft below the driven element. Mount all the antenna elements to their working height.

Without touching the ATU settings, adjust the position of the feeder on the stub for the lowest SWR. Note the SWR, then cut a few inches off the stub and repeat these two steps until the best SWR is obtained, then solder the feeder in place. In our case the stub length was 23½λ and 12½ when tuning was complete. Use an insulator to secure the free end of the stub to a stake, but note that high voltages will be present at the bottom of the stub when transmitting, so make sure that it cannot be touched accidentally. The folded dipole gives the antenna a fairly wide bandwidth, and we found that it was not really necessary to adjust the ATU for transmissions anywhere in the 20m band.

RESULTS AND GENERAL POINTS

The test configuration was as follows: beam direction was fixed at 240 degrees (magnetic), the transmitter was an old Labgear LG300 with a KW low pass filter, the receiver was an ARBB with headphones and CW was used throughout the tests. Performance was found to be much better than dipole and end-fed antennas which were at greater heights, and at times multiple replies resulted from CO calls. Over 500 DX stations were worked between May and August 1987, including five VK stations, three ZL and many VE, USA and South American stations. A PY station was worked several times over a few days, and a report from a PT was just one S point below another G station using a linear amplifier, tower and beam antenna.

Initially, some TVI was caused at the adjoining house in the beam direction, but this was cured by a filter in the television downlead. No other problems have occurred, although there are houses all around and transmissions have been made at all times of day using around 100W output. In addition to a low TVI profile, and because all the wires ran parallel to the garden, the antenna has a low visual impact — not looking the least bit unsightly.

AN ALTERNATIVE DIPOLE AND FEED

After very strong winds during which the stub took a beating, we decided to remove it and connect the feeder directly to the centre of the driven element. A third wire was woven through the slots of the ribbon dipole and connected to either end of the dipole element to make a three-wire folded dipole (Fig 1). The match was still very good with the ATU set for a 300Ω load, although this may not be true for antenna heights other than ours. However, the antenna and feeder can be tuned for a match between the transmitter and feeder terminals using the ATU.

NOTES FOR EXPERIMENTERS

The basic antenna was dimensioned as follows, and can be scaled for other frequencies. The wavelength is given by L = 964/F, or about 70½ at 14MHz. The reflector, driven element and director were 390/F, 496/F and 460/F respectively, with a reflector to driven element spacing of 0.2 wavelengths. The director was placed 0.15 wave-lengths in front of the driven element.

The element spacing could be reduced to 0.1 wavelengths, and if space is short, the ends of the elements could be dropped down or folded to reduce the span, although the bandwidth will be smaller and the stub adjustment may be more critical. The optimum element lengths will be different, although References 1 and 2 contain useful information about this. A two element beam would still provide useful gain if space is at a premium. If 50 or 75½twin feeder is available, an open wire dipole could be used for the driven element, although a broader bandwidth can be obtained with a folded dipole fed with 300Ω ribbon feeder.

The beam direction could easily be turned through 180 degrees by providing extra loops and halliards in the support rope and extra screw-eyes at the house facia board at the correct spacing as shown in Fig 1. It would then be a simple matter to lower the reflector and director and move them to their alternative positions. If space permits, the beam can be set at any angle to the house, but the distances between the loops and the lengths of the support ropes will depend on the angle chosen. A good sketch of the layout would help in working out the dimensions to ensure that the element centres are in line and at right angles to the elements.

IN CONCLUSION

It is hoped that this article will steer the reader towards thoughts of installing a fixed-beam HF Yagi antenna. While theoretical design is complicated, we have described a practical design that has been proved to work. The builder is not restricted to making an exact replica of the original, and construction can be adapted to individual requirements. Planning permission may not be required although this should be checked with the local authority.

REFERENCES

WHERE TO STAY
If you're planning to stay in a hotel, here are some you might like to consider. First of all, block bookings have been made at the Grand Hotel in Granby Street and a room there costs £28.00 per person per night. The telephone number is Leicester 555599, the STD code being 0533. Then there's the Alexandra Hotel in London Road: £26.50 per night for a single room and £36.00 for a double or twin. English breakfast is thrown in, and they're on Leicester 703066. Next comes the Post House in Braunstone Lane, which will do you a single room for £18.00 and a double for £24.00; here again you get a free English breakfast. This establishment is on Leicester 896688. Finally there's the Belmont Hotel in De Montfort Street, where a special show price for two nights has been negotiated. For bath, bed and dinner it costs £32.00 per person; book up on Leicester 544773.

If you book at any of these hotels, do remember to mention that you're taking advantage of the Leicester Amateur Radio Show block booking - otherwise you'll pay rather more than the concesssionary prices listed above.

FAST LANE
SMC have a new rig '...for the amateur who lives in the fast lane?'! Be that as it may, the rest of the press release said 'SMC are proud to introduce the introduction of the FT1000, a dynamic HF transceiver designed exclusively for elite world-class contest and DX operators. The FT1000 is the culmination of a three-year design effort to address the many shortcomings of other manufacturer's top-of-the-line products. The result is a dominating tool...features may include dual receive with two tuning knobs, balance control for dual receive, dual frequency displays, standard filter bandwidths of 2400, 2000, 500 and 250Hz, direct digital synthesis and narrow-range PLL sub-loops for low phase noise and a fast-acting auto-tracking ATU'. Go for it, all you elite world-class contest and DX operators. Me. I just want to go on 3.5MHz and moan about the weather so I obviously have to wait for the FT 3 and a quarter.

CHEAPER AMTOR
ICS Electronics is showing the new AMT-3. In a press release, the company said 'Until recently, it has been relatively inexpensive to become active on packet radio but much more so to become active on AMTOR. The normal route has been to use a relatively expensive multi-mode terminal unit such as the AEA PK-232. AMTOR is far more suitable for HF communication than packet, frequently giving error-free messages when signals cannot be heard in the noise! In contrast, packet requires signals good enough for speech communication before it will work at all.' They go on to say that the AMT-3 is a low-cost AMTOR/RTTY terminal unit which '...incorporates only those modes which are useful for HF data communication...An excellent tuning indicator is incorporated, as well as full status indication for AMTOR.' Apparently the firmware of the AMT-3 was designed by Peter Martinez, G3PLX, who's more or less the father of AMTOR, so it ought to be pretty good. Together with the unit itself, you get split-screen host mode software for the IBM PC thrown in - all for £169.95.

HANDY SCANNER
Waters & Stanton will be showing a number of new products, including the Jupiter II hand-portable scanner covering 25-550 and 800-1300MHz at £299 and the companion Jupiter Mobile/Base scanner covering 25 to 1300MHz (below £400). They'll also have the Mizuho 10W HF amplifier, which matches the 2W SSB/CW transceiver. Two versions are available, single-bander covering 3-5, 7 and 14MHz and a wideband job for 3-30MHz. There should also be some new items from Ailenco on show.

TINY TNC
In a last-minute fax to HQ, Siskin Electronics said that they'd be launching '...a completely new concept in amateur radio; a hand-held TNC no larger than a packet of King Size cigarettes'. Siskin tells us that packet radio is much safer than smoking, so it won't carry a government health warning, but the new box - which is apparently code-named 'Le TNC' is essentially a miniature version of the popular PacComm Tiny-2 and it's designed specifically for use with hand-held wireleses of the Icom 2E/4E, Kenwood TH series and the Yaesu FT family. Features will apparently include the PacComm Personal Message System, full TNC2 capability (including provision for NET-ROM/ThNet), a metal cabinet for full RF screening and conventional RS232 connections. Additionally there's an ni-cad battery option and a '...family of support accessories such as higher-speed modems including the G3RUH 9600 baud modem'. Siskin couldn't quote a price at press time but said that 'Le TNC' would retail in the UK and Europe at '...under £200'.

QRM ELIMINATOR
The Isle of Man-based company SEM Ltd will be showing its 'QRM Eliminator' which apparently allowed W4CHX to report that '...the power line noise is 57 and you are coming through 5 and 4'. Remarkable.

YOUR SOCIETY
RSGB - well, what can we say about quite the best national amateur radio society in the UK? We'll be there in force, of course, with lots of books and other items for sale and staff from Membership Services to help you with any problems.

CLEVER KITS
CM Howes Communications will be unveiling the latest addition to their kit range. They said that this '...is a frequency counter which can be used as a digital readout for receivers, transmitters and transceivers built with Howes kits. The display has five digits and can be selected to show 100Hz or 1kHz resolution on any band between 18 and 30MHz. The circuitry has been designed to minimise 'digital noise' and can therefore be installed in the same case as a receiver without the EMC problems this often causes. With the addition of this new kit to the Howes range, it is now possible to build a receiver or transceiver with all
the major front-panel features normally found on factory-made equipment. Designated the FDS, a demonstration unit will be available at the show for visitor's inspection. Sounds nice - we really must get round to trying some of these Howes kits some time and tell you how we get on.

**2/10M TRANSVERTER**

R N Electronics said they'd be launching a 2/10 metre transverter with 25W PEP output. The spec says that the second harmonic is better than -70dB and spurious are better than -60dB; intermod is quoted as 'less than -32dB' (it didn't say which order and with reference to what) and the noise figure is better than 2-5dB. There are also masthead preamps for 70, 144, 430 and 334MHz. Apparently '...The power handling is up to 200W with a low noise figure of less than 1dB. The gain of these preamps is set to give the best compromise between system noise figure and system intermodulation performance'. No doubt they'll be glad to give you more info on the stand.

**BOOST YOUR HANDHELD**

Nevada are showing a couple of 'docking boosters' which increase the power of a VHF handheld to 25W. It says here that 'By sliding the handheld radio on to the unit, the handheld is converted into a mobile or base radio that may be used while on low power. For mobile use, the 'docking booster' is supplied complete with a fixing bracket for installation in a car. At home, the unit may be powered from any 12V DC mains adaptor (really? The spec says it needs 13.8V at 6A, which means a moderately beefy PSU - Ed). Model BS25 is designed for the Icom IC2E, CTE GT600, Kenpro and similar models. Model BS23 is for the Yaesu FT23 and similar machines. The spec says that both units over 1400-174MHz give 25W output, input power is quoted as 3W. Both models cost £59.95.

**BADGER BOARDS**

Badger Boards of Sutton Coldfield will be showing the full set of PCBs for the G3TXQ transceiver; they're ready-drilled and rolled-tinned and all seven are available from stock. John Badger will also be showing a range of preamp kits, the 'Scanner Vox', a 144MHz amplifier and various other items will be available — and there'll also be a demonstration of computer-aided design of PCBs. We saw a Badger board earlier in the week and must say it was beautifully made - a lot nicer than some so-called 'professional' ones we've come across...

**TEN TEC TASTY**

Fred Rendell and the gang at HRS will be showing the new Ten-Tec Omni V HF transceiver which we mentioned last month - very tasty.

**SSTV AND FAX**

Technical Software will be coming down from Caernarvon to show their new GX-2 fax and SSTV transceive system. Apparently the fax has '...full 320 x 256 pixel definition with 7-level grey-scale, full or quarter-screen transmission at all IOCs with phasing signal and stop tone... Reception at any speed, picture reverse and screen dump to printer. Optional direct printout of received signals with auto phasing for top-quality charts and pictures'. For SSTV you get '...colour and monochrome transmission and reception, complete transparency with existing Robot colour, line sequential colour and mono equipment and automatic operation in Robot mode. All timing standards are supported. Flywheel synchronization to combat noise and QRM, screen dump to printer and lots of other features'. The press release adds a lot more detail and the GX-2 certainly sounds amazingly clever. If fax and SSTV is your thing, you can get one for £99 - or £119 including the fax direct printing option. Technical Software is run by Richard Wilmot, GW3RHI, and an exceedingly bright chap he is too - we've used some of his software in the past and been most pleased with it.

**MODULAR KITS**

A new name at Leicester this year is Jandek, who will be showing a range of kits. The press release said that Jandek kits have been designed to encourage construction amongst radio amateurs and listeners and that a modular approach has been adopted so that the various items can be used with each other or with the constructor's own circuitry. Amongst those available are two audio amplifiers, the JD001 and JD006; these are based on the LM380 IC and produce about 0.7W into 6ohms from a 12V rail - just the thing for an RX. There are also two active audio filters, the JD002-C for CW reception and the JD002-S for SSB. Both use the TL074 low-noise JFET quad op-amp in a six-pole low-pass filter configuration. Cut-off frequencies are typically 1120 and 2560Hz respectively.

The JD003 is a product detector module based on the MC1496 double-balanced mixer and the JD004 is a VFO based on a BF256 in a Colpitts arrangement, followed by another BF256 as a buffer and a tuned 2N2222 buffer. This VFO can be supplied to cover any single amateur band from 1-8 to 14MHz and the output can be fed directly into the JD009 broadband amplifier using a BXS20 to form a simple CW transmitter. There's more - pop along to the Jandek stand and talk to the proprietor, Derek Pearson, G3ZOM.

**NAVICO BIRTHDAY**

Navico have been in touch to say that although they won't be launching any new products at the show this year, it is nevertheless 'a bit of an occasion' for them. To celebrate the first anniversary of the launch of the AMR1000S, they're running a special offer: if you buy an AMR1000 or AMR1000S at the show you'll get a free extension speaker (worth £11.44) and a free 2m antenna (worth £14.99).

**MUTEK**

Last exhibitor to send in some stuff to us was the reincarnated muTek, now doing very nicely in the hands of Mike, G6GEJ. We mentioned the new front-end board for the IC202 last month, and now the TVF50c 50MHz transverter is back in MkII guise. This has 25W PEP output, as opposed to the 10W of the earlier model, and other figures have been improved too; the output 3rd-order intermod intercept is 5dB higher at 60dBm and the spurious are further down. As we went to press, the following muTek products were listed in their catalogue: TVF50c and TVF144 transverters for 144MHz and 2/144MHz respectively, the SLNA433sp 430MHz masthead preamp with 12dB gain and 1-3dB noise figure, two low-noise preamps for 144MHz and replacement boards for the FT221, FT225, IC211 and 251, IC271 and the IC202. Incidentally, the muTek catalogue said that the new front-end board for the IC202 would be available from 30 October 1989. If there were no snags during initial production, but no doubt Mike will tell us the latest on his stand.

**ANTENNA PEOPLE**

By way of a final, we had occasion recently to visit DecComm - the antenna and metalwork people in the West Midlands - and I must say I haven't come across such a pleasant and helpful bunch for ages and ages. I happened to need some distinctly non-standard alloy tubing and fittings, most of which they didn't have. But they went to great trouble to locate a supplier and got the tubing on the following day. I had the distinct impression that if they didn't have it they'd either find it or make it. We don't know what they'll be showing, but it's no doubt good if you need anything for putting antennas up, try them.

**...ALSO PRESENT**

By press-time we'd garnered that Newton Engraving, Quarstlab, JMA Power Supplies, G4 Keys and MFM Supplies will also be at the show, but we didn't know which stands they'd be on.
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The professionals in amateur radio
LEICESTER SHOW

Well, it's that time of year again – time for that hardy annual, the Leicester Amateur Radio Show. This year's extravaganza (which is now in its eighteenth year) takes place on Friday 27 and Saturday 28 October, and as usual the venue is the Granby Halls in Aylestone Road. The 'Leicester Show' is organised by the Leicester Amateur Radio Club and supported by all the clubs in Leicestershire, surprisingly enough it's a non-profit-making event and the surplus is distributed around the local clubs according to their level of participation in the event.

Some 5000 visitors are expected to pass through the imposing portals of the Granby Halls, and as usual there's a large trade show. In addition, Leicester ARS is organising a bring-and-buy and the Leicester Repeater Group is running a raffle. Access is easy – the venue is not a million miles from Junction 21 of the M1, and the Granby Halls are only a short walk from the railway station if you're planning to go the civilised way – and talk-in will be available via GB2GH on S22 and SU22.

Refreshment facilities will take the form of a cafeteria and bar and there are good facilities for the disabled.

