AUGUST 1988 £1·20

ISSN 0141-0857

# Practical Wireless

The Radio Magazine


PLUS LOW-COST INDOOR ANTENNA FOR 144MHz

AND PW REVIEW-YAESU FT-212RH

"They said I couldn't work DX with just 100 watts. Especially with a radio that has less than 1000 switches on the front panel.

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And my FT-747GX is loaded with other features. The receiver works from 100kHz straight through 30MHz, and it's a fantastic shortwave broadcast receiver. I can use all twenty memories for that alone! Plus it's got dual VFOs. A noise blanker. Split frequency operation for the pile-ups. And scanning up the band helps me check out openings as they happen.

I just put in the optional crystal oven, and next month I'm going to pick up the FM board.

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Now my friends are getting FT-747GX rigs, too. I knew they'd figure out my secret weapon sooner or later. But now I'm setting the pace!

Thanks, Yaesu. You've made a rig that makes sense, at a price I can afford."

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YAESU

# "They laughed when they saw my radio. Then they saw my logbook."

Practical Wireless
The Radio Magazine

AUGUST 1988 (ON SALE 14 JUL 1988) VOL. 64 NO. 8 ISSUE 977

THIS MONTH



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**NEXT MONTH**

8-page Pull-out Supplement: "In the Know"

Doppler Shift on Satellites—1

"Valved Comms Receivers" The BC-348 (Part 1)

The Alinco ALD-24E Dual-Band Transceiver Reviewed

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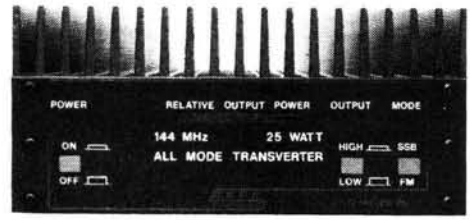


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| Frequency Range | 50--52MHz | 70-72MHz | 144-146MHz |
| Input Frequency | 28-30MHz 144-146MHz | 28-30MHz 144-146MHz | 28-30MHz |
| *Output Power high | 25W | 25W | 25W |
| low | 5W | 5W | 5W |
| Input power (adjustable) | 100uW-500mW 1mW-1W (−10-+27dBm) | 100uW-500mW 1mW-1W (−10-+27dBm) | 100uW-500mW (−10-+27dBm) |
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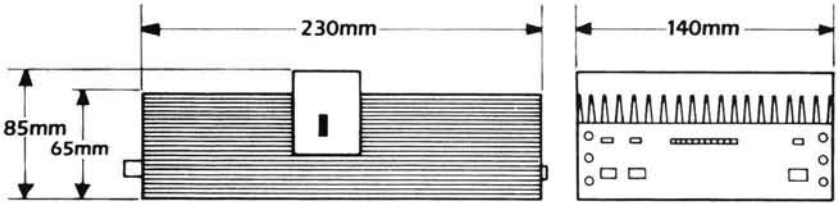


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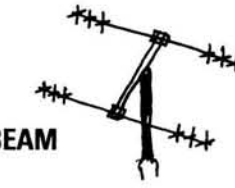

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## It's a Date

After reading your editorial in April *PW*, I am motivated to make you aware that expressing dates by figures, in the sequence of YEAR/MONTH/DATE, has been an International Standard since 1979! The accompanying extract of the relevant Standard, ISO 2014, explains the new system and the reasoning behind it.

I have used this way of expressing dates since 1980, and have extended the concept in many ways. For example, the filing of my correspondence, technical data, references and short-wave reception reports, and also indexing the contents of publications, to name just a few!

You will have noticed that the writing of dates in numerical form can also include expressing time, on a particular date. I do not use division markings between each group of digits and have also dispensed with the figures "19" in front of the year. As soon as I see or read such a number I automatically, in my mind, "see" groups of two digits in the sequence: year-month-date-hour-minute-second. Time is always expressed in the 24-hour mode (there is no need to indicate a.m. or p.m.).

One of my hobbies is DX short-wave listening and I write reception reports to some of the broadcasters, using the extended concept of expressing it in digital form.

Here is a typical example of what such a report looks like: BRT880410-2330/0000-11M695-45435-News-Music. In words I would have to write: "On the 10th April 1988, between 11.30 p.m. and midnight (UTC), I listened to News and Music, on 11.695MHz, SINPO report 45435, Belgian Overseas Service (BRT)." You must agree that this is quite a mouthful.

My collection of technical data and circuit diagrams is indexed in a similar way, saving me much wasted time over the years. For example, the index entry "EA8604103" tells me I can find that particular article on page 103 of the April

### Writing of calendar dates in all-numeric form

0 INTRODUCTION

In all forms of international traffic and exchange, dates must be clearly designated and able to be compared without any ambiguity.

This International Standard for writing of calendar dates in all-numeric form has been prepared to obviate the confusion arising from misinterpretation of the significance of the numerals in a date written with numerals only; it is considered that similar confusion does not arise when the month is spelled out, either in full or in abbreviated form.

The occasions on which an all-numeric date might be used have been examined and the advantages for these occasions of the descending order year–month–day have been found to outweigh those for the ascending order day–month–year, established in many parts of the world.

The advantages of this descending order include the following in particular :

– the ease with which the whole date may be treated as a single numeral for the purpose of filing and classification (for example for insurance or social security systems);

– arithmetic calculation, particularly in some computer uses;

– the possibility of continuing the order by adding digits for hour–minute–second.

**1978-09-12**

For Americans,
12-9-1978 = December 9, 1978
For Europeans,
12-9-1978 = 12 September 1978

Why? Because there was no international agreement on the writing of dates. Whenever the month is spelled out, there is no problem: 12 September = September 12, but a date written in numerical form can lead to confusion.

There is a way to dispel this confusion. ISO has developed an *International Standard* (ISO 2014) establishing a logical descending numerical order:

| YEAR | MONTH | DAY |
|---|---|---|
| 1978 | 09 | 12 |

This means 12 September 1978 the world over.

To date, ISO has published 3600 International Standards all of which have the same goal: better communication, better understanding between people of all nations.

Case postale 56
CH-1211 Genève 20
Switzerland
Phone (022) 34 12 40

September 1978
(français au verso)

# PW COMMENT

## New Blood

SCANNING THROUGH THE MOUNTAINS OF MAGAZINES which regularly arrive in the *PW* editorial offices from all parts of the globe, two unusual items caught my eye. Neither of them directly related to amateur radio, but they give food for thought as the RSGB and others try to encourage new recruits into the hobby.

Rumour has it that details of the new "Student" licence proposals will be announced at the RSGB's 75th Anniversary National Convention at the NEC, a few days after this magazine hits the bookstalls. It will be interesting to see just what form of licence is in mind, and whether the existing (often criticised) UK lower age limit of 14 years for an amateur licence will apply.

According to a report recently produced by CACI Market Analysis of London, mentioned in the April/May issue of *Marketing News*, a decline in the number of 10 to 14-year-olds in Great Britain has taken place over the period 1981–86. Overall, the decline was 17.9 per cent, but in some areas it was much greater. Towns such as Falmouth, Chippenham, Harlow, Chesham, Wilmslow, Ilkley, Richmond (Yorks), Redcar, Newton Aycliffe and Corby have all seen a decline of over 25 per cent. The decline becomes even more apparent in some inner city areas of London, Salford, Glasgow and Liverpool, where there was a fall of between 30–35 per cent.

That age-group is now just the one which we should be trying to interest in amateur radio—or ought we to be looking at an even earlier age? Should there be a lower age limit at all—other countries seem to manage well enough without one. Look at the situation in the computing field, where agile young minds are getting to grips with programming when it seems they've only just left infant school.

That brings me to the other news item I saw, this time in the Australian magazine *Amateur Radio Action*. Apparently a university researcher in Israel, specialising in the study of mental development of young children, has conducted studies of three-year-olds implying that attempts to use computers may be raising their anxiety levels.

He concludes that the computer is threatening to youngsters under age four. "They are unfamiliar with it," he says, "unlike a TV, which they can operate with the press of one button." Among four, five and six-year-olds, the anxiety disappeared and their attitudes to computers were reflected in the degree of success they had in using them.

Though it perhaps requires different attitudes to technology to operate a radio and a computer, surely we should be trying to capture the imagination of youngsters in that same age range. By the age of 10, many have already settled on an absorbing hobby and it then becomes more difficult to tempt them away into amateur radio.

If it is felt that we must retain a lower age limit to an amateur licence, maybe eight years old would be a suitable level. Obviously there will be some very immature eight-year-olds who should never be allowed near a radio transmitter, but then the same applies to some people into middle age and beyond!

***Geoff Arnold***

1986 issue of *Electronics Australia.*

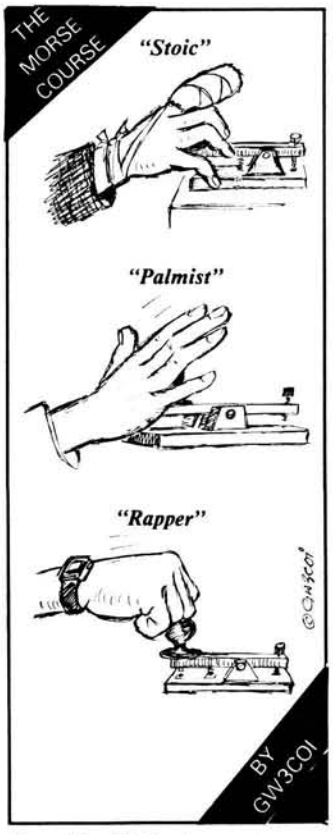
I am naturally delighted that the IARU has seen the light and recommends to all amateurs that they should use the convention of expressing dates on QSL cards in digital form.

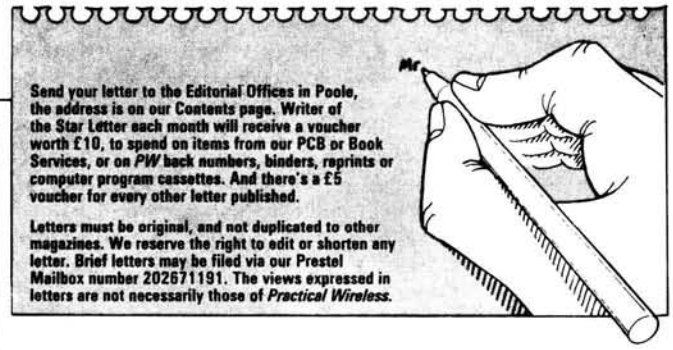
***Eric Barber***
***Orewa, New Zealand.***

*One of the delights of an Editor's job is the opportunity to ride a particular hobby-horse in print from time to time. Sometimes, though, the neck is stuck out just a little too far, and the head is very smartly chopped off!*

*Having read Mr Barber's letter and the extract from ISO 2014, I have to admit that the reasoning behind the new system is so delightfully logical that I totally withdraw the rude comments I made about it in our April issue!*

*In fact, the new system is really an extension of the "Date Time Group" (DTG) system used in Naval (and no doubt in other armed services) communications for many years. There, for example, the group 132245Z at the end of a message would mean that it was originated on the 13th of the month at 2245 hours GMT (UTC). The letter "Z" identifies the time zone centred on the Greenwich Meridian (0° Longitude).—Ed.*




## Junk Radio

I found the letter from I. R. Willson of Epsom (*PW* April, 1988) very interesting. It took me back many years, to the days of "real" radio.

As an "Old-timer" who once embarked on one of these projects, I can say that sets could be made from junk, and they worked, too, if one got the values right. Apart from valves and headphones, everything can be made, even a crystal. The two main ingredients are plenty of patience and time, the whole thing is trial and error from start to finish.

I am not sure what the bent spoon was for, except perhaps a crude Morse key, and it is not possible to get the completed set into a bully-beef tin. Components made in this way take up far more room than conventional ones, and a "baseboard" about 250 × 400mm (10 × 16in) is required to mount them on.

A crystal set is the easiest to make, as very few components are required. It is best to have the correct crystal, but other materials will work. I well remember using a piece of cube sugar with quite good results. The coil can be wound on any sort of former—try the inside of a kitchen roll, a small jam-jar or pvc waste-pipe.

Most of the fixed capacitors will be of small value, and can be made by twisting two lengths of insulated wire together. Variable capacitors can be made with two pieces of thin plywood with foil stuck to one side of each, arranged with some form of insulation between them. The capacitance is varied by sliding one piece over the other, to vary the area of overlap.

For resistors, try rubbing a lead (graphite) pencil along a thin piece of wood, and clip a wire to each end. The more lead used over a given length, the lower the value. For values up to about 30Ω, a length of electric fire element spiral or a pencil can be used, 185mm of HB pencil lead is about 20Ω!