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This month we look at some more of your letters and consider some of the things we need to bear in mind about heatsinks. Remember, by the way, that this is very much your column - which, incidentally, will appear every month from now on. We'd much rather use the space to deal with your practical amateur radio-related problems than second-guess you and write reams about technical and practical matters which aren't necessarily what you want to know. So do keep those letters coming; we'll do our best to find answers for you. The first one this month picks up on something in last month's piece about electrolytic capacitors.

**Reforming Electrolytics**

In your item about using electrolytics in series, you said that if they were surplus or ex-equipment, they ought to be 're-formed' before putting them into service. I've seen this mentioned several times in books and articles, but technical authors all too often throw away little phrases like this on the assumption that we know all about these things. What exactly is 're-forming' in this sense, and what's the mechanism by which it works?

C. S. Blackburn

Basically, an electrolytic capacitor consists of two aluminium foils interleaved with an absorbent material - paper is the most common - and then wound into a cylinder. This is then impregnated with a suitable electrolyte and placed into a container, usually aluminium. When a voltage is applied across the foils, a dielectric layer of aluminium oxide is formed on the surface of one of them; this becomes the positive electrode, or anode, of the capacitor. The electrolyte forms the other plate, and has the secondary role of repairing any flaws in the oxide film which appear when the capacitor has a voltage applied to it.

The oxide film which forms on the positive foil when a voltage is applied during manufacture is an insulator, and in a 25V working component it is only about 0.5µm thick. For this reason, an electrolytic capacitor has very high capacitance for its size. The problem is that when a voltage is not applied to an electrolytic (when it is stored, for instance, in an equipment containing it switched off for a long period), the oxide film formed on the anode foil gradually deteriorates. This is another way of saying that electrolytics which aren't used for a long period gradually lose their capacitance. So if you leave one in your junk-box for a long time and then want to use it for something, you may find that the circuit which it is in doesn't behave properly. Equally, if you buy a big electrolytic at a rally for use as the reservoir capacitor in a PSU, the component may not have been used for a considerable time and the same problems might arise. As well as an apparent loss of capacitance (especially noticeable in the small wire-ended variety), the leakage current of a long-unused electrolytic can be very high when it's first switched on; in severe cases this can lead to rapid internal heating, thermal runaway and a loud explosion.

**Reforming Circuit**

However, the process which led to the deterioration can be reversed - and this is where 're-forming' comes in. All you have to do is to apply a voltage across the capacitor which is equal to its rated working voltage - but you must also connect a resistor in series to limit the current through it. It's also a good move to connect a milliammeter in series with the capacitor and measure the leakage current (Fig 1). The value of the resistor should be chosen on the basis that if it was connected directly across the supply there would be about 50mA drawn; for a 500V working component we'd use a 10k resistor, for example. This will limit the current flowing in the capacitor if it happens to be short-circuit or extremely leaky. Equally, if it has high leakage current, some volts will be dropped across the resistor and consequently a lower voltage will be applied to the capacitor. As its leakage current falls during the re-forming process, the voltage across the electrolytic will gradually increase to somewhere near that of the supply.

When you connect a suitable supply via a resistor and milliammeter to an electrolytic which hasn't been used for some time, you might well see anywhere between less than 1 and more than 20mA of current indicated. This is the leakage current of the capacitor; whatever its initial value, the important thing to look out for is that it should begin to decrease almost immediately unless it was only a few milliamps to start with. It's impossible to give precise figures because there are so many variables involved, but as a rule-of-thumb the leakage current of an electrolytic should be in single figures of milliamps after ten or fifteen minutes unless the capacitor is in a bad way. I tend to think that after 30 minutes the leakage current is about as low as it will ever be, although you'll find that good-quality components often display extremely low leakage currents after a few hundred hours' continuous use.

Going back to last month's example of a 100µF 450V working component, I'd expect to find after about half-an-hour of re-forming that its leakage current was around 1mA or less. A high-capacitance low-voltage electrolytic will (and to have a higher leakage current and take longer for it to reduce, but look for a steadily decreasing trend on the milliammeter over a period of time. If you're down to 10mA or so after 30 minutes, the capacitor should be perfectly reliable in normal service.

One last tip is that it's worth taking some trouble to make up a 're-forming' supply whose output voltage is equal to the capacitor's working voltage. Particularly with the higher-voltage components, it's asking for trouble to re-form them at a lower figure than their rating and then use them in a circuit which applies the full working voltage. That's another good way to blow up the shack!

It's sensible to re-form all electrolytic capacitors if they're anything other than brand-new, although the smaller ones don't deteriorate with time and disuse as much as the power-supply variety. STC Capacitors suggest that components with a working voltage rating of 100V or less should not deteriorate sufficiently to require re-forming over the next three years after manufacture under normal storage conditions. However, they add that higher-voltage components should be reformed after 18 months. Many of the examples you see at rallies have a date code on them, which should help in deciding whether re-forming is necessary or not.

**Safe Operating Area**

'Mulling over some back copies of RadCom, I read an article in which the designer of a particular circuit mentioned something called the 'safe operating area' (SOAR) of a power transistor. I can't find any mention of it in my textbooks - can you tell me what it means and whether it's important?' M W, Walton-on-Thames

It's highly important, but even professional designers occasionally come unstuck because they sometimes forget about it. There are several ways of thinking about SOAR, but what it amounts to is this. Bipolar transistors are prone to a failure mode called 'second breakdown'. At high currents and voltages the transistor junctions don't conduct equally over their entire areas and what are colloquially called 'hot spots' start to form. These are small areas carrying more current than the bulk of the adjacent structure. Because of this they get hotter, and in bipolar transistors this unfortunately means that their resistance falls - so they conduct even more current and get even more hot. And so on until the device fails.

Second breakdown sets a restriction on the simultaneous voltage and current that a bipolar transistor can handle. The manufacturer's data sheet for a power device will give a maximum collector-emitter voltage, a maximum current and a maximum dissipation - but don't stop reading at this point because these are emphatically not the whole story. The data sheet will also contain a family of curves which display voltage against current for a particular transistor, in a way these are more important than the simple numbers for volts and amps; the reason is that the area under the curves shows the regions in which you can use the device without it running into second breakdown. This is known as the 'safe operating area' which is often referred to by semiconductor manufacturers as SOAR.

It's important to be aware of the concept of safe operating area whenever you use bipolar power transistors, but the time to have a careful look at the SOAR curves is when you're thinking of using a particular device as a pass element in a power supply. In this case, you're interested in what the data sheet usually refers to as the DC SOAR - the area under this curve shows you the maximum voltage you can apply between collector and emitter when a particular current is continuously flowing. The other curves relate to repetitive pulse operation for given 'on' times of the device, and they're important if you're using the transistor in some sort of high-speed switching application.
such as a switched-mode power supply.

If you frequently suffer from strange failures of bipolar power transistors in a PSU, dig out the data sheet and check that their working conditions are within the DC SOAR. It might be an enlightening experience. Equally, if you're designing something for publication, make sure that you've checked the point. For instance, the circuit on page 37 of Technical Topics in July 1989 (Fig 5) might not be all that reliable in the long term. The reason is that although the BU208A is only dissipating about 7W, its working point is outside the DC SOAR for the device - according to the Mullard data sheet for it. Incidentally, FETs aren't subject to second breakdown, which is a good reason for using them as the pass elements in PSUs.

Quite why the notion of safe operating area is so neglected in the literature is a bit of a mystery; it's highly important to know about SOAR if you want to design reliable circuits with power bipolar transistors.

Mains-borne Noise

I have terrible trouble with mains-borne noise coming into my HF receiver. The low-frequency bands seem worst affected but even 28MHz suffers quite often, especially when my DIY-mad neighbour gets his electric drill out at the weekend!

Also, my Icom IC251E sometimes seems to be affected by surges on the mains and goes into a mode when the display goes on working but it won't receive or transmit. This seems to be especially triggered by our immersion heater switching on and off, although it misbehaves at other times as well. Are these things linked, and can I do anything about them?' B T, Northallerton.

If what we hear is anything to go by, problems caused by noisy mains supplies are becoming more common - especially when the incoming mains supply utilizes the so-called 'protective multiple earth' or PME system. Happily, mains-borne interference can usually be easily removed by fitting an RF mains filter of some kind. The increase in popularity of the home computer has led to the appearance of many types of filter built into the enlarged body of a standard 13A plug. All you need to do is to replace the existing plug with one of these; the local computer shop will almost certainly keep them. Alternatively, Electromall does a range of three which handle successively greater currents - the stock numbers are 238-902 for the 3A version, 238-918 for a 7A component and 238-934 for a 13A job. If you prefer, you can buy a dual 13A mains socket which contains an integral filter. These fit into the standard 35mm-deep wall-box and in our experience do a very good job of removing mains-borne interference in HF receivers. Some plug-in types which resemble a 13A adaptor are also available, and we've seen these at rallies for a few pounds; you plug them into the normal 13A socket and then plug the equipment you want to protect into them.

If your equipment has the common three-pin 'IEC' mains socket and there's enough room available, you could replace the socket with one containing an integral filter. Have a look in the Electromall catalogue, where they have a wide variety with different suppression performance and current handling.

For a little more money you can buy multi-way distribution boards which contain integral filtering. These are very useful in the average amateur situation where several items of equipment need to be connected to the mains, and the filter performance is usually superior to that of the plug-mounted variety. Most contain chokes in the earth line as well, which is useful in cases where interference is simultaneously carried on all three mains lines. In our experience, filters of this type are essential if you live in a rural area where the supply comes in on an overhead line and it's a PME system. Incidentally, we're still not happy about certain aspects of PME - which was discussed in an article by Peter Chadwick, G3RZP, a year or two ago in these pages - and we're planning to go into it again shortly.

Transient Suppressors

Most of the filters we've mentioned so far will probably cure the microprocessor-crash syndrome which affects not only the 251E but several other rigs as well. The reason is not primarily their filtering ability - although that probably helps - but because they also contain a 'transient suppressor' in the shape of a voltage-dependent resistor or VDR. These are extremely useful devices, and we'll look at them in more detail in a subsequent In Practice. Suffice it to say for now that they act as a very last-acting clamp to voltages in excess of the ones they're rated for, so they soak up spikes and glitches on the mains very well indeed. It's the latter which tend to cause microprocessors in rigs (and also in items such as video recorders and CD players, not to mention the CMOS input switching in some hi-fi preamplifiers) to 'crash' and do strange things. My own IC251E used to get confused by mains spikes and fall over at least once a week, but since I fitted mains filtering and VDR protection a couple of years ago the problem has completely disappeared. Incidentally, any equipment containing thyristors or triacs for phase-angle control also tends to be hypersensitive to noise and spikes on the mains - so if you have a clever home-built mains-controlled PSU which misbehaves for no good reason, try some filtering and a VDR or two.

Before you buy a particular mains filter, it's worth checking whether it incorporates some form of transient suppression. Having said that, it's easy enough to fit a VDR inside every one of your mains-powered items and this has the benefit of conferring protection on the equipment whatever it's plugged into. We've always used the GE-MOV II devices made by General Electric and available from the likes of Farell, Maplin and Jermy - although VDRs are also made by several other companies such as Harris Semiconductors and Philips Components (Mullard). For UK mains voltages, the GE device you want is the V250L40B
- it's like a large red ceramic capacitor and you just wire it across the primary of the mains transformer or any other suitable point where you can get at phase and neutral. This will stop any surge voltages dead, and 'crashes' become a thing of the past; a secondary benefit is that the rectifier and other components are given protection from mains surges, which is especially important in the case of high-voltage supplies with several rectifiers in series. In fact, it doesn't hurt to fit integral mains filtering and VDR protection to the power supplies of everything in the shack. You can get everything you need at rallies for a few pounds, and the benefits are out of all proportion to the costs. If you really don't fancy connecting things to the mains circuitry inside your rig, you can buy 13A plugs which contain integral VDRs - again, the local computer shop is a good source, or Electromail does them under the stock number 238-665. However, you may as well pay a little extra and get a plug which contains an RF filter as well as a VDR or two.

Having done all this, of course, you will then discover that you have S5 power-line noise - which you couldn't hear previously because of all the din coming down the mains...

RFI from the Hi-Fi

*Please can you help me with a very strange problem. I have a moderately expensive valve audio amplifier, which lives in the lounge along with the rest of the hi-fi system. My shack is in an upstairs bedroom directly over the lounge, and - you won't believe this - the audio amplifier creates a very high noise level on the LF bands when it's switched on! There's about 58 noise on 3.5MHz, although it's only just detectable on 7MHz; it sounds like a 50 or 100Hz waveform which is rich in harmonics. A medium-wave transistor radio in the kitchen is almost unusable. The amplifier sounds fine, but the noise is there even when there's no signal. Could it be unstable? Neither the supplier nor the (American) manufacturer of the amplifier has been able to help - can you? M McB, Edinburgh

If the amplifier sounds OK and isn't blowing up tweeters with monotonous regularity, the odds are that it isn't a stability problem. We suspect that the trouble is being caused by the signal being generated by the rectifier in the amplifier and either radiated by the associated wiring or coupled back into the mains in some way.

This is probably the cue for an item about some of the finer points of rectifiers. On the face of it you might think that there weren't many, but actually there are quite a few factors to take into account when designing rectifier circuits, even if you merely want to know which component to use with a particular transformer and reservoir capacitor.

We'll confine ourselves to some basic points for now and perhaps consider the subject in more detail later on.

Put simply, the function of a rectifier is to change AC to DC; we normally use the word in the context of converting the AC voltage from the secondary of the mains transformer in a PSU to a pulsating DC waveform, which is then smoothed to something approaching true DC by the reservoir capacitor and any subsequent components such as a smoothing choke or resistor and a smoothing capacitor. A rectifier consists of one or more diodes, which as we know have the ability to pass current in one direction and block it in the other. There is a wide variety of possible configurations

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**Fig. 4**  Circuit to illustrate the concept of 'conduction angle'. When S1 is set to connect the rectified output from the transformer to D1, the rectifiers conduct for almost all of each half-cycle from the secondary. However, when S1 connects C1 instead, the rectifiers conduct for only a very short time on each half-cycle. Consequently, the current into C1 flows in the form of short pulses with a repetition frequency of 100Hz. This is a possible source of RF interference.
biased again. If you measured the conduction angle with an oscilloscope, you’d probably find it was only a degree or two. It certainly wouldn’t be anywhere near 160°.

The Bottom Line
Can you see where this is leading? Audio power amplifiers (and of course RF linear amplifiers) tend to have beefy power supplies with high-value reservoir capacitors. In use, the amplifier is drawing current from the reservoir, which - to put it colloquially - is ‘topped up’ 100 times every second by the rectifier. But as we’ve seen, the top-up current will be in the form of a very narrow pulse. It won’t be quite as narrow as the pulse in our example above because there’s now a load on the supply. So the average voltage on the reservoir capacitor won’t be as high as the peak voltage from the transformer secondary. Consequently, the voltage on the rectifier diode cathodes will be lower than the secondary voltage on the anodes for a greater proportion of the half-cycle, so they’ll conduct for rather longer. But the important point to grasp is that the required current has to flow from the transformer into the reservoir capacitor in an awful lot less than 50 milliseconds. And instead of there being a smooth transition from reverse- to forward-biasing - as was the case when Rt was in circuit - the diode now switches abruptly from the reverse-biased ‘off’ state into heavy forward conduction. In mathematical language, dI/dT is very much higher when C1 is connected.

The actual conduction angle depends on the load current, the size of the reservoir capacitors and a few other parameters, so it’s not possible to quote hard-and-fast figures. What you can say is that with a capacitor-input filter it’s always going to be very much shorter than 180°.

In other words, heavy current pulses with a very short rise-time and a repetition frequency of 100Hz are flowing in the rectifier and associated wiring. Incidentally, this is why the data sheet for some rectifier diodes places an upper limit on the size of these capacitors which may be used with them. This phenomenon also has an important bearing on the choice of rectifier for use in a particular application, which we’ll consider on another occasion. The fast rise-time means a high harmonic content, and the high current implies high energy therein. Unless the equipment is very well screened, there will inevitably be lots of RF radiation from the rectifier wiring. In some cases it can also couple quite nicely into the mains. As a digression, and just to show that even highly-respected professional designers can’t think of everything, one of the finest audio power amplifiers in the world - the Krell KSA-80 is an extremely good generator of RF hash from its rectifiers!

Happily, it’s usually easy to cure the problem of rectifier interference. First, check the screening of the offending amplifier. Then do what most manufacturers of HF linear amplifiers do and connect a 100nF capacitor (with a suitable working voltage) across the secondary of the mains transformer and another one across the rectifier output. For split-supply rails, use a capacitor across each rectifier output to earth. If that doesn’t stop the hash, try small choke in series with each leg of the rectifier output; about 1mH should do. Capacitors from the directly in parallel with each diode in the rectifier can also have an effect; experiment with anything between 1 and 100nF. If all else fails, try a mains filter on the input of the offending unit and another one on the affected rig - or, if you don’t mind modifying the unit, see whether you can screen the rectifier and its wiring in some fashion. If you’re home-brewing an RF linear amplifier (or an audio power amp, come to that) it’s a good move to design such suppression into the rectifier circuitry early on.

Rectifier interference has been with us for many years, and it’s strange that almost none of the standard textbooks seem to mention it. Bear it in mind as a possible source of mysterious 100Hz-based interference in your Rx.

Get your FT101 on the new bands
Harry Leeming, G3LLL, of Holdings Amateur Electronics has been burning the midnight oil to work out how to get FT101’s from the MK1 to the ‘101E on to the new bands (but not the ‘101D). We thought that with the release of 18 and 24MHz, it would be a good idea to describe how to do it.

Harry points out that the mods are simple but some experience is necessary. Here’s the info:

1) Make sure that the rig is in good working order, then disconnect it from the mains.
2) Remove cabinet base.
3) Identify the 21MHz and 27MHz crystals and oscillator trimmers (touching the hot end with an insulated screwdriver will cause the note to change when the Rx is tuned to the calibrator on the appropriate range).
4) Fit a 24.02MHz crystal temporarily in place of the 21MHz one and fit a 30.52MHz crystal in place of the 27MHz rock.
5) Check the rig on receive. 18-19MHz should come in at ‘100’ on the black dial and peak at around 7 on the preselector; 24-34MHz comes in at ‘900’ on the red dial and peaks similarly at about 8 on the preselector. The mod usually works without any alignment being required; however, if the Rx is dead on either band, tweak the 21 or 27MHz trimmers by the minimum amount necessary for the rig to burst into life. See the section in the manual entitled ‘Heterodyne Crystal Oscillator’ and align correctly after you’ve completely finished the mod - or just peak for maximum drive if you haven’t got a VVTM or whatever. The setting of the 21MHz trimmer will be a compromise between that band and 18MHz, but it isn’t critical.
6) Remove the top of the PA cage and locate the loading capacitor. MAKE SURE you’ve discharged the 600V rail before sticking your pinnkies inside.
7) Strap the two sections of the loading capacitor in parallel by soldering a short lead between the two top live terminals - then refit the PA cage.
8) Remove the screening cover over the driver/range switch and strap the switch as shown in Fig.1. You’ll need a long and thin bit on the soldering iron. Refit the screening.
9) Ensure that the 30.52MHz crystal is in the 27MHz position. Then fit the 24-02MHz rock in the spare ‘X’ position and the 21MHz one back in its original place.
10) Remove the two screws from the crystal panel and withdraw it slightly. Place the rig on its side (mind you don’t lose the spacers) and unsolder the lead from the ‘hot’ end of the 21MHz crystal socket - that’s the end which is NOT commmoned with the other rocks.
11) Wire two short insulated leads to the hot ends of the ‘X’ and 21MHz crystal sockets - then refit the crystal panel.

12) Mount the relay with suitable adhesive in an inverted position adjacent to the ‘X’ crystal socket. Solder a thick wire to one side of the relay coil and connect this to chassis via one of the screws on the crystal board.
13) Wire the centre contact of the relay to the wire which originally went to the 21MHz crystal socket.
14) Wire the relay contact which is made when energized to the hot end of the ‘X’ socket.
15) Wire the contact made when the relay is NOT energized to the hot end of the 21MHz crystal socket.
16) Wire the free end of the relay coil to a length of insulated wire and route this towards the rear of the rig.
17) Fit the new switch (which is henceforth the ‘18/21MHz switch’ by filing out the hole which holds a cabinet screw above the IF and AF phono sockets at the rear.
18) Wire one side of the switch to the 13.5V rail and the other to the wire going off to the relay coil.
You’ve now finished the hard bit. Next, check the crystal oscillator trimming - see 5).

You should now find that the ‘15m’ position tunes 21-21.5 or 18-18.5MHz as selected by the new switch and ‘11m’ tunes 24-25MHz.

The 21 and 28MHz bands will operate as before except that the loading will be about 2 points clockwise of where it was. The PA will tune the new bands around the 15-20m point. Holdings advise keeping the power to a maximum of 50W and using an antenna tuner to ensure a clean signal. 10W is equivalent to about 100mA anode current.
current and 200mA gives about 50W CW; 130mA peak is about 50W PEP.

Finally, you might like to note that the ‘11m’ crystal is marked 32:02 and the ‘15m’ crystal 27:02. If you’re using a ‘X’ socket, you’ll need to wrap a crystal holder and run one end to the relay and the other to the cold end of the ‘X’ crystal. NB - late production FT101Es label the CB band ‘AUX’; earlier ones call it ‘11m’.

Thanks to Harry for these mods — great stuff.

Heatsinks and Hi-Fi?

Last month I had a wee dig at the wacky world of hi-fi. There must be some very creative PR men dissipating a good 100W of heat, and the problem is that it is in full.

In case you hadn’t noticed, we’ve had a most un-traditional English summer. As usual in such circumstances, there’s been a surge in the sales of beer, soft drinks, ice-cream - and RP power transistors. It’s an unfortunate fact that when the hot sun shines on your equipment sitting by the shack window (or on the boot of your car with the mobile PA inside) you may be about to come face-to-chequebook with the problems associated with heat dissipation.

Electronic components hate high temperatures — and transistors in power amplifiers dread them most of all. The tiny semiconductor chip can be dissipating a good 100W of heat, and the problem is to get that heat away before the temperature rises too far and the device fails. The usual failure mechanisms are bound up with an increased susceptibility at elevated temperatures to excessive drive power, high voltages or high VSWR. There’s also the phenomenon known as ‘thermal runaway’.

The only thing to be said in favour of thermal runaway is that it is a problem confined to bipolar transistors; FETs aren’t susceptible to it. On that basis, you won’t be surprised to hear that it’s related to the second breakdown phenomenon we discussed last month. In this case, constant bias conditions force collector current increases with temperature. This causes more dissipation in the transistor, a rise in temperature, even more collector current, and ultimately the transistor junction melts into a useless lump of slightly impure silicon. Solid-state power amplifiers are particularly prone to thermal runaway, for two reasons: a) they generate considerable heat and b) they need to operate with a small amount of permanent forward bias.

As well as subjecting the device to additional electrical stress, excessive drive and/or high output VSWR will also increase the power dissipation — and with it the risk of thermal runaway.

In essence, power transistors opt out when the sun shines if their heatsinks aren’t big enough to keep them cool. Largely as a result of the trend towards physically smaller equipment, the manufacturers of transistors consider the most thermally-controlled fans nowadays; equally, many home-built or temperature sensors which reduce the RF drive if you attempt to run full power for too long. But the RF power transistors in older rigs (and in almost every add-on ‘100W brick’) just

to have to sweat it out and hope for a fresh breeze.

How big should a heatsink be? It all depends on the heat load. At one extreme, a tiny clip-on heatsink may be enough for a small transistor dissipating only a few hundred milliwatts. But a solid-state power transistor dissipating 100W RF output is likely to have to dissipate an additional 100W of heat, and that calls for something much larger. A typical RF PA will contain one or more flange- or stud-mounted RF power transistors which are bolted to a large finned heatsink of extruded aluminium. If the heat flow from the semiconductor chip must eventually be given up to the surrounding air. The first stage in the heat transfer path is inside the transistor itself - from the semiconductor junction to the mounting flange or stud. Then the heat has to flow across the barrier between the flange and the heatsink, and finally it has to spread out through the heatsink and cross over into the outside air. The better the heat transfer path, the cooler the semiconductor junction will be and the longer the transistor will last. Since heat flow is very much like electrical current, the same principles apply. Use highly conductive materials with large cross-sections, and make good connections which have a low resistance to heat transfer. As we’ll see shortly, a kind of ‘Ohm’s Law’ of heat can be used to work out how well the transistor is being cooled.

Heat Flow

Looking at each of the heat transfer steps in turn, efficient heat flow within the transistor is obviously the responsibility of the semiconductor manufacturer - there’s nothing you can do to change it. The datasheet for that transistor will tell you the ‘thermal resistance’ between the junction and the case; it’s usually referred to as ‘jc’ (pronounced ‘j-see’) and measured in °C per watt. For example, if the jc is 1°C/W, every watt of heat flowing out through the flange causes a 1°C rise in junction temperature.

The next thermal barrier lies between the transistor flange and the heatsink, and this is where home-brewers sometimes come unstuck. You can’t just bolt them together and hope for the best! In modern RF power devices, flat flanges are superseding the older single-stud mounting because they offer a larger area for heat transfer. Ideally, both the heatsink and the transistor flange should be rubbed smooth and flat with very fine emery or Grinding Paste, with a thin smear of thermal conducting paste on both surfaces to fill any remaining irregularities. One warning, though. Although heat sink paste is a better conductor of heat than ordinary grease (although just as messy), it still isn’t particularly good, so never use more than necessary. If the transistor and heatsink mate together properly, there should be no need for excessive tension on the mounting screws, which risks breaking the transistor. For some stud-mounting devices the data sheet will quote a torque figure to which the screws should be tightened - it’s important to stick to it. Having done all that, you might be surprised to learn that thermal resistance of the joint is still about 0.5°C/W. This means that the flange of a transistor dissipating 100W will be about 50°C hotter than the heatsink it’s mounted on.

Let’s now consider the heatsink itself. Most heatsinks are barely big enough, as the following example will show. Take one of those so-called ‘100W power amplifiers - remember, by the way, that a ‘100W’ solid-state amplifier is highly unlikely to deliver more than 50W PEP of clean SSB - which is typically going to be dissipating a good 100W as heat. What’s the junction temperature under these conditions?

A Bit of Maths

We’ve already thought about the idea of thermal resistance and mentioned an ‘Ohm’s Law’ of heat flow, so here it is in full.

Junction temperature (°C) = thermal power (W) x (jc ± 0.8 ± d8 (°C/W)) ± ambient temperature (°C)

It’s just like the electrical Ohm’s Law (think of it as ‘Oh’s Law), with temperature taking the place of voltage and heat flowing like current - and the higher the thermal resistance, the higher the temperature drop. As we’ve seen, jc is the thermal resistance between the transistor junction and the case, and is about 0.7°C/W for a flange-mounting RF power transistor. dc is the thermal resistance of about 0.5°C/W between the flange and the heatsink, and dh is the thermal resistance on the heatsink itself. Strictly speaking, dh is the thermal resistance between the heatsink mounting surface and the surrounding air, and power transistor heatsinks have values typically in the range 0.2 to 1°C/W.

To calculate the junction temperature Tj of a transistor dissipating 100W on a 0.5°C/W heatsink at an air temperature of 25°C, we simply apply ‘Oh’s Law’:

Tj = 100 (0.7 + 0.5 + 0.5) ± 25 ± 195°C

That looks uncomfortably hot, given that most power transistors have an absolute maximum Tj of 250°C and some have a lower than that, but there’s worse to come. Although the power transistor may have a rated thermal dissipation as high as 250W when its case is held at 25°C, the datasheet will invariably show that the device must be derated at higher temperatures — typically by about 1-4W for every degree above 25°C. Applying ‘Oh’s Law to find the temperature of the transistor flange, this works out to be 125°C. This implies that the transistor must be de-rated by 1-4 x (125-25) watts from the original 250W. So the actual dissipation is only 200W. At a temperature of 125°C it is thus only 110W — which leaves almost nothing to spare above the 100W we need.

In particular, this leaves no allowance for additional dissipation in poor VSWR conditions, or for the fact that the temperature inside your car heat sink may be much higher. Under extreme conditions, all the temperatures along the heat transfer path increase accordingly, pushing the junction temperature up to 230°C and the transistor closer to the edge of breakdown. Exactly the same applies, of course, if the sun is shining directly on the heatsink and pumping in additional heat.

The regrettable conclusion is that a 0.5°C/W heatsink is barely big enough to handle 100W of heat continuously with any margin of safety for the transistor. And how big might such a heatsink be, physically? Well - just about the size of the heatsink on the average 100W ‘black brick’ alias. It’s big enough for normal use, especially on SSB or CW where the low duty-cycle acts in your favour, but there’s very little in reserve. If all the factors conspire against you - prolonged use at full power, in full sunlight or in a confined space such as a car boot, and maybe with a poor VSWR - it’s best to be sure, and you may find yourself facing a bill for a new power brick. About one of those.

That’s all we have space for this month. If fitting a different heatsink to your transmitter PA makes your audio sound better, hire a PR man and send us a copy of the press release...
This is your chance to make a suggestion to do so drop Phil Mathews a line at Siskin Electronics, 2 South Street, Hylte, Southampton SO4 6EB.

Licences

It's a very quiet month for GB7 licences, with none being issued by the DTL. (This must have something to do with holidays.) I'm pleased to see all of the GB7 calls in use on 70cm, as reported last month, and especially the increase in speed of messages from north to south. With so many more mailboxes now running 24 hours on UHF this could be the start of the system we have all been waiting for?

Next month I hope to be able to report first hand on the latest developments in the packet scene in America. While I am in the USA I have been invited to PacComm to see items for future release including a working version of the 9600 baud system and the new ultra-miniature TNC that fits inside a laptop.

Beginners - Getting Started

This month I hope to provide you all with the information you need to get on the air and set up a packet station.

If you are new to the mode, don't be put off by some of the technical jargon - it really is quite simple.

What you will need.

(1) Any computer with an RS232 interface or a simple terminal emulator will do. There are many stations using Spectrums and Atari, and even some using sophisticated equipment such as IBM 386 technology. This is one of the few cases where, unless you intend to run a mailbox, you will not see any difference between the type of computer in use.

(2) Terminal Node Controller (TNC). This is an interface that plugs directly into the RS232 interface and then into any transceiver. It is the encoder/decoder and main controller for the packet system, so choose the type you wish to purchase carefully. With many products on the market offering different facilities you will have to make your own decision here; don't get carried away with flashing lights and multiple ports because it's very hard to hold two real time conversations at once. Some offer the facility of a personal mailbox which enables the user to have other amateurs leave personal messages for them when they are not available. The problem with this system is that the messages are stored in RAM, which is volatile when power is removed. For this reason it is safer to use the mailbox network provided. The best advice I can offer is to keep it simple. Nearly all TNCs have the same command set and if I were to be starting today, my choice of TNC would be made by how clear the manual was.

(3) Software. A large amount of people meet are under the impression you need an expensive software package, this is not the case. Many stations are using simple terminal emulation software, mostly available as Public Domain software. There are custom designed packages available for certain computers, but although they do make life easy with split screens, storage facilities and methods for changing TNC parameters, they are not a necessity.

(4) Transceiver.

Getting Started.

Now that you have all the equipment it's time to get on the air. The first few chapters of the manual for the TNC are the most important and should be read very carefully. They set out the various diagrams for wiring the TNC to computer and transceiver. The RS232 connections are normally pins 1 thru 8 and no 20 of the RS232 interface plugs. As for the transceiver you will need to connect PTT, TX audio, RX audio and ground. Some transceivers today also are designed with the facility for squash monitor specially for packet radio, in which case you must follow the manufacturer's instructions.