A valved project requires much more experimenting to get the values of resistors and capacitors correct. There is also the problem of power supplies. It is better, for safety reasons, to use batteries rather than a mains power pack—you can offset the cost of batteries against the fact that the set is "free". There is no need to use valve-holders. Solder copper wire tails to the pins, cover the wire and pins with sleeving, and mount the valve on its side on the baseboard. Most triode valves will oscillate with an h.t. voltage of 45 to 60V.

These are just a few suggestions, no doubt other readers can come up with better ideas. Good luck to all those who are willing to have a go.

***G. W. Millmore***
***Wootton, Isle of Wight***

## Waiting

Permit me to have a last word on the subject of Novice/Student Licences. For various reasons there are many people like myself who have to be content to be listeners only. Contrary to expert opinion, I believe the current Radio Amateurs Examination is far from basic in its questionnaire. Those would-be radio technicians and semi-professional users might argue that $f=1/2\pi\sqrt{LC}$ and a knowledge thereof is an essential requirement for granting of a "B" Licence. This is not so; it is possible to amass a great amount of expertise through practical and experimental interest and discarding the academic jargon and theory.

I speak as an ex-RAF Wireless and Radar Operator, undergoing a two-year course with the subsequent trade tests which in no way reflected the necessity as in the RAE to test one in physics theory and mathematical equations. To become a senior wireless operator I passed the 23 w.p.m. Morse tests, putting me on a par with those wizards in the Merchant Marine and the Royal Navy.

Alas, all the foregoing does not give me an automatic right to an exam-free licence. But, you might ask, why not brush up one's knowledge by joining a non-vocational course in amateur radio at the local colleges or night classes? The answer is simple—in the whole of the City of Nottingham or locally, there aren't any. No shortage of courses in flower-arranging, yoga, etc.!

And so, until a Novice Licence becomes a reality, I'll remain content to stay in the background under my massive antenna array, with the sure knowledge that my Ohm's law, basic electrical knowledge and practicality will keep me interested in amateur radio.

***L. Hawkings***
***Bingham, Nottingham***

*I'm sure yours won't be the last word on the Novice/Student Licence topic by a long way, Mr Hawkings! Speaking as someone who first learned his radio theory and his Morse almost 40 years ago, before going to sea in the Merchant Marine, I must tread carefully here.*

*Surely the principle of resonance in a tuned circuit is the lynch-pin of radio communication. If it did not exist, we would not have progressed from the era of spark transmitters and coherer receivers, with just a single channel of Morse communication available in each area of the world.*

*If you accept that Ohm's law is an essential part of basic electrical knowledge, why jib at* $f=1/2\pi\sqrt{LC}$*? Why let a square-root sign stand between you and an understanding of how a radio receiver can be made to respond to just one of the many thousands of signals presented to it by the antenna system?—Ed.*

## Rally Calendar

* PW/SWM in attendance

***July 15–17:** The RSGB 75th Anniversary National Convention will take place at the National Exhibition Centre, Birmingham. HRH Prince Philip, Duke of Edinburgh, will perform the official opening.

***July 24:** The Cornish Radio Amateur Club are holding their rally at the new venue of the Village Hall, Perranwell. This is about 8km south-west of Truro.

**July 24:** The Burnham Beeches, Maidenhead and Chiltern ARC will be holding the 6th McMichael Rally at Haymill Centre, Burnham, near Slough, Doors open at 10.30am, 10.15am for the disabled. All the usual attractions will be there and the car boot sale will again be held. More details from: ***Bob Hearn G0BTY. 70 Herbert Road, High Wycombe, Bucks.***

**July 28–31:** The AMSAT-UK Colloquium will again be held in the University of Surrey, Guildford. More from: ***G3AAJ. Tel: 01-989 6741.***

**July 30:** The Hilderstone Radio Society are holding their mobile rally and convention at Hilderstone College, St Peters Road, Broadstairs, Kent. There will be trade stands, a bring and buy, talk-in station, a special event station, raffle, refreshments and a lecture programme. ***Alan. Tel: 0843 593072.***

***July 31:** The Scarborough ARS Rally will be held at The Spa, Scarborough. Doors open at 11am. Talk-in will be on S22 and SU8 as well as GB3NY. More details from: ***Ian Hunter G4UQP. QTHR. Tel: 0723 376847.***

***August 14:** The Flight Refuelling ARS and the Bournemouth RAIBC Rally will be held at the FRARS Sports & Social Club, Merley, Nr Wimborne, Dorset. All the usual attractions will be there for all the family. Entrance is 50p (children free). Gates open from 10am to 5pm. More details from: ***John Fell. Tel: 0202 691649.***

**August 14:** The 1988 Derby Mobile Rally will take place at the usual venue of Lower Bemrose School, St Albans Road, Derby. Doors open at 11am. More details from: ***G3KQT. QTHR.***

**August 21:** The Newbury. District ARS will be holding a radio car boot sale at The Acland Hall and Recreation Ground, Cold Ash, Newbury. It opens at 10am. Pitches are £5 or £4 if pre-booked and there is a limited supply of inside tables at £10. Please contact: ***Mike Fereday G3VOW. Tel: 0635 43048.***

**August 28:** The Annual Rally of the British Amateur Radio Teleprinter Group (BARTG) will again take place at Sandown Park Racecourse, Portsmouth Road, Esher. More details from: ***Peter Nicol G8VXY. Tel: 021-453 2676.***

**August 28:** The Galashiels & District ARS are holding their Open Day at the Focus Centre, Livingstone Place, Galashiels. There will be trade stands, a bring and buy as well as catering facilities. More from: ***John Campbell GM0AMB. Tel: 0835 22686.***

## Broadcasts in Band I & Band III

The Government has decided not to introduce broadcast services into Bands I and III. In a written answer, Lord Young, Secretary of State for Trade and Industry, stated: "The technical feasibility study has shown that there is insufficient scope within Band III to accommodate a broadcast channel without the risk of serious mutual interference with adjacent mobile services. In Band I, there is potential scope for a single broadcast channel covering at most some, but not all, major conurbations. But even this restricted coverage could not be achieved unless a number of existing mobile radio services were to be moved at very substantial expense.

"Additionally, the re-introduction of high power broadcasting in this band could be very difficult and costly to negotiate with our international neighbouring administrations, who would regard a policy reversal by the UK as a serious disruption of the international understandings on which their domestic planning over the past few years has been based.