Once you have connected everything together and followed any instructions supplied with the TNC for calibration, it is time to talk to the TNC before you talk to the world. The TNC on startup will have a set of defaults most of which will be alright to start with. You must tell the TNC your call sign using the command MYCALL or MY: in MB6XX. The TNC will respond with a message similar to:

MYCALL was N0CALL now GB6XX

Set the TNC to monitor the frequency by typing MON ON. The TNC will respond with a message similar to:

MON was OFF now ON

For the time being leave all the other parameters as their defaults unless you have a transceiver with relay operation. With slow switching of this type you should alter the parameter called TXDELAY. The default for TXDELAY varies from TNC to TNC but should not be left too low especially when using HF as older valve equipment takes a few milliseconds to get to full output power.

The time has at last come to make your first connection. If you are not sure of your local mailbox leave your system receiving for about 15 minutes and then with the command prompt on the screen (usually cmd:) type MH. A list will appear of all stations that have been heard. At least one of these should have a GB7 + 3 letter callsign. To connect to this mailbox type C GB7xxx (C is the command to connect and xxx are the letters you have seen in you MH list).

Once you have connected your screen will have a message similar to:

Connected to GB7 xxx followed by the message of the day from the mailbox.

From there, experiment. Typing H will give you a help screen.

SysOp 7 Shrewsbury 23 July 1989

The SysOp meeting took place as planned in Shrewsbury, with a good turn-out even though the weather was glorious. It was very productive; with varied subjects including:

Confirmation of @ fields and the election of a co-ordinator for them namely Doug Shore GOEOJ @ GB7YAX.

The formation of a co-coordinating committee, to provide co-ordination between all of the various working groups with the aim of solving any of the network problems. This committee will be co-chaired by Paul Guilbert, G0DXX, and myself, Neil Lasher, G6HIU.

Varied discussions about NET/ROM nodes, logging of routes, parameter changes and a submitted paper on standardising level 4 Destination addresses and aliases. Removal of SSID from GB7 mailbox.

The next meeting was planned for the end of October/ beginning of November in York, north of the M82, so there will be no excuse for SysOps in GM not to attend...

Finally
That's all for this month apart from a small message to all Clubs and packet groups. Do let me have details of your future events for publication at the above address. Copy dates are 20th of each month.
Recent Microwave Operating Awards

Of a ‘collection’ of nine operating awards or award stories notified by the Awards Manager, G4OUT, this month, six of them were for the 1.3GHz band, and one for each of the 2.3, 3.4 and 24GHz bands, thus proving that there is still some activity after all!

On the 1.3GHz band Dave, G6UWO, claimed the Standard award (No80); John, G4BVV, the Senior award (21); John, G4ZTR, the Distance award (127); Ela, G4AHKM, the 30 (31) then the 25 Squares (27) award and Keith, G6DER (mentioned in the last awards news) 70 Squares (4).

Keith, G6DER, also gained the 35 Squares award (No.2) on 2.3GHz and the 10 Squares (No.8) on 3.4GHz. The final award was to Dave, GM3WIL, for his portable operation on 24GHz where he has won an Intermediate certificate (No7). Well done all stations and thanks to Ian, G4OUT, for the ledger abracad!
signal readability by a factor of 10 and simultaneously reduce transmitter output power by a like amount. I outlined the system on page 63 of The Amateur Radio Operating Manual (RSGB).

Very briefly, c.w. uses the concept of signals transmitted and received in carefully defined time ‘windows’. All c.w. dots, dashes and spaces are exact multiples of a basic time unit and occur within predictable time frames. Received c.w. signals sound like conventional cw signals except they are sent very precisely. As a result very narrow filters may be used. 12 w.p.m. is usual for c.w. and filter bandwidths in the order of 10Hz. A 1 watt signal copied through a 10Hz filter is equivalent to a 50 watts signal heard through a 500Hz filter or a 230 watts signal copied through a 2300Hz filter.

The advantages are obvious but the system does require all frequency determining oscillators, including the clock for the keyer, to be accurate within 1 or 2Hz. The transmitter must also be stable, under keying conditions, to within 1 or 2Hz. Crystal controlled QRP transmitters were successfully used in the early experiments. Direct conversion receivers seem ideal for the reception of c.w. signals, avoiding the use of another very stable oscillator for the bfo. The filters are capable of being built by anyone who has a little experience of building simple digital equipment. It may sound daunting, but I recall seeing a photograph of an original experimental station which used a Ten Tec PM2 transceiver which is far the most sophisticated rig ever built.

Coherent CW remains one of the areas of the hobby open to the genuine experimenter. The equipment must be home made but is of modest proportions and cost. Peter Lumb, G3IRM, and together with Bert Arnold, G3RIH, are trying to revive the idea and are building equipment. They have copies of much of the relevant information on the system and certainly enough data to enable anyone interested to build c.c.w. equipment. Peter would like to hear from anyone who is interested in joining them in the project. There is a small section on c.c.w. in all issues of the ARRL Handbook and it may be useful to read this before going further. Interested amateurs should contact: Peter Lumb, G3IRM, 2 Brierwood Avenue, Bury St. Edmunds, Suffolk LP3 5QE.

Looking Back
Many QRP operators are builders and modellers of equipment, so amongst them are a fair number of those radio amateurs who derive pleasure from restoring and using old and classic items of radio communication. The German DL AGCW Group have introduced a new contest which should appeal to such amateurs, for equipment which is either homebrew or over 25 years old.

AGCW OL HOT (Homebrew and Old Time) PARTY 1989
TIMES: 1300-1500 UTC on 7010-7040kHz.
1500-1700 UTC on 3510-3560kHz
Class A: TX and RX home or RX only
Class B: TX only or RX only
Class C: TX less than 10w input (5W output as above).

Call: ‘CG HOT’ and exchange RST + serial number, beginning 001 on each band + class, e.g. 57900/A, Scoring: by class working: A-A, A-C, C-C = 3 points, B-A, B-C = 2 points, B-B = 1 point.
Log: UTC, Call, Check Numbers, Scoring and total with a brief description of the station equipment. To be submitted by December 15th to Dr Hartmut Weber, DJSTJ, Schieslerweg 13, D-3320, Salzhigler 1, West Germany.

Sixth HF Challenge
As we are in to October, it is time once again to plug my annual HF Challenge, which is designed in the hope that listeners will take a look at the bands during the upcoming CWQW Contests, log some good DX, and put in an entry for the Challenge. Every year, even in years of low sunspot activity, it is amazing how active the bands are during these two weekends. As this year should see the peak of the Cycle, conditions could be exceptional.

The SSB challenge will be held on 28/29 October, with the CW leg taking place over the weekend of 25/26 November. Once again, the idea will be to log as many countries as possible during the two periods. So that 200 Ws do not appear in logs, only one station from each DXCC country can be logged from each of the six bands. The full rules are as follows: (1) Entries may be single band or multi-band, but not both. (2) Each different country heard on each band will count for points.

(a) Countries in the SWL’s own continent count 1 point on 28, 21 and 14MHz, 2 points on 7 and 3.5MHz, and 3 on 1.8MHz.
(b) Countries outside the SWL’s own continent count 3 points on 28, 21 and 14MHz, 5 on 7 and 3.5MHz, and 10 points on 1.8MHz.

3. The final score should be calculated as follows:
(a) Single band entries — the total points should be added together and multiplied by the number of DXCC countries heard.
(b) Multi-band entries — the total points from each band should be added together and multiplied by the total number of DXCC countries heard on each band.

4. Entries must either be on standard sized log sheets and written legibly in ink, or on computer generated log sheets with 40 entries to the page. A multiplier checklist showing the countries heard in alphabetical order MUST accompany the log.

5. Entries showing the full call signs of stations heard, the station being worked, the time and signal strength with the station heard (minimum acceptable reports being 4x4 on SSB or 449 on CW — note the change from last year). Logs should be sent to me at the address shown at the front of this magazine, to be postmarked no earlier than 21 November for the SSB leg, or 19 December for the CW leg.

Although there seems to be a current trend against contest participation by SWL’s, I hope that the Challenges will, as usual, be well supported.

More on Taking Radio Equipment Abroad
After the piece in my August column about taking radio equipment abroad, G3URE wrote with some further helpful information which is well worth repeating here.

Having travelled for many years into highly sensitive areas carrying radios, recording equipment and computers, he is reasonably well versed with the problems to be encountered at airports. He felt it worth clarifying the difference between ‘customs’ and ‘security’. Generally, Customs only become involved after landing, and do not care too much about whether your box of shiny knobs will go off bang (as long as it happens outside the Customs Hall) — they are only interested in whether you bought the box of tricks on your holiday/business trip, or in the UK and have paid VAT and duty. In this case it is always advisable to either obtain a carnet before leaving, or at least carry the UK receipt with you.

Computers pose a different problem and it is suggested that professional advice is sought before taking your expensive lap-top out of the country.

Security is a different matter entirely. They will be very interested in finding out whether your black box will play a tune or smoke, before allowing you onto a plane, so it is suggested that removing any batteries is not such a good idea. Experience suggests that Security will be keen to see that you black box does what you say it will. My earlier comments about presenting an open and helpful attitude, whether to Customs or Security, were fully endorsed.

I hope that these helpful comments will straighten the record and will be heeded by listeners and amateurs alike when travelling by plane either for business or pleasure.
Heard All Britain News

Dennis, GWLJNE, provided his now regular update or SWL activity in HAB. A new Awards Manager has been appointed. He is Dave, G4VJD. He lives at 5 Braemar Close, Keetley NN15 5DD. Quite a lot of Listener Awards have been issued since the last update. A general overview of listener activity sees SWL Wainwright mentioned 26 times in the listings. He has Class One awards in the Districts, Counties and Large Squares categories.

Chris Gibbs has heard 2600 WAB Bookholders. He also has 150 Islands heard on 3.5MHz. Other listeners who are doing well in collecting islands are SWL Brown and Sheppard. The 'daddy' of them all, however, is Frank Parkhurst collecting islands are SWLs Brown and Shepperd. The 'daddy' of them all, however, is Frank Parkhurst.

A 50MHz WAB/HAB contest is arranged for 0900-1200 on Sunday 8 October. Listener entries are encouraged and should be sent to Ian Webb at Cornerways, Orchard Road, St Neots, Cambs PE19 3AN.

It is always interesting to hear from Dennis, but I wonder if any of the listeners mentioned here — or any others involved in HAB — would like to write and give me their impressions of the HAB movement. I could then include this news in a later issue along with all the latest HAB news received from Dennis.

New HF Contest

Malcolm Harrington, BR520249, reports that the Society are to promote a new LF SSB Contest next year which will be open to SWLs to replace the 7MHz SSB contest which died earlier in the year.

It appears that the contest will be held on 3-4 February between 1200 and 0900. Full rules will appear soon in 'Contest News', but I know that some established listers will be delighted to know that an LF event is to be re-instated in the Contest Calendar.

Newcomers

Jeff Smith, BR592044, wrote for the first time as a result of my plea for new SWLS to get in touch. He has been an SWL since April and has heard around 80 countries on HF so far, including APZ2R, FY4FM, HL1EJ, J7AAE, LUFSD, VK3VWL, 5N2MSB and 9K2CS. He also monitors SSTV using a Spectrum 48K computer. An F4874 is the main receiver with the VHF Converter and antenna tuner. A dipole received the signals on HF and a 10 element yagi does the business on VHF.

Jeff shared the view about some QSOs being unintelligible and garbled and also, being an ex RN communications man, that if everybody had a spell as an SWL, there might be better discipline on the amateur bands.

I hope that more newcomers will drop me line in the next few months. I am always interested to read of other SWLs experiences, and will gladly put the best offerings into the column.

Early News of Society's SWL Contest

As the deadline for entries approaches, the number of entries so far received is little down on last year. Logs from Japan, Australia, Belgium and East Germany have been received, as well as a number from the shores. Some quite good scores have been claimed, but we will have to wait for news of the winners until I have been at the logs with my red pen. I hope to have the results into print soon.

One detailed view of the contest has been received from Joan Slater, BR590400. She had not intended taking a serious part in this year's event, but after she had calculated a provisional score she found she had a better one than in previous years. She therefore took the log on holiday with her and wrote it out, duped and scored it finally either on the beach or at the holiday hotel! She just had about enough logsheets with her to finish the job while away.

Initially, she had decided that there would be no more contests until a decent antenna had been erected, but somehow the 'old' antennas did their stuff. It will probably be her last SWL contest as she passed the last RAE after many hours of studying (Class B licences can still enter SWL Contests). She had been encouraged by a plaque in the shack which said 'There is no failure except by not trying'. She came away with two disillusions. Living 'in a bit of a hole' Joan hopes to catch some good autumnal tropo on 144MHz to prove that the new rig will reach a little further than 'the repeater down the road'.

Finale

That's all for this part of the column. No doubt you have already read my 'Specimen Analysis' bit. If not, you know what to read next.

I am still on the look-out for anything of interest to listeners to put in the column, and from this one you will see that I would like some SWL input to HAB and some more newcomers to write. So, until next month, Tj.

The deadline for the Christmas issue is Saturday 14 October.

HAB AWARDS ISSUED AS OF 12 JULY 1989

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Protecting products from EMI/RFI requires effective screening, although many firms producing electronic equipment which is housed in shielded cabinets tend to be more concerned with the electronics rather than with the cabinets themselves. In some cases, the cabinets may be bought in, having been tested in isolation from the product. But for effective screening the case and 'innards' should be thought of as one system, with testing for shielding effectiveness being carried out accordingly.

Screened Enclosures

As many people are only too aware, manufacturers have tended towards plastic packaging for their products. As plastic does not restrict the path of EMI, and as a remedial method, manufacturers have sought to provide a plastic with the conductive properties of metal, either by using nickel plated paints or zinc arc sprays. These two methods have proved partially successful, although Copper/nickel plating is probably the only method which can approach the desired standards at present. The bonding produced by this method is more permanent than the paints and sprays and, because copper is an excellent conductor the shielding effectiveness against high intensity fields is very good. The emission aspects of EMC are also very important to consider. Any noise which may be emitted from the product through the case may affect nearby equipment.

There is also one other aspect which must be kept in mind — that of security. Electronic eavesdropping has reared its ugly head recently and is at present causing a great deal of concern in the corridors of power. Signals which are fairly structured, such as the drive signals to a VDU, can be reconstructed reasonably easily. VDUs can now be fitted with EMI shielded windows which prevent such eavesdropping whilst at the same time helping to reduce glare and improve contrast. Another suggested remedy to the problem is the use of 'scramblers' which generate extra signals to prevent sense being made of the data. It doesn't take much imagination to see the dangers of this so-called solution!

Spray Paint

If you or a neighbour are suffering from direct breakthrough into a TV or radio receiver via its plastic
cabinet you can now screen the product with a plastic RF-proof coating. Radiospaces, who also provide the home constructor with components via their Electromall outlet, now sell a metal-based plastic sheet which is designed to prevent computer generated RF radiation affecting nearby radio receivers.

The same paint can be sprayed onto the inside and back of radio and TV products to form a thin RF-proof screen. The Radiospaces part number is 551 570 and the price is currently around £14 for a 365ml aerosol can. The paint is touch dry in 15 minutes, full conductivity can be obtained after 24 hours, and a large radio and television manufacturer is currently using it to prevent VHF signal breakthrough into TV and VCR IF circuits.

One practical word of warning. Spraying is best accomplished out-of-doors and the product should be left standing in fresh air for a few hours before reinstallation so as to prevent a build up of acrylic fumes in the domestic environment.

**Ferrites**

Although the Mullard FX1588 toroid has become a standard weapon in the TVI armoury, it is now becoming difficult, and at times expensive, to obtain. An alternative is to use MW ferrite rods which are both cheap and readily available at local radio rallies.

Both the FX1586 and the ferrite rod will require some 15 turns or so in order to block 3.5MHz and higher frequencies from being conductducted along mains, loudspeaker or coax cable. When winding onto a ferrite rod, the winding should start at one end and continue to the other, so providing a flat spiral coil. A ferrite ring should be wound so that the 15 or so turns are spaced evenly so that the leads into and out of the winding are not running parallel. This is to prevent coupling between the input and output connections. If possible, there should be 180° spacing between these leads.