"Band I also suffers from a seasonal pattern of interference, known as Sporadic-E, whereby broadcasts from 1000km or further away can be reflected from the ionosphere, completely obliterating the wanted signals for prolonged periods. Finally, the Civil Aviation Authority have advised us that the re-introduction of broadcasting could pose some threat of harmonic interference to aircraft navigational and communications systems.

"With so many actual or potential disadvantages in return for, at best, an extremely restricted coverage, we have concluded that the re-introduction of broadcasting into Bands I and III is not a viable option and that it is in the interests of all concerned to make that conclusion public at the earliest possible date."

## The LBO-1020 Oscilloscope

Thandar Electronics have announced the introduction of the Leader LBO-1020 20MHz dual-trace oscilloscope.

It is a 5mV/div, 20MHz (500μV/div 4MHz), portable dual-trace oscilloscope with a maximum sweep speed of 50ns/div (mag ×10) and 150mm c.r.t. with internal graticule.

The major features include an illuminated graticule and a special trigger pick-off circuit which ensures synchronisation with composite video signals. Alternate trigger mode allows the stable display of two asynchronous signals plus display modes for CH-1, CH-2, ALT, ADD and Polarity CH-2 INVERT plus X-Y operations.

The LBO-1020 is supplied complete with probes, priced £315 plus VAT. For more details, contact:
***Thandar Electronics Ltd., London Road, St Ives, Huntingdon, Cambs. PE17 4HJ.***

## Bridge Megger

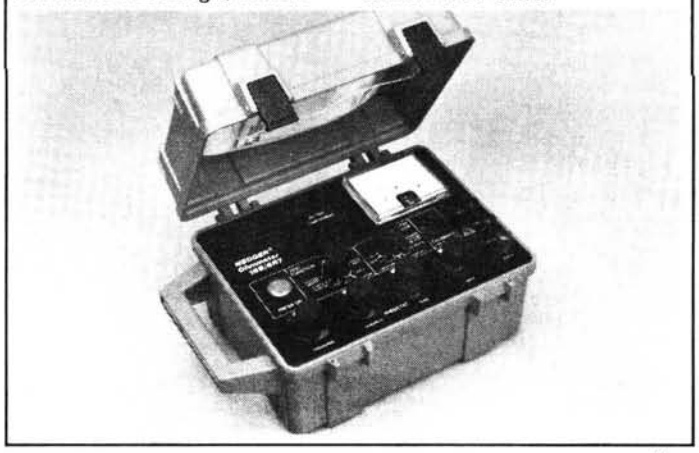
Megger Instruments Ltd. has launched its latest generation 18B/BR7 model.

The 18B/BR7 Bridge Megger tester combines high level functionality with modern styling and cost savings. It locates earth, contact or open circuit faults using bridge techniques on telecommunications networks, as well as general insulation and circuit resistance testing on cables.

With insulation resistance ranges of 500V and 95V, the 18B/BR7 has a signal meter for readings, which also acts as a bridge galvanometer when four rheostat switches are adjusted—the bridge reading being given on switch dials.

The unit combines the functions of insulation tester, resistance bridge with a 0.1Ω resolution and cable fault locator capable of pin-pointing open circuit, resistive and short circuit faults. The unit weighs 4.2kg including a rugged plastics case with carrying handle.

***Megger Instruments Ltd., Archcliffe road, Dover, Kent CT17 9EN.***



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B **Realistic PRO-2021.** Features direct keyboard entry, search and scan in two speeds and two-second scan delay. Priority function will automatically switch to the priority channel when a call is received on it and individual lock-outs for temporarily bypassing channels. Scan up to 200 channels in these bands: VHF Lo 68-88 MHz, VHF AIR 108-136 Mhz, VHF Hi 138-174 MHz, UHF Lo 380-470 MHz and UHF Hi 470-512 MHz. Easy-to-read LCD channel/frequency display with electroluminescent back-lighting, squelch control and built-in speaker, telescoping aerial. Jacks for external speaker, external aerial, tape recorder and DC power supply. Size: $3^{1}/_{8} \times 10^{1}/_{4} \times 8$". Includes mounting bracket for mobile use and DC power cord. Mains operation (or 13.8 VDC neg. gnd.). Memory back-up requires 9v battery. **20-9113** ..... **£219.95**

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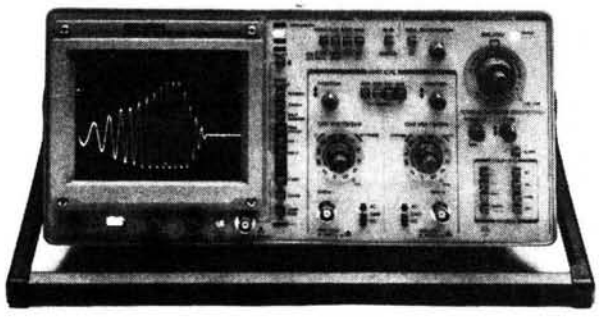
## Digital Storage Scope



Fieldtech Heathrow Ltd have announced the arrival of the Intron DSO-2020A digital storage scope.

Each channel has its own a-d convertor with a maximum sampling speed of 20 million samples per second. The trigger level markers superimposed on either side of the digital image provide exact indication of the trigger level selected. Because of the complete trigger facilities such as: Normal, Auto, TV Line, TV Frame, HF Rej and Ext., which also work in storage mode, complex signals such as a TV test signal can be recorded with automatic line/frame selection depending on the timebase range.

For more details on what the DSO-2020A can do, contact:

***Fieldtech Heathrow Ltd., Huntavia House, 420 Bath Road, Longford, Middx. UB7 0LL.***

## Icom IC-32E

Icom have a new dual-band hand-held transceiver called the IC-32E. It has full duplex capability, you can really transmit on one band and receive on the other simultaneously.

There are twenty memories, but each of these can store two frequencies, presumably one on each band. The Programmed Scan function scans all frequencies between two programmable edge frequencies. The Memory Scan function scans all the memory channels in succession, except those you have locked out, or it will scan just the 430MHz memories or the 144MHz memories.

There is a Monitor switch which provides a "listen on the input" facility. There is also a Priority Watch, this will monitor the calling channel, a memory channel or all memory channels in succession every five seconds. This happens whilst you are listening elsewhere on the bands.

For the full details of all the facilities available on this hand-held, contact:

***Icom (UK) Ltd., Sea Street, Herne Bay, Kent CT6 8LD.***

## Special Events Station

**GB75TV:** The Rugby TV Repeater Group is planning a special event station over the August Bank Holiday weekend (August 27/28). The station will be operating ATV on at least 430 and 1296MHz from Sheenington, near Banbury in Oxfordshire. The hours will be from 12 noon to 8pm on the Saturday, and from 7am to 12 noon on the Sunday.

**G6IQM QTHR**

**GB0NKG:** This station will be on the air from 10am on July 17 from Littleton Road Playing Fields, Salford, Lancs.

The Salford Recreation Department are having a family funday and the Northern Kite Group will be taking part. They have CAA clearance to fly up to 1000ft. They will be running a 1000ft wire antenna for the station as well as 144MHz using a 200ft antenna. All QSOs will be acknowledged with a special QSL card.

**GB75YMD:** This station will be on the air from Dover Castle on July 2. It's for a youth rally being held then. They will be operating on h.f. and 144MHz s.s.b. The callsign stands for "Young Men of Dover" as the station is being run by the South East Kent (YMCA) ARC.

**GB2RNL:** On July 28–31, a special event station will run for the benefit of the Royal National Lifeboat Institution. They will be on the air from the headquarters in Poole (in the depot complex) to coincide with the RNLI open days which are the 29th and 30th. On those two days the HQ will be open from 10am to 6pm to the public. A QSL card will be produced for this event, but can only be supplied on receipt of an s.a.e. or for overseas amateurs the requisite number of IRCs. Don't forget the RNLI is dependent upon donations so costs must be kept to a minimum.

The frequencies they will be using are:
3.750, 7.050, 14.250, 21.250 & 28.500MHz ('phone).
3.550, 7.025, 14.075, 21.075 & 28.075MHz (c.w.).
Of course, that's ±QRM.

As the RNLI is funded by donations only, if you would like to send them something to help out, they will be more than happy to accept. The donations-only address is: ***GB2RNL. Peter Holness, RNLI HQ, West Quay Road, Poole, Dorset.*** The address to send your envelopes for QSL cards is: ***GB2RNL. Malcolm A Williamson G0EGA, 21 King Alfred Avenue, Bellingham, London SE6 3HT.***

## RSGB 75 Award

To celebrate the 75th Anniversary of the Radio Society of Great Britain, the Society has decided to introduce the RSGB 75 Award. To qualify for the award, stations must achieve the following:

**UK Amateurs and s.w.l.s**
One contact with any of the following stations:
GB75RS (throughout the year)
GB75HQ (July 1988)
GB75AC (9–17 July 1988)
GB75ER (9–17 July 1988)
or 10 other GB75 calls PLUS contacts with a total of 75 different RSGB members.

**Overseas Amateurs and s.w.l.s**
A total of 75 points made up from the following:
GB75RS (10 points)
GB75HQ (15 points)
GB75AC (15 points)
GB75ER (15 points)
Other GB75 calls (5 points)
RSGB members (1 point).

Contacts may be made on any band using any mode, including satellites, but must NOT include any duplicate contacts or contacts via repeaters. All contacts must take place between 1 January 1988 and 31 December 1988. Short wave listeners, in both categories, will be able to apply for the award on a "stations heard" basis.

Claims must be postmarked no later than 1 April 1989 and be accompanied by a cheque or postal order for £1.50 made payable to RSGB to cover postage and packing. Ten IRCs are required for overseas applicants.

When you have the required number of contacts or points, you should send a certified log entry (QSL cards not required) to:

***Mr John Harvey G4IV, RSGB 75 Award Manager, 38 Bodenham Road, Northfield, Birmingham B31 5DS.***

## Ooops!

In the June issue of Practical Wireless, we inadvertently printed the wrong telephone number in the RST Valves advertisement. The correct number is: ***Tel: 01-684 1166 FAX: 01-684 3056.*** Many apologies to all concerned.

## I/O Interface

The 2308 I/O Interface from Black Star is a microprocessor-controlled general purpose measurement and control instrument. It is easily connected to any personal computer having an RS232 port.

It is controlled by a simple command structure in ASCII string format, enabling the user to use almost any programming language on the controlling computer. An instruction manual is provided together with a demonstration floppy disk containing program listing in BASIC.

The 2308 is a versatile instrument with a wide range of useful functions and features including: eight-channel ± 12 bit analogue input, four-channel 12-bit analogue output, eight opto-coupled digital inputs, eight mains rated relays and eight-channel non-volatile data logging memory.

Among the applications for the unit are data acquisition, data logging, automatic testing, computer education, laboratory automation, robotics and industrial control. The unit costs £299 plus VAT, and more details are available from:

***Black Star Ltd.,***
***4 Harding Way,***
***St. Ives,***
***Huntingdon,***
***Cambs. PE17 4WR.***


## Microflame Super Cub

The Microflame Super Cub burns with the same clean, blue flame as a full-size butane blowtorch. Despite its small size, it can still deliver 1300°C. That should be hot enough to soft-solder 12.5mm copper plumbing, but sufficiently precise to silver-solder small items.

There should be no trouble fitting the Super Cub into any tool kit, complete with a refill. The 25g high capacity, low pressure disposable cylinder should burn for two hours.

The Super Cub and one 25g butane canister costs £9.95 including VAT, replacement butane canisters cost £1.65.

***Microflame Ltd.,***
***Vinces Road,***
***Diss,***
***Norfolk IP22 3HQ.***
***Tel: 0379 644813.***

## Thanet Electronics Club

The Thanet Electronics Club meets every Monday evening at 7.30pm in the Quarter Deck Centre, Zion Place, Margate.

They provide lots of other fun activities for "kids", like visits and Youth Hostel Trips. There are opportunities for lots of real interest in science, model and project making and history of science as well as talks and article writing.

If you are in the area and think this group for youngsters is interesting, contact:

***Richard on Thanet 61821***
***or***
***Chris on Thanet 221131.***

## SILVAR

The Stevenage & District ARS are putting on a display of radio and electronics for the nine secondary schools in Stevenage. The combined school rolls amount to more than 7500 students. The display will take place at the John Henry Newman school on July 20–22.

The Stevenage Information Technology Centre is joining them in this project, the purpose of which is to interest students in a career in radio/electronics via a knowledge of, and an interest in, amateur radio.

They will be putting on a 75 minute talk/display and demo on amateur radio, using the RSGB New Student Publicity packs. This will be followed by a 30 minute talk/display by SITEC on vocational training and career entry, with handout fact sheets on the new Student Licence, r.f. propagation, club membership, etc.