In both cases, the ferrite ring or rod should be installed some 10cm or so from the receiver rear panel to prevent direct radiation of RF from the lead or cable effectively bypassing the filtering action.

**Cables**

RF radiation from your station's feedlines is only as good as the amount you spend on the cables. Obviously perhaps, but there have been one or two cases of RFI and TVI caused by the leakage from the poor weave of cheap cables. Do not skimp on these; ensure they are the best quality you can afford. Incidentally, the same applies to UHF TV coax cable. As the years go by, the outer sheath of many cables are produced with larger and larger holes and its wire construction gets thinner and thinner. You only get what you pay for!

A member has written in making interference from his transmissions to one of his extension phones. The problem was satisfactorily cleared up by the use of two TWP Electronic Supplies 0.25"split beads, which are taped to the lead where it entered the phone. It was interesting to note the other phone (made in Taiwan) connected to the same socket had no problems at all.

**In the meantime**

There is no doubt that the world of EMC is buzzing with activity, both in professional and amateur circles - indeed if paper could cure the problems we would be home and dry! Most people are pretty unenthusiastic about official documents but in this case the mountain is working in our favour. It is generally agreed that the major problem on the amateur EMC scene is poor immunity of domestic electronic equipment. Of course, there is nothing new in the breakthrough problem - one Old Timer used to tell a story about the trouble he had when the first 'talkies' came to his local cinema and his top band AM QSO came over loud and clear in the auditorium - but things have got worse of late simply because there are so many more electronic gadgets about.

The good news is that the authorities in the UK and other ECC countries are presently drafting documents which will define standards of immunity for all manner of domestic and industrial equipment and these will be obligatory. The bad news is that although these are intended to come into force in 1992 it will be some time before they become really effective. In a nutshell, things will get worse before they can get better, and the way the Amateur community handle their problems over the next few years could be crucial to the maintenance of the good image that Amateur Radio still enjoys. It is perhaps worth remembering at a time when we are trying to attract young people into Amateur Radio via 'Project Year' that nothing is more likely to deter the parents of young amateurs than the fear - however unfounded it may be - that they will have problems with their neighbours. Well, we can try to make it clear what we are doing about it? Here are a few suggestions, which may at least act as a stimulus to further discussion:

a) Try to avoid having breakthrough problems from the start by practicing good radio housekeeping, particularly in the siting of antennas. See page 20 of the 1989 Call Book. This probably won't stop you having the problems, but at least it will reduce them to manageable proportions!

b) Where conditions do not permit an ideal set-up (and this must apply to most of us) take extra care in operating. Everyone knows that is is good operating practice to use only the power necessary to give satisfactory communications, but do we all do it?

c) Consider using 'EMC friendly' modes where possible. Generally FM gives less trouble than SSB, and CW scores because it allows you to use much less power for a given contact than either of the voice modes. (See Amateur Radio Operating Manual, Third Edition, p33). At first sight it looks as if RTTY and the new data modes should be 'EMC friendly' because of the basic modulation technique and because they require less power for a given contact than SSB. I would be pleased to receive comments from users of the data modes particularly where the performance of several modes can be compared.

d) Try to tone down the local club know-all who tells any newcomers that the way to deal with RFI is to bluster and threaten everyone in sight. Breakthrough may not be our fault, but it is definitely seen to be our problem.

e) Keep a simple breakthrough kit ready, and respond quickly to any complaint. Nothing impresses a neighbour so much as fixing his problem in a few minutes. A suitable kit is described in the 1989 Call Book, p22.

f) It is advisable (if funds run to it) for all Clubs to have the full, boxed filter kit which is available from HQ, so that it can be loaned out.

**European Meeting at 'ham radio' '89**

A further meeting of the EC countries took place during 'ham radio' 89 at Friedrichshafen, West Germany, at the end of June. The first meeting of the group occurred earlier in the year when it was agreed to consider the formation of a Europe Amateur Radio Association.

Unfortunately a meeting of the IARU Region 1 EMC Working Group had been arranged to coincide with the EC meeting and therefore there was a split in the attendance of all interested countries. The RSGB was represented by the President and the EMC Committee Chairman, and the meeting was chaired by Dr John Allaway. The EC Countries were well represented and many of the Region 1 Countries were also present. After much discussion the following resolutions were passed:

1. That EC Matters are taken care of by a special body formed within the IARU Region 1 following IARU terms of reference.

2. That the 12 Amateur Radio Societies within the EC nominate their Representative within two months.

3. That these representatives form the EC Committee of IARU Region 1. One Society produces a Conference Paper for the next Region 1 Conference for approval of this Committee.

4. That UBA is kindly requested to co-ordinate the activities with the EC in the meantime, and to organise the first meeting of this Committee within 6 months, to elect a Chairman and Secretary, and to formulate policies.

5. That all other Societies with an interest in EC Matters are invited to join as observers.

The next meeting is to be arranged in Brussels with the European Commission in September.

A meeting took place on the Sunday morning of a sub-committee dealing exclusively with the problems of EMC within the EC. Some very useful work has been done during the spring and early summer, and a number of countries had improved their relationships with their national organisations. The EC EMC Directive has now been fully approved and issued, and work is continuing on implementation agreements. The policing of the new arrangements in 1992/3 has still not been agreed, but the DTI intend publishing a Discussion Document in the near future. If you wish to obtain any information on the EMC Directive, contact the DTI at Waterloo Bridge House, London, who will provide the information free of charge.

An article on the EMC Directive will appear in RadCom later in the year and a full update on the latest situation will be presented.

---

**EMC helpline**

The Society has installed an EMC Helpline at the EMC Committee Chairman's QTH to improve the service to society members who may have EMC problems.

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ANTENNA RANGE

<table>
<thead>
<tr>
<th>ANTENNA</th>
<th>SPECIFICATION</th>
<th>PRICE</th>
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<td>Cashcraft</td>
<td>A 3 Element Tridiber Beam</td>
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<td>A 10 Element 10m Monobander</td>
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<td>A 15 Element 15m Monobander</td>
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<td>26-30C 3 Element 20m Monobander</td>
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<td>A P F 6 Band vertical 25ft high</td>
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<td>Range Ranger 2m antenna</td>
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<td>R F 5 New 5 Band Vertical Roof Mounting</td>
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<td>No Radials</td>
<td>£259.00</td>
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<td>D W 10-18.24 MHz Rotary Dipole</td>
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<td>Butternut</td>
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<td>HWVX 6 Band Vertical Antenna</td>
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<td>All Butternut accessories available</td>
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<td>Hy-gain Antenna Range available</td>
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<td>Jaybeam</td>
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<td>TSM/HÍ3 3 Element Tridiber Beam</td>
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<td>TRM/HÍ3 Rotary Tridiber dipole</td>
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<td>DB8 &amp; 6 Element Vertical</td>
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<td>4cm 4m 4 Element Beam</td>
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<td>8 Element 2m Vagi</td>
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<td>Antenna Tuning Units</td>
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<td>Kenwood AT300</td>
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<td>MFJ 929B 1.8 KVE Versatuner</td>
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<td>MFJ 300 Watt Basic ATU</td>
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<td>MFJ 160 Random Wire Tuner</td>
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<td>Global AT1000 SWL Antenna Tuner</td>
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<td>D C 3 N 25-1300 MHz OScope Antenna</td>
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<tr>
<td></td>
<td>D CPS 5 band trapezoidal vertical with radial kit</td>
<td>£155.00</td>
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<td>D CPS 4 band vertical</td>
<td>£145.00</td>
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</tbody>
</table>
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|                   | Half size GSR/ Antenna               | £14.50

Kenwood Antenna Range

<table>
<thead>
<tr>
<th>ANTENNA</th>
<th>SPECIFICATION</th>
<th>PRICE</th>
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<tr>
<td>TS940C HF Transceiver</td>
<td>£195.00</td>
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<tr>
<td>TS440 Automatic Antenna tuner</td>
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<td>SP540 Speaker with filter</td>
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<td>TS460 HF Transceiver</td>
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<td>TS460 A Automatic Antenna tuner</td>
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<td>PS600 20 mm power supply</td>
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<td>TS460 HF transceiver</td>
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<td>PS40 power supply</td>
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<td>AT250 Automatic Antenna tuning unit</td>
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<td>AT250 Antenna Tuning Unit</td>
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<td>TR240 Linear amplifier</td>
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<td>MC50 Base station microphone</td>
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<td>MCD50 De Luxe desk microphone</td>
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<td>TR510/1 2m Multimode Mobile Transceiver</td>
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<td>TM250GE 45 watt 2m Transceiver</td>
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<td>TM25RE 46 watt FM Transceiver</td>
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<td>TM421E 70cm 35 watt Transceiver</td>
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<td>TS606GF + 6m Transceiver</td>
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<td>TM15BE 2m FM Transceiver</td>
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<td>TH15E 2m Handheld Transceiver</td>
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<td>TH15H 2m Handheld FM Transceiver</td>
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<td>R5000 General coverage receiver</td>
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<td>NS240HF 100-170MHz vertical</td>
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<td>R200 General coverage receiver</td>
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<tr>
<td>VCUHF2 Converter 118-174MHz</td>
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<td>HS2 De Luxe headphones</td>
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<tr>
<td>LF30A Low Pass Ftr</td>
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<tr>
<td>TM231E 50 Watt FM 2m mobile</td>
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<td>TM431E 35 Watt FM 70cm mobile</td>
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<tr>
<td>TM25 Dual Band 25 Watt</td>
<td>£465.00</td>
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<tr>
<td>FZ1 Wide Band Scanner</td>
<td>£10.32</td>
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50kHz to 1300kHz Gain 7dBi Typ
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<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
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<tr>
<td>Gain</td>
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<td>Frequency Range (kHz)</td>
<td>50-1300</td>
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<tr>
<td>Interface</td>
<td>100kHz</td>
</tr>
</tbody>
</table>

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R 5000 .................................................. £799
R 5000 inc ARA 30 .................................. £999

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(Including VAT & Carriage)

<table>
<thead>
<tr>
<th>Product</th>
<th>Price</th>
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<tr>
<td>4 Amp</td>
<td>£53.13</td>
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<tr>
<td>6 Amp</td>
<td>£78.72</td>
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<tr>
<td>12 Amp</td>
<td>£104.71</td>
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<tr>
<td>24 Amp</td>
<td>£151.34</td>
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<td>3 Way VHF Switch (SQ 239)</td>
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<td>3 Way UHF Switch (N Type)</td>
<td>£18.69</td>
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<td>2 Metre Preset A.T.U.</td>
<td>£24.15</td>
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<tr>
<td>Ripple and Noise &lt; 10mV Pk-Pk</td>
<td>£17.60</td>
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BDOS L14U-3-180 2m 3W in 180W out
BDOS L14U-10-180 2m 10W in 180W out
BDOS LP14U-3-100 2m 3W in 100W out
BDOS LP14U-10-100 2m 10W in 100W out
BDOS LP14U-180 2m 3W in 180W out
BDOS LP14U-3-180 2m 3W in 180W out
BDOS LP14U-10-180 2m 10W in 180W out
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RS-4070 Bell type rotary duplexer
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Dates: 13 and 29 Oct; 14 and 30 November
Times: 0300 to 0300 time clock (not GMT).
Use GMT on logs.
Sections: Single Operator Fixed, All Other.
Scoring: Radial Ring (will be normalised by adjudicator).
Adjudicator: Dr D A Verke, G4JLG, 40 Edge Fold Road, Worsley, Manchester, M28 4OF.
Rules: as per 1989.

1296 and 2300MHz CUMULATIVES
Dates: 21 October, 6 and 22 November, 6 December.
Times: 2000 to 2000 clock time (not GMT).
Use GMT on logs.
Sections: Single Operator Fixed, All Other.
Scoring: Radial Ring (will be normalised by adjudicator).
Adjudicator: D J Cannings-Bushell, G4AWD, 24 Blind Close, Evesham, Worcestershire, WR1 6TH.

ERIC MOLLART MEMORIAL TROPHY
H F DF EVENT
Date: Saturday 26 October 1989.
Times: 0800-2200 GMT
Sections: One section only
Scoring: Radial Ring.
Adjudicator: G4AWD
Certificates for leading fixed station (single op), and leading other station.
Full OTH information to be exchanged (see rule 13).

4 METRE CW CONTEST
Date: 6 December.
Times: 0600-1200 GMT
Sections: One section only
Scoring: Radial Ring.
Adjudicator: J Pillegs, G8HHI, 43 Barton Drive, Yateley, Camberley, Surrey, GU17 7DW
Certificates for leading fixed station (single op), and leading other station.
Full OTH information to be exchanged (see rule 13).

AFFILIATED SOCIETIES TEAM CONTEST 1990 RULES
1. General. As in 1989, provision of a checklist is required as a rather than a require-
ment, but it is hoped that all groups will comply and thus greatly ease the burden on the adjudication team. Contestants should be aware of the increased frequency allo-
cation for this year’s event, the top 20kHz of the allocated band are dedicated as the "QRP CORRAL" – it is intended that operators less experienced in CW and contest tech-
niques should be able to make contacts here in a more relaxed environment; expe-
renced operators using this segment should play fair and keep their speed right down.
Contestants are reminded that those who operate in a manner not within the spirit of the event render themselves liable to dis-
qualification, as do those who breach the rules.
2. When, 1300GMT to 1700GMT on Sunday, 9 December, 1990.
3. Teams. Teams comprise up to five stations. Each team represents a society or group which is affiliated to the RSGB, and each society may enter as many teams as it wishes. Which stations make up which team is determined by the society entering the event. Team placings will be determined by the total points scored by each station in the team. After checking, Club secretaries are held responsible for the entered log and must include a summary sheet (see 'Entries') for each team entered by the club.
4. Eligible Entrants.
(a) Each entering society must be affiliated to the RSGB.
(b) Each operator of a team station must be a member of the club he or she represents. The operator is not required to be a member of RSGB.
(c) All stations representing a club must be located within a radius of 50 miles of the normal meeting-place of the club. Where a society has "branches" eg RNARS, each team may define a separate 'branch' representing that station, and the list entered by that branch will be considered to be entirely separate from those entered by other branches, other than in respect of affiliation.
(d) Each station may be single- or multi-
operator, as best suits the club, but no station or operator may represent more than one affiliated society, or branch.
5. Contacts. CW (A1A) only in the band 3.510 to 3.590kHz be retained for slower-
speed contacts (the QRS CORRAL). Any stations, including overseas, may be worked for points.
6. Contest Exchange. RST and serial number, commencing with 001. No points will be lost if a serial number cannot be obtained from a non-competing station, but any contest exchange sent by that station should be logged.
7. Scoring. Each completed contact scores 10 points. Points may be deducted for errors or illegibility. Entrants are reminded that each unmarked duplicate contact for which points are claimed will be penalised at 10 times the claimed score, plus the score of the correct contacts, calculated at a rate of 110 points. Stations having more than five unmarked duplicates may be disqualified.
8. Logs and Entries.
(a) Logs must be typed or clearly written on paper meeting all reasonable standards. The log sheets (form HFC1) or on A4-sized paper, using blue or black ink. Standard lead-told paper, which differs only slightly in size from A4 is a satisfactory alternative. Computer-generated or hand-drawn log sheets which are acceptable to the adjudicator must correspond with the HFC1 format, i.e., forty contacts per A4 page, divided into groups of five and with the correct serial number arrangement (see below). Logs which are incomplete or illegible, or which differ from the correct format may not be adjudicated.
(b) Logs must show, for each contact, the following information, tabulated across the page: Time [where in HFC1 [call sign of station worked] RST and serial number received from station (Points claimed) 
(a) The Edgeware Trophy will be awarded to the leading affiliated society.
(b) The trophy will be awarded to the second and third-placed affiliated societies, and to the leading Scottish or Welsh affiliated society.
(c) A certificate of merit will be awarded to the station having the highest individual checked score.