The event is scheduled to run from 9.30am to 3.30pm for students and from 6.30pm until 9pm for teachers and members of the public, by invitation.

If this year's venture is a success they hope to repeat it in subsequent years from different school sites each year.

The title of the event SILVAR stands for Student Link via Amateur Radio. They will be using the callsign GB75JHN, so if you hear them on the band and can answer them, remember it's in a good cause.

Offers of help, material, equipment, manpower or suggestions to:

***Peter G0GTE***
***Tel: 0438 724991***

## BATC Contests

**IARU ATV (International):** September 10/11. 1800 Saturday to 1200 Sunday (UTC). f.s.t.v. all bands.

**Slow Scan TV Autumn Vision Combined:** November 13. 0001 to 2359 local time. Slow scan, f.s.t.v. all bands.

**Winter ATV Joint European:** December 10/11. Saturday 1800 to Sunday 1200 (UTC). f.s.t.v. all bands.

There are some changes in the contests planned for next year (1989) due to an agreement reached with neighbouring societies in Europe. It has been agreed that there will be four joint contests through the year. One of these contests will be the International, which from now on will be an official IARU contest. This contest will be run each year by a different member country. The BATC will be organising the 1989 contest on behalf of the RSGB.

The advantage of running contests at the same time is that, conditions permitting, contacts into Europe may take place as everyone will be QRV at the same time. For more details on the British Amateur Television Club contests, contact:

***Mike Wooding,***
***5 Ware Orchard,***
***Nr Rugby,***
***Warks. CV23 8UF.***

## Rally & Convention

The Hilderstone Radio Society are holding a rally and convention at Hilderstone College on July 30.

The lecture timetable is:
2.00pm Derek Bradford G3LCK on "Youth into Amateur Radio, What Can We Do"
2.30pm Dr. Ken Smith G3JIX on "Simple Test Equipment in the Shack"
3.00pm A symposium by a number of young members of the Thanet Electronics Club for Youth on topics including: "The History of Morse", "Where Your Wave Came From", "The Advent of Telephony", "Can Kids Foxhunt & Build Oscilloscopes?".
3.45pm Ian Keyser G3ROO on "Simple Receivers, DC and Others".

In addition to the lecture programme there are all the usual events to be found at the rally.

For more details, contact:

***Alan on 0843 593072 or***
***Ron 0304 812723***

## More Special Event Stations

**GB75IBH:** Between July 23 and 31, the Wigan-Douglas Valley Amateur Radio Society will be operating a special event station to celebrate a week-long international Scout Camp at Bispham Hall Scout Estate, Billinge, near Wigan. Approximately 1500 Scouts from around the world will be participating. They hope to be using most bands including 50MHz. For further details, contact ***Colin G6AHF. Tel: 0942 715851.***

**GB2NTS:** This is to commemorate the 200th anniversary of the death of Prince Charles Edward Stuart, the callsign stands for National Trust Scotland. They will be on the air on August 20 and 21 from Culzean Castle, 19km south of Ayr. ***Paddy GM3MTH, QTHR.***

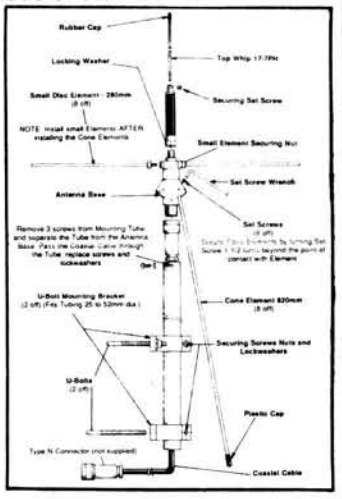
**GB2WVR:** This is for the World Veteran Rowing Championships, Strathclyde Country Park, Motherwell between September 5 and 11. ***Brian GM0EGI, QTHR or Paddy GM3MTH, QTHR.***

## The Royal 1300

This antenna is a 25-1300MHz discone, manufactured in the UK. It is made of stainless steel and chrome plated brass machined components with UR67/RG213U coaxial cable and Greenpar "N" connectors.

The price for this antenna is £59.95 including VAT and is available from Raycomm Communication Systems Ltd. Further details are available from:

***Raycomm Communication Systems Ltd.***
***International House,***
***963 Wolverhampton Road,***
***Oldbury,***
***Warley,***
***West Midlands B69 4RJ.***




## The Morse Coach

Smartek are a Cornish firm who are specialising in amateur radio and electronics. The Morse Coach is a complete "hi-tec" training package, designed to actively teach Morse.

It is a battery/mains pocket portable unit with internal loudspeaker and earphone. It has a synthesised speech system and has 18 separate learning sections, most with sub-divisions and revision. It has speed and delay controls, a practice oscillator and an automatic key reader (with single character facility) giving spoken answers.

The "test" facility sends 36 x 5 letters or 10 x 5 numbers at fixed test speed, followed by the corresponding spoken answers. Similarly the reader has more than sufficient memory to take a full "sending test" before replay.

The full package includes the Morse Coach, NiCads, charger, mains adaptor, earphone, a comprehensive instruction booklet and an Altai high speed type TK3 Morse key.

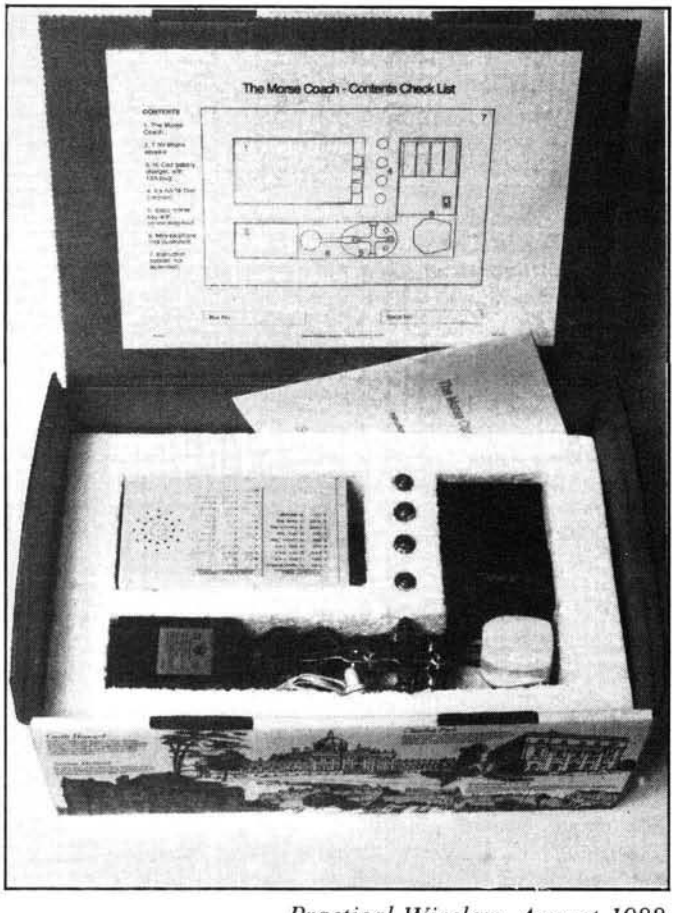
It costs £150 to buy or £5 per week to rent. A hire/buy refund is also available. On the rental side a deposit of £40 is required plus £5 for p&p both ways. The return is by Post Office pre-paid parcel service. Customers with their own key, charger, etc., may request these to be omitted for the appropriate price reductions.

For more details, contact:

***Smartek,***
***Mistletoe Cottage,***
***Heredsfoot,***
***Liskeard,***
***Cornwall PL14 4QX.***
***Tel: 0579 20313.***

## 144MHz Barking Contest

**Date:** August 14.
**Time:** 1300-1700GMT
**Sections:** (a) high power—full legal limit, (b) low power—20W p.e.p. output or equivalent, (c) s.w.l.
**Exchange:** Contestants will exchange report—RS(T), a serial number commencing at 001 and the county in which the station is located. The RSGB county codes may be used. Where contacts are made with stations outside the UK, the locator square of the station worked should be received.
**Scoring:** Each completed contact will score 1 point, contacts with G3XBF or G8XBF count 10 points. The final total is the number of contact points multiplied by the number of counties and overseas locator squares.
**Awards:** A certificate will be awarded to the winner and runner-up in each section. The committee may decide to issue additional certificates if the number of entries justifies the situation. In addition a certificate will be awarded to the leading station in Essex in each section.
**Duplicates:** Unmarked duplicates will be deducted at double the claimed points. More than five unmarked duplicates may result in disqualification.
**General:** Contestants attention is drawn to RSGB v.h.f. rules 7, 12 and 15-21 which will apply in this contest.
**Logs:** RSGB logs sheets would be preferred, but any neatly produced log will be accepted. All entries should be accompanied by a check list of the counties/squares claimed for multipliers. Short wave listeners should ensure that callsigns in the station worked column only appear once in every five contacts. Each entry should be accompanied by an RSGB cover sheet 427 or similar summary.
**Posting:** All entries must be postmarked before August 30. The address is: BRS31976, 32 Wellington Road, Rayleigh, Essex SS6 8EZ. **This is not the address in the callbook.**
**Disputes:** The ruling of the committee of the Barking Radio & Electronics Society shall be final.



# PW REVIEW

*The FT-212RH represents the latest development in 144MHz mobile/base station rigs from Yaesu. Mike Richards G4WNC checks the on-air performance while Geoff Arnold G3GSR puts it through its paces in the lab.*


The FT-212RH is a very compact 144MHz mobile transceiver with a host of features including 45 watts r.f. output! Probably one of the most revolutionary optional features is the Digital Voice System which allows digital recording and playback, but more of that later.

## Getting Started

As the FT-212RH has been designed primarily as a mobile rig, connecting-up was quite simple. Readers will be delighted to hear that a mobile mounting bracket is supplied as standard. This bracket is quite well designed and consists of a simple "U" bracket with a spring clip on one side. When fitting the FT-212RH into this bracket the lefthand side is inserted first then the set is swung-up to engage in the spring clip. The great beauty of this simple arrangement is that the FT-212RH can be removed very quickly for use as a base station or just to prevent theft.

The antenna connection comprised a 50Ω SO-239 socket which was mounted on the end of a short length of cable. This seems to be standard practice for in-car installations and I must admit it does make connecting-up under the dashboard somewhat easier. The power connections were also very simple with a short "pigtail" cable at the rear of the FT-212RH which connected to a 2.8m power cable fitted with 15 amp fuses in each leg. One point to remember is that the FT-212RH consumes some 10 amps when transmitting at full power so you will have to make sure your power source can handle this. Well worth remembering if you go out mobile onto hilltops and stay parked without the engine running for long periods.

The only other connection required was the microphone which, on the review model, was the MH-14 standard hand microphone. I think it's about time that manufacturers started supplying headsets or boom microphones with all mobile rigs, as I'm sure hand microphones can encourage bad driving and operating habits.

Although the internal speaker was quite adequate, those of you who like to use an external speaker have been catered for with the provision of the standard 3.5mm speaker jack on the rear panel. As usual, when a plug is inserted in this jack, the internal speaker is automatically cut off.

Although the FT-212RH is a very simple rig to operate, a read of the manual is essential before you start to operate in earnest. The supplied manual comprised a well indexed, 40-page, A5 book covering the operation in great detail. One of the first sections dealt with the installation and covered all aspects including base station packet radio operation and the fitting of the optional extras. This was followed by a detailed description of all the facilities and how to make best use of them. The Digital Voice System demanded an eight page section of its own to cover the many features available.

There was also a small, but nevertheless useful, section to get you out of difficulty should the FT-212RH fail to behave as expected.

In addition to the manual there was a double sided, A3 sheet and two A4 sheets containing full circuit diagrams and a block diagram. The diagrams were remarkable clear and much better quality than a lot of others.

One final extra with the manual was two A4 sheets containing quick reference charts. These charts summarised the functions of all the controls and the corresponding display. This proved to be very useful once the basic operation had been mastered.

## The Front Panel

With any mobile transceiver it is very important to have a good front panel layout and the FT-212RH scores well here. The first thing you notice is the excellent illumination. Each of the buttons and knobs on the front panel had a small translucent border which allowed the back-lighting to penetrate and create a glow around each control. The only controls excluded were the low power switch and the main on/off switch which seemed rather strange. The brightness of the panel illumination was dependent on the level of ambient light and was actually switched between two preset levels by a small sensor on the front panel. The illumination was very good indeed with the controls very easy to identify even in total darkness.