Foreign entrants to RSGB VHF contests
I have been asked to look at the possibility of allowing foreign amateurs to enter RSGB VHF contests. The following rules have been agreed with members of the VHF Contest Committee:

A foreign amateur is allowed to enter any RSGB VHF contest (even though this may not be specifically stated in the individual contest rules) as long as the station entered is located within the boundaries of the United Kingdom (G, GD, GJ, GJ, GM, GJ, GU).

The foreign amateur must be a member of his or her own country’s national society, and must be able to prove when and if qualified. Logs.

The foreign amateur must enter a separate and if sufficient number enters a contest, then a certificate will be issued to the highest placed entrant. Foreign amateurs will be listed separately, and if sufficient number enters a contest, then a certificate will be issued to the highest placed entrant. Foreign amateurs will be entitled to take 'trophy sweeps'. The issue of certificates will be at the RSGB Contest Committee's discretion.

Foreign amateurs who are also members of the RSGB must also abide by the above rules, but there would be no need to show that they are members of any other society. RSGB members of national society on form 427-80 that membership can be proven.

Definition of major and minor errors in VHF Contests
In an effort to make things a little easier for contestants in VHF Contests, the Committee have drawn up a list of errors that occur in entries. I hope that you will understand that we are trying to reduce the bureaucracy and thus hopefully increase the number of contestants.

Minor errors will be noted and corrected by the adjudicator (no changes will be made to contact information - it's wrong you will lose points as per normal).

Major errors will be pointed out to the entrant, and the log returned for correction within one week (from date of posting back to the entrant). If nothing is received within the time limit no errors due to the entry will be made in the results.

Where an entry is clearly invalid (eg a /P entry in a listed station event) an note will be sent to the entrant asking if it can be used as a checklog. The entry will obviously be disqualified from the contest as an entrant.
Minor errors
1. Missing zone information on the 427-86 in zonal contests; the entry will not be valid for a zonal award but will be accepted as an entry.
2. Non-critical details of station equipment incomplete, eg antenna height omitted. RX described as operates 3000W.
3. Section omitted, but where other information on the 427-86 makes it clear which section is being entered.
4. Location omitted, unless in a county multiplier event.
5. Batch of information missing or rendered incomprehensible during checking.
7. Serial numbers issued in duplicate or out of sequence (although this depends on how bad it is and how often it occurs in the log).

Major errors
1. Declarations unsigned or not dated.
2. Operations not listed.
3. Final stage or power information missing.
4. Registration as per amended rule 16 not complied with (if necessary). Registration should be made with VHFC Chairman DTS before the event.
5. Incorrect stationery used; adjudicator to supply correct forms with reburned log.
6. Multiplier lists missing or in wrong format in County/County multiplier events.
7. Logs with missing contact information, eg no times or location.
8. Computer generated logs not complying with standard formats, eg too many QSO's per page or columns transposed.
9. Grossly inaccurate scoring (where this is not possible the adjudicator has a deliberate attempt to inflate the score).
10. Missing summary sheets in multiband, cumulative and AFS events.
11. Entries sent to the wrong address.
12. Missing declarations of club membership in AFS events.

Entries to be treated as check logs
1. Entries not eligible for any section in the event (eg P in fixed events). Entries to be advised first.
2. Entries to VHFC NFD from groups or individuals that have not registered their site.

Entries to be disqualified automatically
1. Entries from non-RGB members.
2. Entry where power declared exceeds contest limit.
3. Entries where Power Capability of equipment exceeds that laid down in Rule 16 (general rules, amendment), and equipment is not registered.
4. Entries where antenna declared exceeds contest limit.
5. ENTRIES POSTMARKED AFTER THE DEADLINE, or as agreed by the adjudicator (under exceptional circumstances, eg postal strike, proven illness etc).

Disqualifications to be discussed and agreed in committee
1. On grounds of poor signal complaints.
2. On grounds of gross errors, deliberate cheating, overscoring of contact points.
3. Following station inspection, where reasonable cause is found.
4. On grounds of non-observance of band plans or code of practice.

Notes
Please use the correct forms; these can be obtained from the RGB, or from VHFC Chairman G4DEZ QTHR - Please enclose stamped self-addressed envelopes.
Please in future enclose an SAE with your contest entry so that confirmation of receipt of entry can be made and also that notice of correction can be given. If there is no SAE and an error is found, the committee will not be responsible for lack of response.
Regarding multiplier lists see 'Country County Multiplier Contesters' information on page 50 of RadCom September 1989. If you are thinking of using computer generated logs, write to G4JLQ, QTHR for information on what is required.

VHF Field Day 1980
Possible Changes
Every new one again is like to stir things up a little bit, just to see if anyone is actually reading about VHF contests. There is always an undercurrent of new members, lurkers, or the odd gripe about VHF contests. The complaints range from we can't compete with the big boys to 'we don't have the power, the equipment, the antennas' or in fact any excuse that allows a group to lose gracefully! What I would like to do is to see if we could change things a little (or a lot) so that skill becomes a larger factor in what it takes to making winning group.

Here are my suggestions:
1. Two sections: Restricted 25W PEP output from the transmitter and only one antenna per band. Main section 25W output (yes twenty five watts PEP output from the transmitter), and multi antenna arrays allowed for each band.
2. Two sections: The first two the same as above, the third section allowed to use 4000W PEP output, DTL (4m 8, 6m, 2m) and multi antenna arrays. For those who have a power complex.
3. Do away with 13cm
4. Do away with 6m

Contests are for you the entrant! I would like to know your views, whether controversial or not, for instance why there is no restrictions on what they rather than kilometres. If you have views regarding VHF Field Day this is your chance to air them. If the response is wide enough I will try to answer your questions, possibly make changes, and renew the whole subject on the pages of RadCom.

Bryn Lewellyn, G4DEZ QTHR

RESULTS
NATIONAL FIELD DAY RESULTS
Please note that the National Field Day results will appear in the November issue of RadCom.

144MHz and SWL CONTEST MAY 1989
This contest was blessed with excellent conditions over most of the UK and USA sections. Of GM, GD and GU lining the going rough. The band was wide open into DL, OK and CZ for many hours on both days with one report of an HA having been heard. Several stations commented on the lack of scatter on the band, perhaps as a result of a more responsible attitude from contestants or maybe a lack of activity from within the UK.

There were some objections to the fact that the contest coincided with a Bank Holiday, and there were also comments from operators as regards the scoring of the system and its supposed bias to the South East (I'm sure I can remember contests being awarded to Gi back in medieval times - G4DEZ).

Congratulations to all the winners and runners-up, and thanks to everyone else who entered for an excellent set of logs. Certificates will be awarded to G4APA/P and G8CDA/P in the Multi Op section, and G4G9SP/P and G8CDA/P in the Single Op and RSBS1976 in the SWL section.

G4AWD

RSGB HF-DF QUALIFYING EVENT - SOUTH MANCHESTER
10th June 1989
The 1989 South Manchester Direction Finding Contest was held on Ordnance Survey Map 118 (Stoke on Trent and Macclesfield Area). The starting point was at the premises of Mr Chris Plummer, GA7GPB, in a field 153456.S. Trevor went to Transmitter 'B' first and then to Transmitter 'A'.

The full results are as follows:

<table>
<thead>
<tr>
<th>Name</th>
<th>Club</th>
<th>Time in Seconds</th>
</tr>
</thead>
<tbody>
<tr>
<td>G COLE</td>
<td>GM4LPM</td>
<td>15:34</td>
</tr>
<tr>
<td>1 Gage</td>
<td>Mid Thames</td>
<td>15:34</td>
</tr>
<tr>
<td>2 Foster</td>
<td>Mid Thames</td>
<td>15:35</td>
</tr>
<tr>
<td>3 Newman</td>
<td>Mid Thames</td>
<td>15:35</td>
</tr>
<tr>
<td>4 C Plemmer</td>
<td>South Manchester</td>
<td>15:55</td>
</tr>
<tr>
<td>5 D Holland</td>
<td>South Manchester</td>
<td>15:55</td>
</tr>
<tr>
<td>6 M Sand</td>
<td>South Manchester</td>
<td>15:56</td>
</tr>
<tr>
<td>7 G Whelan</td>
<td>Coventry</td>
<td>15:56</td>
</tr>
<tr>
<td>8 W Fasch</td>
<td>Mid Thames</td>
<td>15:59</td>
</tr>
<tr>
<td>9 P Lyke</td>
<td>Mid Thames</td>
<td>16:03</td>
</tr>
<tr>
<td>10 C Aplin</td>
<td>Cheesemold</td>
<td>16:06</td>
</tr>
<tr>
<td>11 B Broke</td>
<td>Mid Thames</td>
<td>16:06</td>
</tr>
<tr>
<td>12 G Nicholas</td>
<td>Bankbury</td>
<td>16:10</td>
</tr>
<tr>
<td>13 C Malm</td>
<td>Bankbury</td>
<td>16:10</td>
</tr>
<tr>
<td>14 E Chan</td>
<td>Mid Thames</td>
<td>16:30</td>
</tr>
<tr>
<td>15 R Brewer</td>
<td>South Manchester</td>
<td>16:30</td>
</tr>
</tbody>
</table>

Trevor fostered and Derrick Newman can quality for the RSGB National Final. Tea was served at the Coach and Horse Inn where the Cup was presented to the Winner, Mr Trevor FOSTER and GA7G2B and G8CDA/P in the Single Op and RSBS1976 in the SWL section.

G4AWD

RSGB HF-DF QUALIFYING EVENT - NORTHAMPTON
25th June 1989
Nine of the fields assembled in bright sunlight on the picturesque banks of the Pitsford Reservoir some ten miles north of Northampton, at 1300hrs.

Despite the fact that one Tx came on the air some seven minutes late (because it was so well hidden that the operators had difficulty finding it), the event was very successful, with the majority of operators being pleased with the two very good signals.

Bearings were taken for nine and a teenis and spread off into the Northamptonshire countryside. Both transmitters were within 9km of the start and were about 5km apart. However they proved to be very difficult to find.

Station 'B' manned by GA4ZUKP/Eric, was located in Blue Cover in dense undergrowth and Blackthorn bushes. This Tx proved just as difficult for the competitors to find and they expressed their frustration in no uncertain terms.

The success of the contest was reflected in the results, the winner not finding his second station until after 1600hrs, but most competitors finding both before the end of the event.

Trevor was pleased with the contest at Yardley Gobion Village Hall on the Northwich and Other places were presented to Chris Plummer and Andy Collett who then told how they had struggled through the afternoon.

Thanks are due to Mrs Sue Lineham and her band of helpers for the tea of course to Eric Young and Steve Stanton for organisation.

The full results are as follows:

<table>
<thead>
<tr>
<th>Time in at Reception</th>
<th>Time in at Final</th>
<th>Name</th>
<th>Club</th>
<th>Time in Seconds</th>
</tr>
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<tbody>
<tr>
<td>D ECE MBER 1988</td>
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<td>G COLE</td>
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<td></td>
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<td></td>
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<td>15:55</td>
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<td></td>
<td></td>
<td>5 D Holland</td>
<td>South Manchester</td>
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<td></td>
<td></td>
<td>14 E Chan</td>
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<td>16:30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>15 R Brewer</td>
<td>South Manchester</td>
<td>16:30</td>
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</tbody>
</table>

Contest News

CONTEST NEWS

70MHz CW CONTEST DECEMBER 1988
We apologise for the delay in publishing these results - we hope this hasn't given contestants too many sleepless nights!

Propagation conditions still confound on this band. The previous day's high pressure and fine weather did not provide stations with the results and activity expected. QSB and noise created problems. Leading station contact rates were compatible with the previous two years, the majority of stations being restricted to one contact. GM0FRT gave five stations their best DX, but only managed six contacts.

We apologise to contestants if they missed the contest owing to an error in dates published in RadCom. This was beyond the control of the committee. Congratulations and certificates to both the winner ES9BP/P and the runner-up, GA4RFA.

GM4EIR
HF DF QUALIFYING ROUND, SALISBURY 1989

16 teams assembled on Sunday 16 July for the Salisbury RSCB of Qualifying Event. The starting point was a beauty spot at Vorey Hill, high up and overlooking the New Forest. Good signals were received from both stations.

The ‘A’ station did appear to be further from the sea site and most (as expected) headed for it first. Perhaps here the problem was finding the easy approach to West Moors Plantation from the main A31, G3TRY/Pathfinder hidden in thick and deeply tunnelled ground. If the right gate was found it was not too far to walk.

It was a very hot day and summer traffic added to the hazard getting over to the ‘B’ station. G3ZNW/P, hidden in ferns and bracken (plus decoy aerials), was near Fritton towards the north-east corner of the Bournemouth map.

The excellent tea was organized by Margaret (XXL of John, G3ZNH) at the Activity Centre, Salisbury. Out-stations were operated by members of the Salisbury Radio and Electronics Society and the event was managed by our chairman Sir Evan Nepan, G5YN. We do appreciate the great support given by so many from around the country.

G32DFX
**RESULTS - 7MHz**

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<th>Points</th>
<th>Points</th>
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<td>G3DBP</td>
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**RESULTS - 3.5MHz**

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**RESULTS - 1.8MHz**

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Checklog received with thanks - G36CC

**CONTEST LOG SHEETS**

Readers are reminded that both HF and VHF logsheets are available from Headquarter's in packs of 100. Prices (which include postage and packing) are £3.29 for RSGB members and £3.87 for non-members. When ordering please remember to specify which type of log sheet is required. Send your orders to: RSBG Sales (CWO) Lambda House, Cranborne Road, Potters Bar, Herts EN6 3JE.
CONTEST NEWS

432MHz TROPHY RESULTS

In an effort to reduce the number of individual and Trophy contests, the following were included in this one as an experiment. Opinions were mixed on the success of this format, the majority of entrants welcoming the inclusion of the 432MHz Trophy at the start of the contest but most seemingly wanting the 1296MHz and 2300MHz Trophies on a different weekend.

It was hoped that the separate Trophy sections would help boost activity and possibly help the smaller groups who are unable to man all bands for the full 24 hours to achieve a better overall result. Activity did increase, particularly on the lower bands, and was aided by enhanced propagation overnight. Those who continued operating on 432MHz after the Trophy had finished enjoyed good contacts into DL, HB, and F. Conditions remained good for the majority of the first few hours of the 1296MHz and 2300MHz Trophy section on Sunday morning, but died once the sun warmed up. The resulting quandary over whether to work the DX before it fades away or to wait until the contest starts possibly explains why more stations than expected chose to ignore the 1296MHz and 2300MHz Trophy sections and operated in the 24 hour section.

Unfortunately, few groups took equipment for the higher bands, possibly as a result of trying to concentrate resources for a good result in the Trophy sections. Activity suffered as a result. Despite this it is encouraging to see an increase in the number of contacts made on 10GHz and also that Wutruf tried, albeit unsuccessfully, on 24GHz. G6DER had a system working on 5.7GHz even though he didn’t hear anything all weekend!

There were the usual statutory complaints about the East Coast stations not coming in strong enough, but as G6PFI commented the points are all lost when a station breaks down and DXers beam away from the main DX pool and while there is more activity there than in the UK what is the incentive? Any suggestions?

Last year the idea of arranging the 10GHz Cumulatives to coincide with this contest was mooted, but only very little feedback on this point was received. Does this mean that it is not wanted? Your comments, please, as it is difficult to know what is wanted until you tell us.

Oh, and while you’re writing, would it be better to put the 1296/2220 Trophy on:

(a) the beginning of the October UHF contest?
(b) the first weekend of June which would coincide with the continental contest but clash with HF NDF?
(c) or a totally separate weekend without the benefit of any co-ordinated continental activity?

In the Overall event G6DER and Hadrats and Tarts CG won their respective Single Operator and All Other Sections once again — well done.

The 432MHz Trophy (1951 Council Cup) winners were G6FYP/UP the Sheppy Trophy. The 1.3GHz Trophy (WFT Trophy Committee Cup) and the 2.5GHz Trophy (GZER Trophy) were won by The Northern Lights, G4XUV/ P and G6EMD/P respectively.

Thanks once again to all the participants in this event and congratulations to all the certificate winners.

GNNBS

CONTESTS CALENDAR

RSGB HF CONTESTS

<table>
<thead>
<tr>
<th>Date</th>
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<th>Rules</th>
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<tbody>
<tr>
<td>8 Oct</td>
<td>21/28MHz Phone (Aug98)</td>
<td></td>
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<tr>
<td>9 Oct</td>
<td>28MHz Cumulative (Aug98)</td>
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<tr>
<td>10 Oct</td>
<td>21/28MHz CW (Aug98)</td>
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<tr>
<td>17 Oct</td>
<td>28MHz Cumulative</td>
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<tr>
<td>25 Oct</td>
<td>28MHz Cumulative</td>
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<tr>
<td>31 Oct</td>
<td>Mollan Memorial Trophy HF DF Event (Oct98)</td>
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<tr>
<td>2 Nov</td>
<td>28MHz Cumulative</td>
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<td>2 Nov</td>
<td>28MHz Cumulative</td>
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<tr>
<td>11 Nov</td>
<td>Club Calls Contest ‘CCC’ (有名)</td>
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<tr>
<td></td>
<td>Second 4.8 MHz CW (Sept98)</td>
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<tr>
<td>1990</td>
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<td>24 Feb</td>
<td>7MHz CW Contest (Aug98)</td>
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<tr>
<td>14 Jan</td>
<td>1994 AFS Team Contest (Oct98)</td>
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RSGB VHF CONTESTS

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<td>432MHz/24GHz/14/4UHF/SHF</td>
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<td>14/4MHz Fixed &amp; AFS &amp; SWL</td>
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<td>5 Dec</td>
<td>1/24GHz SHF (Oct98)</td>
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<td>70MHz CW Contest (Oct98)</td>
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OTHER CONTESTS

- Australian Ladies Amateur Radio Association Contest (Aug98)
- 13 Jan, 1999 DYLIC Mid-Winter Contest (Aug98)
- First Tuesday each month 14/4MHz Scandinavian VHF/UHF/SHF Activity Contest (Jan98 VHF/UHF)
- First Thursday each month 432MHz Scandinavian VHF/UHF/SHF Activity Contest (Jan98 VHF/UHF)
- First Wednesday each month Microwave Scandinavian VHF/UHF/SHF Activity Contest (Jan98 VHF/UHF)

Dates of publication of rules in RadCom are shown in parentheses

1988 432 MHz CUMULATIVE CONTEST

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<tr>
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<td>G4GR/</td>
<td>3200</td>
<td>823A</td>
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Check logs gratefully received: G2DVH, G4NBS, G2QKY, G4AJF, G4DRM, BR21976
LOCAL AFFILIATED SOCIETIES AND CLUBS

The following list shows all the societies and clubs which are currently affiliated to the RSGB. The details of where the club meets, contact person etc were the best available at the time of going to press. If you have any corrections or additions to this list, please give them to your RSGB Regional Liaison Officer (RLO) whose details are shown at the start of every county. Each club is listed under the administrative county or Scottish region in which it regularly meets. For example the clubs which meet in the greater postal district of Kent can be found in the Greater London section, likewise the Todmorden club is listed under West Yorkshire despite having a Lancashire address. Some affiliated societies, eg contest groups, do not hold formal meetings, and details as to where other clubs have met proved impossible to obtain. These societies have therefore been listed under the county of their RSGB registered address.

Each county is assigned to an RSGB Zone and elects a Zonal Council Member. There are 7 Zones (A to G) and their Zonal Council Members are:

Zone A: (Northumberland, Tyne & Wear, Co Durham, Cleveland, North & South West Yorkshire, North Hampshire, Cheshire, Greater Manchester, Lancashire, Isle of Man, Cumbria)
  Goff Smith, G4AJJ, “Greenacres”, Sawton, Scarborough, North Yorkshire YO12 5YS. Tel: 0723-85845.

Zone B: (South: Hereford & Worcester, Derbyshire, Northamptonshire, Lincolnshire, Shropshire, Staffordshire, Shropshire, Leicestershire, Cambridgeshire, West Midlands, Hertford & Worcester, Warwickshire, Northamptonshire, Bedfordshire)
  John Allen, G3DOR, 4 Philip Avenue, Waltham, South Hampshire D33 0QB. Tel: 0472-852599.

Zone C: (North: Norfolk, Suffolk, Essex, Herefordshire, Essex, Greater London, Surrey, Kent, East & West Sussex)
  John Greenwell, G3EAS, Eastleigh, Beare Green, Dorking, Surrey RH4 5W. Tel: 0730-797236.

Zone D: (Gloucestershire, Oxfordshire, Buckinghamshire, Avon, Wiltshire, Berkshire, Somerset, Cornwall, Devon, Dorset, Hampshire, Isle of Wight, Channel Islands)

Zone E: (Gwynedd, Cwmd, Dyfed, Powys, West & Mid South Glamorgan, Gwent)
  John Case, G4WHR, 2 Abbey Close, Tyrwhit Taffs Well, Mid Glamorgan CF4 7RS. Tel: 0222-810368.

Zone F: (Co Londonderry, Co Antrim, Co Tyrone, Co Fermangh, Co Armagh, Co Down)
  Terry Barnes, G2SUQ, “White Gables”, 95 Crawfordborough Road, Bangor, Co Down, BT1 1BJ. Tel: 0247-974288.

Zone G: (Shetland, Orkney, Western Isles, Highland, Grampian, Tayside, Strathclyde, Cynwival, Fife, Lothian, Dumfries & Galloway, Borders)
  Frank Hall, GM4BZX, 45 Priory Cottages, Lunanhead, Forfar. Angus DD6 3NQ. Tel: 0397-075675.

AVON

Council Zone: D
RLO: Shaun O’Sullivan, G8VPQ, 15 Witney Close, Salford, Bolton, BL1 3DX. Tel: 0205-873598.

BATH & BRISTOL, G4TAA. Meets 8.00pm on alternate Wednesdays in the month, at Bathwick Institute, Bath, Bath BA1 1BA. Tel: 0225-231166.

BATH UNIVERSITY RC, G7JBU. Details c/o 36 Church Parade, Farnham St John, Bath, Bath BA1 3DJ. Tel: 0225-951451.

BRISTOL ARC, G3TAD. Meets 7.20pm on Tuesdays, at St Andrews Saxon Hm, Fivemile Lane, St George, Bristol, BS1 5TD. Tel: 0743-463737.

BRISTOL, G5OQ. Details of meetings on the last Monday of the month at the Smeat Lecture Theatre, University of Bristol, University Walk, Clifton, Bristol. Details from Tony Critten, G5OQB, 23 Roman Avenue, Lockleeze, Bristol BS7 6ST. Tel: 0272-512573.

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BRISTOL, G3540. Details of meetings on the last Monday of the month at the Smeat Lecture Theatre, University of Bristol, University Walk, Clifton, Bristol. Details from Tony Critten, G5OQB, 23 Roman Avenue, Lockleeze, Bristol BS7 6ST. Tel: 0272-512573.

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Tuesday in the month, at Marcon College, Arbor Lawn, Extonton, Essex. Details from G. Wilson, G4HF, 21 Borestone Close, Chelmsford, Essex, CM4 9YD. Tel: 0245-260381.

SLADES ADVANCED radio society (SLAR). Monday nights in the month, at Elmcroft House, Caister, North Norfolk. Details from Mr I Nucifora, G4SLA, 406 Sheringham Road, Caister, Norfolk, NR28 9BD. Tel: 0263-422595.

SOFTWELL RADIO STATION (SOFT). Meetings alternate Thursday evenings, at New Cross, Croydon. Details from Mr D Johnson, G4SJX, 21 Benfield Close, New Addington, Croydon, CR0 8BF. Tel: 01-6653426.

E X M O U T H A R C . G 4 H 0 8 . M e e t s a l t e r n a t e T h u r s d a y s d e t a i l s a t G 4 T E K .

DORSET Council Zone: D

RLO: Post vacant, please refer to Zone D Council Member.

Bournemouth RC, G4BSB. Meets 6pm on 1st and 3rd Tuesdays in the month, at Bournemouth RC Club, Bournemouth. Details from Mr R Bowen, G4BSB, 14 Garden Road, Poole, BH1 1SU. Tel: 0202-922572.

Plessey (Christchurch) ARC, G4SSB. Meets 8pm on 1st and 3rd Tuesdays in the month, at Plessey House, Christchurch. Details from Mr G Sibson, G4SSB, 12 Boundary Road, Christchurch, BH23 1SS. Tel: 01202-677283.

Dorset RSS, 5E6RS. Meets 8pm on the 2nd Tuesday in the month, at Dorset County Hall, Parkstone, Poole, BH14 0LG. Tel: 0202-222822.

Dorset TRF, G4DPR. Meets 7.30pm on the 1st Tuesday in the month, at Wareham Priory, Wareham, BH20 2QJ. Tel: 01929-55222.

Dorset SRS, G4DSG. Meets 7.30pm on 1st Tuesday in the month, at The Wessex Centre, Parkstone, Poole, BH14 0LG. Tel: 01202-55222.

Dorset Amateur Radio Society (DARS), G4QQQ. Meets 7.30pm on the 1st and 3rd Mondays in the month, at The Community Centre, Victoria Road (near bus stop), Bournemouth. Details from Mr R Chadwick, G4QQQ, 12 Station Road, Bournemouth, BH9 2JN. Tel: 01202-55222.

DORCHESTER Radio Club, G4DPP. Meets 7.30pm on Wednesdays in the month, at St Mary's Church, Dorchester, DT1 1SU. Tel: 01300-240200.

Details from Mr T H Dyer, G4DPP, 86 High Street, Dorchester, Dorset, DT1 1SU. Tel: 01300-240200.

Dorset TRF, G4DPR. Meets 7.30pm on the 1st Tuesday in the month, at Wareham Priory, Wareham, BH20 2QJ. Tel: 01929-55222.

Dorset SRS, G4DSG. Meets 7.30pm on 1st Tuesday in the month, at The Wessex Centre, Parkstone, Poole, BH14 0LG. Tel: 01202-55222.

POOLE RAS, G4GFS. Meets 7.30pm on the 1st Tuesday in the month, at Poole Town Hall, Poole, BH18 1TS. Tel: 01202-752322.

DORCHESTER rc, G4GHz. Meets Thursday evenings in the month, at The Jolly Sailor, West Street, Dorchester, DT1 1SU. Tel: 01300-240200.

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S.E.M. QRM ELIMINATOR
Do you suffer from local interference? The answer is probably yes. If you moved your receiver into the country you would be amazed how quiet your reception would be. The noises you hear on the H.F. bands are produced by local electrical equipment.

This completely new idea, developed by S.E.M. can provide the complete removal of any of these problems. You don't even have to know where or what the source is. It can be your own computer next to your receiver or r.f. welding equipment in a factory several miles away.

The QRM Eliminator connects in your aerial lead (you can transmit through it) and requires an auxiliary aerial (this can be any other aerial e.g., a 2 metre one, or a few metres of wire, because wide band amplifiers are used to boost the level of the QRM). Your welcome signal will arrive at the two aerials slightly out of phase and by adjusting the phase of the signal from the auxiliary aerial with the Eliminator controls, you can completely remove it.

*BEFORE IT ARRIVES AT YOUR RECEIVER.*

Forget all the inadequacies of noise blankers, this is a new, different, concept. Sceptical? As W4CXX in Florida says: "The power line noise is S 7 and you are coming through 5". Practical Wireless review says: "Does it work? Yes it does." Other comments "A remarkable achievement," "It works like magic", "It even eliminates rain static" and comments about being able to operate again after years of enforced inactivity because of some local problem not previously curable or even traced, are many.

Size: 6" x 2" x 3" deep Sockets SOC39s Supply 12 V (10-14) 30 mA.
Frequency range 500kHz - 60 MHz continuous. May be transmitted through.

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"I found it quite easy to select the correct tuning point."
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AND ELECTRONICS FAIR

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**LLANDUDNO**

on Saturday/Sunday, 4th/5th November 1989

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<table>
<thead>
<tr>
<th>Description</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 x 232c40x serial unit</td>
<td>£15.18</td>
</tr>
<tr>
<td>BHT MICRO R532 lead</td>
<td>£7.95</td>
</tr>
<tr>
<td>PC-320 dual port PC card</td>
<td>£99.00</td>
</tr>
<tr>
<td>MICROCHIP PK 124</td>
<td>£2.49</td>
</tr>
<tr>
<td>Real Time clock option</td>
<td>£27.95</td>
</tr>
<tr>
<td><em>835 handset</em> backup</td>
<td>£45.00</td>
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- 220/110V G570B TUNER (£5)
- CF19-100, m/s £74 G4QVD OR (Loughborough) 01532 631774
- MENTOLA XGC17 F17 Blackmark merit £20 OTR TUNER. Mint cond. £295.
- 220/110V G589B TUNER (£5)
- FT207B, excellent condition, £350.
- 14M4 £125/£150 (09375 462919)
- MINOLTA X1G2 SLR F17 Blackmark merit £95 OTR TUNER. Mint cond. £125.
- MINOLTA X1G2 SLR F17 Blackmark merit £95 OTR TUNER. Mint cond. £125.
- FT207B, excellent condition, £350.
- CONRAD 620 TUNER (£50)
- TEKTRONIX 547 scope with 1 x 1 pA probe and inc. cable stand. £80. 800AF QRP £15. Buyer select c텐rary or arrange own. (G4QVD OR, Reading) 0181 274 9720
- Tektronix 547 scope with 1 x 1 pA probe and inc. cable stand. £80. 800AF QRP £15. Buyer select c텐rary or arrange own. (G4QVD OR, Reading) 0181 274 9720
- SWR5424S red,{orange, £50. (G4QVD OR, Reading) 0181 274 9720
- TEKTRONIX 547 scope with 1 x 1 pA probe and inc. cable stand. £80. 800AF QRP £15. Buyer select c텐rary or arrange own. (G4QVD OR, Reading) 0181 274 9720
- SWR5424S red,{orange, £50. (G4QVD OR, Reading) 0181 274 9720
- BARGAIN of the month. Station self-up to 1500watts. £150. 220/110V G570B TUNER (£5)
- WEIL AC38M ATU, Portside top-band ATU. £440, inc. 150-1000kHz. With both units. G4QVD OR (Loughborough) 01532 631774
- YAESU FT810 £200 tight fit otr w/chg. Exc cond. £100 G4QVD OR (Bristol) (£5)
- YAESU FT817G with MX, AM/FM board, CW, 40 watt output. £300.
- YAESU FT817 £250G4QVD OR (Bristol) (£5)
- FT120 with mic, FM/AM board, filters, manuals. £50. Spare set of 3 matched 1486 £32. £32 nib
- FT120 with mic, FM/AM board, filters, manuals. £50. Spare set of 3 matched 1486 £32. £32 nib
- YAESU FT817 £250G4QVD OR (Bristol) (£5)
- FOR collectors. Cosmos. Gochocafe, Varley, I/Ramenski LTFs. LFCs. Variable clamping input unit (£50)
- FT207B, excellent condition, £350.
- 2M05T500G4QVD OR (Loughborough) 01532 631774
- SIMCLARK Ox, computer and teletype terminal. (£150)
- HXB1100 £100. (£5)
- LEO D594 220/110V (£75)
- LEO D110 220/110V (£75)
- A286, 220/110V (£75)
- FROZ, 2m vhf HR digital radio £1350. 2m/6m both inc. £1500. (G4QVD OR, Reading) 0181 274 9720
- 2220/110V G570B TUNER (£5)
- 2220/110V G570B TUNER (£5)
- CONRAD 620 TUNER (£50)
- TEKTRONIX 547 scope with 1 x 1 pA probe and inc. cable stand. £80. 800AF QRP £15. Buyer select c텐rary or arrange own. (G4QVD OR, Reading) 0181 274 9720
- RAW TEXT END
**EXCHANGE**

**MEMBERS ADS**

- YAEUS YV1QD0M est digital VFO cev leads and manual please. Piers, G4XNY OTH(4).
  \- YAOE+ vessel digital VFO leads and manual please. Piers, Q4XNY OTH(4).

- **WANTED**
  - YAESU FT87B HF SSB receiver, 20m, £120.
  - FT850. 1000W 2M, £350.
  - BURLINGTON
  - EDDYSTONE paneters for early Merlin dictating machines and for Garand tape decks. Also early U.S. military equipment. Tony, T1F0. 0734 35531.
  - On Offer: MMBE 3M T9207. £20.
  - MBB 2M FT895. £1000.
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TRIO R300 RECEIVER

Secondly, very many thanks to the three fund seeking units who were put on display in the Ecuadorian Territories by the "Help Lines", and to a few others whose names you will no doubt remember. We are very grateful to have had the opportunity to launch a new campaign for the Trio R300 receiver. This is the first unit to be found on display in the amateur bands. At this moment, we have three special cases for the Trio R300 receiver. One of them is for "On the Air" and the others are for "In-Depth". We have very few cases available, but you can still order them.

AKAI 1721 TAPE RECORDER

CIRCUIT

On the basis of a good consumer product, the Akai 1721 is a tape recorder which has the advantage of being able to say anything, and this in combination with a well-designed tape recorder and says "All systems are running, along with lots of gratitude." Sounds good - audiohops, have a listen to our new Akai 1721 and see if you like it. Mr. Rodgers' address is 9 Highclere, Tawbridge, Up Holland, Lancs WA6.

SPERRY MAP DISPLAY

Mr. B. GAYE, an electronics engineer and problem-solver, has just produced a new map display which he calls the "Sperry Map Display" (SMD) which requires the use of a "Sperry Map Display" (SMD) in order to complete the restoration of a complete Sperry navigation system. Although likely to be rare, I note that a number of the Sperry display units were used in the South of England last November. This consisted of a great variety of equipment, from the simplest to the most sophisticated.

MARINE HF ANTENNAS

Another DX family from Mr. M. HARRIS, GHICH, who is currently operating in Coventry, has just released a new model of the NPS Mobile Radio using his car. This is the latest DX version of the Sperry Map Display. Mr. Harris, who has been using this equipment in his car, has never been satisfied with the results.

FISHER TUNER-AUFMERKER MODEL 234

"Looks like you're my last hope," writes Mr. G. OAK, G4WUO. "The Sperry Map Display" is a fantastic device. I was very pleased to hear that you are currently operating with a model 234 Fisher tuner, and I am sure that any of our friends who are using this model will appreciate your efforts.

HUNTINGTON

"Thanks for all your help," replies Mr. G. OAK, G4WUO. "We are very pleased to see that you are continuing to use this model. We hope that it will continue to be successful.

BRENTWOOD

"Thanks for all your help," writes Mr. G. OAK, G4WUO. "You have made a great contribution to the world of amateur radio, and we hope that you will continue to do so."
This is a list of all rallies, exhibitions and conventions notified to HQ (as at picture date) and gives information for the next three months inclusive and in brief thereafter. Please send detailed information, including contact call-sign and telephone numbers direct to HQ and Amateur Radio News - Diary.

MOBILE RALLIES


19 JULY 1990

Kendal and District Mobile Rally at Roadway Youth Centre, Kendal, Cumbria. Details from John Johnstone, G3OJW on 0709 220221. Pre-ARC 60MHz ORP Convention. Details G1CMH (OTHR).

24 JULY 1990

Icy of Bristol Group 33rd Annual Lightning Rally. Details from John Johnstone, G3OJW, 0709 44627.

Other Events

1 OCTOBER

ISBG HF Convention - Bailey Hotel, Milton Common, Oxford. Doors open 9.30am. Admission £5.00. All the usual ISBG Committee stand, presentations of trophies. Young Amateur of the Year Award, full lecture programme. Details: Martin Atherton, G023ZK.

10 OCTOBER

Flight Refuelling ARS - DF Hunt in the Purbeck Hills.

21/22 OCTOBER

22 OCTOBER

 convertible car show at the Arundel Motor Show. Details from John Johnstone, G3OJW, 0709 44627.

27/28 OCTOBER

Leicester Show - Granby Halls, Leicester. Do not miss the Convention, or 1000 early each day. Admission £5.00. Details from John Johnstone, G3OJW, 0709 220221. Pre-ARC 60MHz ORP Convention. Details G1CMH (OTHR).

4 NOVEMBER

North North Devon Rally - Bradford Meeting Hall (near Heatons). Admission £5.00. Details 0709 44627.

15 NOVEMBER

Welsh Wales Amateur Radio & Electronics Rally. Penygroes Country Park, Llanelli. Gates open 11am both days with talk in on S22 and 70cm Details Gogy, GDY, 0492 571875 (afternoons-eweekends).

19 NOVEMBER

West Manchester Rally - Wotton Grange Hotel, Chester. G3OJO 0702 540416 evening. Midland ARS - Birmingham Mini-Mobile Rally (Venue to be advised) Details Norman, GWBCHE, tel. 021-422 9787.
GB CALLS
The list below shows all special event stations licenced for operation during this month (as at press date). It is taken direct from the GB Calls file on the HQ computer. These calligns are valid for use from the date given but the period of operation may vary from 1 to 28 days. The calligns in parentheses is the source for further information.

1 OCTOBER
K8BSTU COASTAL DEFENCE STATION Z G0LW
K8BDWC EAST WICKHAM CURS G0HA
K8BPZA RED ROSE AWARD G0BJ
K8BRRR RED ROSE RALLY G0JJ
K8BPSC FIRE SAFETY WEEK GYII
K8BDBS BRITISH MUSEUM G0FO
K8BECN CUMBERLAND COUNTY COUNCIL G0C3
K8BPRA RED ROSE AWARD G0FP
K8BPGR RED ROSE SILVER G0GQ
K8BSJL JUBILEE SAILING TRUST G0GS
K8BHEY KNOWSLEY HEY SCHOOL G0GZ
K8GBJJ RED ROSE GOLD G1DD

2 OCTOBER
K8BCDR CIVIL SERVICE RADIO G1AS
K8BCLP CENTRAL PROCESSING UNIT G0GG
K8BSKX \X\ NETT EXPEDITION G4LX

4 OCTOBER
K8BBTU JUBILEE FAMILING TRUST G0JS

5 OCTOBER
K8BDTH TIMOTHY HAWKCOM SOCIETY G1CQ
K8BDLP LORD BADEN POWELL G3YQG
K8BDUL UNIVERSITY SILVER JUBILEE G0JJ
K8BDXX 25TH ANNIVERSARY BRISTOL ARC G3JX

6 OCTOBER
K8BFDH FRIENDS OF HIGHFIELDS GOWSH
K8BDHA HEMET COMPREHENSIVE SCHOOL G0HM
K8BDWJ SAM BROOKE WORTH G3CQG
K8BGJG GOLDEN JUBILEE G0YL
K8BGSD METHODIST CHILDREN'S WEEKEND G0PM
K8BGRS QUANTON ROAD RAILWAY STATION G0PS
K8BHFJ HOUGHTON FEAST G0AF
K8BDCB OPEN BIRTHDAY CAMP G0L

7 OCTOBER
K8BGCL COASTAL DEFENCE G0GHZ
K8BECQ CONCOURSE ELECTRICAL LTD G0XL
K8BGER EAST LODDEN HALL G0GB
K8BAPC ALLMENBURGH PARISH CHURCH G0CGU
K8BEPQ ESSEX LITE GROUP G0CG
K8BLMB NATIONAL LIFEBOAT INST G0HL

8 OCTOBER
K8BDLC MAGNUS DRIVER'S CLUB G0DF

10 OCTOBER
K8BDHR N WALES RALLY GOWDSJ

12 OCTOBER
K8G2BES SEVENTH BRACKNELL SCOUTS G8BRU

13 OCTOBER
K8G2RCC RADIO CARAVAN CAMPING G4EPN

14 OCTOBER
K8G207 R 101 AIRSHIP G0GB

15 OCTOBER
K8B1DKX COASTAL DEFENCE 'K' G0JU
K8B2WV WATSON FRS G0GW
K8B2CDY COASTAL DEFENCE 'Y' G0JU

20 OCTOBER
K8BROPG PENINKSCOT SCOUT GROUP G0G0J
K8B2UM JAMESBRED G0HGR
K8B4RCS FIRST COULSOON SCOUTS G0SC
K8B2SMG ST AMHURS G0L

21 OCTOBER
K8BSJAMS HER MAJESTY'S SHIP G0ER
K8BSBBS SIGNAMORE SCOUTS G0PP
K8B300 680 YEARS NORTHAMPTON CHARTER G0GV

25 OCTOBER
K8B3RCO COASTAL DEFENCE G0IP
K8B3FPC SCOTTISH POLICE COLLEGE G0MDT

27 OCTOBER
K8B4SPC HAYLING ISLAND G0MHS

G-PLATES - A WHILE YET
I do not normally bother the Society with letters, being one of the majority of members who are very concerned that it is grateful for the work you do all for us. But I must write and say how much I appreciate how you can arrange for us to be able to have 'G' licence plates for our cars, in my opinion the vast majority of members will be very happy to have this facility, though of course there a school who will decline on the grounds that it advises potential buyers of one's absence from home. A very valid point I am sure - but that, of course, is up to the individual member's judgment.

Reading the press on the topic of the cost of specialised number plates it is horrifying to see the prices asked by the specialist dealers in the Sunday papers. Hopefully, as there is no competition for a callign plate, which is only saleable to one person, the DOT will charge a reasonable price. I would consider something in the order of £50-£100 as reasonable and such a price would I am sure, bring a massive response from members. It goes without saying that I would expect the RSGB to collect a commission on each sale.

I wish you good luck with the DOT and look forward to hearing of a positive result in the near future.

Once again, thankyou for all you do for RSGB and us members.

H Kirkland, G4EFG

The last...
WARC Bands by Bob Whean, G3PUT - I was indeed inspired to get 'going on' 18 and 24MHz. Fortunately my full size G5RV antenna tunes up very nicely on 18 and 24MHz and I very soon got going as encouraged. However, I feel it worthwhile to mention that a 'special' for me was my first RTTY contact on 18 and the unqualified mutual pleasure in RTTY with Felix, CT1HB on 22 July will be long remembered. We were both so excited that a few keys were undoubtedly hit in error!

I enclose my valued C5L card from CT1HB for you to see. Mr S G Casperd, G3XQN

HELPLINE GRATITUDE I had a wonderful uplift in receiving quite a number of very helpful replies to my recent plea for help regarding a micro dot terminal unit. Thanks again. Mr L S Gumbrell, G2BZH.

W6HPH L-METER I read with interest G3FDG's modification of my L-meter circuit in the June 1989 RadCom. It is standard practice to use two silicon diodes to tie together the bases of a complementary output stage such as shown below. The two emitters to base junctions in series require a forward bias equivalent to two diode drops. If only one silicon diode is used the two series transistors will not be turned on, quiescent current will be zero, and cross-over distortion will result. Furthermore, temperature compensation will be incomplete with only one diode. The collector current is excessive as G3FDG found it to be, it can be reduced by increasing R1 in the diagram below. This will unbalance the output stage but balance can be restored by increasing the value of R2 to make the DC output voltage exactly half the supply voltage. G3FDG also had trouble getting full oscillator output on the highest frequency range. This will not be a problem if a high Q coil is used for the micro coil inductance. A high coil is required because of the high L to C ratio. Mr F Brown, W6HPH

GREY EXPORTS Having read the article by Bob Treacher in the last RadCom concerning taking radio equipment abroad I would like to clarify two significant aspects of his article.

Having travelled for many years into highly sensitive areas carrying radios, recording equipment and computers, I am reasonably familiar with the problems to be encountered at airports and felt that the article was slightly misleading in that Customs was confused with "security". Generally speaking Customs only become involved after landing, and do not care too much whether your box of shiny knobs will go bang (as long as it happens outside the Customs Hall) - they are only interested in whether you bought your box oflicks on your holiday/business trip or in the UK and have paid VAT and duty. In this case it is always advisable to either obtain a card before leaving or at least, carry the UK receipt with you to prove the point, especially if I it is a large new radio, or whatever, and can save untold frustration, especially if you encounter an official with an unfamiliar text.

R. D. Thorton, G3URE

THE SHRINKING WORLD In recent years we have read much about the decline in amateur radio in the United Kingdom and lack of enthusiasm from the younger generation to join our hobby. As an ex-graduate amateur, I would like to say that I have seen more people involved in recent years, and indeed one which will help to eradicate the already serious problem of attracting 'new blood' into amateur radio. It is the ever shrinking world of amateurs primarily caused by bureaucratic red tape and more often or not a complete lack of understanding on the part of our hobby by many of our stations. I am sure that if we could all stop and have a look at the people who we contact the face would soften a little. I have frequent contact with a number of very pleasant people who I think that you would enjoy contacting. It is not the hardware that we use, but the people that we meet.

Mr J W Thorton, G3URE

GETTING YOUTH INVOLVED I am writing to support the comments and suggestions put forward in the February issue of 'Last Word?' by G4NZZ and G1ZIH.

In order to involve your people more in Amateur Radio surely we as amateurs must get more involved with them! Schools would present the largest and easiest point of contact and this should be done on a personal basis rather than just calling into the school, it is not always within the school if there is a member of staff interested in amateur radio and where may all should be directed. A good place to start might be the Head of Science, although not all teachers interested in radio teach Physics or Technology (I teach Mathematics). If, however, no one within the Science Department is interested the letter may be discarded. Has anyone thought about contact with the Modern Language or Geography Departments? Have other radio clubs put on displays at their local school during their Summer from that country with great pride as the ARRL recently confirmed to me that it is the first and only CS DXCC issued to a G9 station - maybe there will never be another one!

The point that I am trying to make, and throw out for comment by members, is that unless country societies such as RSGB and ARRL and, more particularly the IARU, make proper representation of our hobby to such countries then the list of workable countries will go into a steady decline. Don't be locked by any DXCC lists - if you erase the Countries which do not issue licences it will reduce in length by a considerable amount.

Given the above and referring to the opening paragraph, how can we possibly expect our own young people to become interested in our much heralded World 'Wide' hobby, when unfortunately it is not! D S Radley, G4ABl

WATERPROOFING COMPOUNDS I submit another contender for the ultimate in waterproofing materials proposed by Arthur Tait (G4MABLE) in The Last Word earlier this year, is 'Denso tape' which is a petroleumastic compound canned on an open-weave nylon fabric. In the same wild environment as G4MABLE I have used this material with complete satisfaction for many years for the waterproofing of antenna connectors such as the BNC type, and of other outdoor electrical furniture. 'Denso tape' protective covering on exposure to the weather gradually assumes a stiff and durable texture. It is easily removed when it is necessary to open the joint. 'Denso tapes' are commonly stacked in 10m rolls in widths up to 300mm by builders merchants.

J A Young, G4HDDO

MANNERS MAKETH HAM I have now become accustomed/discouraged by the manners or lack of manners shown by European stations when trying to work DX. Over the past few years the problem has grown out of all proportion. As an ex SUZ I had my share of 'plee ups' on CW and SSB. In those days 1968-1975 only a few guys caused a problem, mainly LZ, HA and YU calling me while in OSO with another station. The disease is now spreading rapidly. It is now impossible to give a directional call to, say, G or USA without giving half of Europe replying and being insulting if you do not reply. Working a JA or USA pile up presents no problems. If someone stops out of line, he is quickly told by his own country to ORT. Europe - NO! They argue and fight on the air, until the DX station quits. Recently a group of ZS hams put 7P6 on the DX map for a few days. One operator a YA, eventually took off the 'calls' threw them across the room and refused to operate. I myself have been called "25ULID" and "25ULD" when trying to OSO a station purely because I did not acknowledge some clown with 25W and a loud signal coming up on the OSO, it would be interesting to get the views of a few regular DX operators on their views. My own list would be IZ, LU, ITALY and HA. This letter was finally promted by a "G0" who called me once as a casual contact while I was in OSO with another "G". When I did not reply he turned up, waved his camor about and then lost interest. Sorry chaps! but maybe this is why it takes so long for you guys to get DXCC. The DX stations do not care what you call, D Sargent, G3SKZ

...word
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