The frequency readout occupied the central position on the front panel and comprised a large liquid crystal display. The back-lighting system used was particularly effective and the display was always very easy to read. Yaesu have obviously put considerable thought into the layout of the display, as it managed to successfully convey the status of all the features of the FT-212RH without becoming confusing. One of the key features which made the display clear was the use of "inverted text", i.e. white on black as opposed to the more normal black on white. This inverted text was used for all warning messages and certainly made them stand out well. In addition to the messages and frequency indications there was a bargraph display used to indicate the power output on transmit and the signal strength whilst receiving.

There were three rotary controls on the front panel and these were used for; volume, squelch and tuning. The tuning control was actually a 24-position switch which controlled other features of the FT-212RH in addition to the basic tuning.

The majority of the FT-212RH's features were controlled by eight buttons on the lefthand side of the front panel. Most of these buttons have secondary functions which were accessed by pressing the F-WRITE first.

The display was a great help here as it clearly showed the warning message FUNC when the secondary function were active.

The only other item on the front panel was the microphone socket which comprised a standard eight-pin unit.

## Musical Beeps!

The FT-212RH was equipped with a rather unusual audio indication system which used musical notes to represent each push-button. The sequence used gives a single low frequency "beep" when the top left button is pressed which gradually increases in frequency as you work along the front panel, finally giving the highest frequency "beep" when the centre bottom button is pressed.

A slightly different system is used for the high/low power switch. In this case a pair of "beeps" are emitted which change from high to low when selecting low power and conversely low to high for high power. This system is also used when tuning with the UP and DOWN buttons on the MH14 microphone. The FT-212RH emits a low then high tone to indicate an increase in frequency and a high/low to denote a decrease. This system came into its own when working in cramped or poorly lit conditions, though to get maximum benefit a good musical ear would have been useful!

Those of you who prefer to operate in peace and quiet will be pleased to hear that the "beeps" can be disabled very simply from the front panel. One other nice touch was that the level of the "beep" was controlled by the main volume control. Also the ratio between the normal audio and the "beep" level was set just about right on the review model. All this came as a refreshing change.

## Operation

The first operation, other than turning the power on, is usually to tune to your favourite frequency and check for activity. Tuning on the FT-212RH is achieved using either the large rotary knob on the front panel or alternatively by pressing the UP and DOWN buttons on the microphone. Each press of the buttons or click of the tuning control shifts the frequency up or down one step. These steps can be either 5, 10, 12.5, 20 or 25kHz and are set by pressing the F-WRITE and STEP buttons and then rotating the tuning knob until the required frequency step is shown on the display. The default frequency steps for the UK version is 25kHz, so you wouldn't normally need to alter the steps.

If you hold either the UP or DOWN buttons depressed the FT-212RH will start scanning the entire band stopping only when it finds a station that exceeds the squelch threshold. Once the scan has stopped the FT-212RH can be set to either wait until the carrier drops before resuming or alternatively resume scanning after 5 seconds. While the FT-212RH is stopped during a scan the decimal point flashes to indicate that scanning mode is operational which is quite handy when using the rig at home, when you're driving it could be less useful. The scan can be stopped at any time by simply pressing the UP or DOWN buttons for a second time.

Mobile operation often necessitates using repeaters and to aid this the FT-212RH is pre-programmed with the UK repeater sub-band. This means that a −600kHz transmit frequency shift is automatically enabled when tuned to any frequency between 145.6MHz and 145.8MHz. Another big plus point is the provision of a reverse repeater button, this allows you to very easily monitor the repeater input to see if simplex operation is possible. If you should need to use a shift other than 600kHz or even to operate simplex in the repeater sub-band then this is all possible.

One of the great advantages of microprocessor control is the very comprehensive memory facilities that can be achieved and the FT-212RH is no exception. It has 18 general memories and three special purpose memories. The eighteen general memories can each store separate transmit and receive frequencies, repeater shift and (if the optional FTS-12 has been installed) tone squelch information. The procedure for storing a set of parameters in a memory is simplicity itself, all you do is press F-WRITE select the memory number and press F-WRITE again. If you're storing split transmit and receive frequencies then you merely repeat this operation but with the p.t.t. operated. I don't think you can get much simpler than that!

The recall of memories is also very simple and involves pressing the D/MR button which acts as a toggle between direct tuning and memory tuning. Once memory tuning has been selected, the rotary tuning control and UP/DOWN buttons on the microphone are used to select the required memory. Memory scanning can also be enabled in the same way as with direct tuning, though there is a very useful additional feature in that any of the memories can be skipped or hidden from the scan. This can be particularly useful if, for example, you are checking for activity but want to avoid the FT-212RH stopping on a busy local repeater.

As mentioned earlier there are three special purpose memories, called U, L and C. The U and L memories work together and hold the upper and lower limits of a programmable sub-band. Any two frequencies within the range of the FT-212RH can be stored to make up this sub-band. Once this mode has been selected you can either manually tune between the band limits or alternatively you can scan in the same way as with a simple memory scan. This programmable sub-band is a very useful feature as you could for example set up a scan of the simplex channels only. The C (call) memory is used to store one of your most common operating frequencies, perhaps the local repeater. The beauty of this memory is that it can be instantly recalled at the touch of a button. This is also ideal for storing a simplex operating frequency for when out mobile.

The final memory mode is priority channel monitoring. This is a fairly standard feature which allows you to regularly monitor a particular frequency whilst operating on a different frequency. On the FT-212RH the desired frequency should be stored in memory one and when the priority function is activated the contents of memory one will be checked every five seconds.

## Digital Voice System

The digital voice system is an optional extra with this rig. I must say I found it really impressive and full of potential. The best way to describe the system is to imagine there is a tape recorder inside the rig. The facility offered enables the user to record speech, either off air or from the microphone, and to play any recording over the air or through the loudspeaker. You can see where the tape recorder analogy comes from. There obviously isn't a tape recorder involved, it's all done digitally thanks to the wonderful microprocessor.

Before you start thinking about voice synthesisers sounding like irate Daleks, think again. The FT-212RH uses p.c.m. (pulse code modulation) to convert the audio signal into a digital form that can be stored in conventional RAM (random access memory). The FT-212RH is equipped with 1Mbyte of RAM, which is sufficient to store 128s of recording when using the slowest data rate (lowest quality). The quality of the recorded speech is directly pro-

# ★ SPECIFICATION AND PW TEST RESULTS

**GENERAL**

| | |
|---|---|
| **Frequency range:** | 144–146MHz |
| **Channel steps:** | 5/10/12.5/20/25kHz (user selectable) |
| **Standard repeater shift:** | ±600kHz |
| **Emission mode:** | G3E (phase mod) |
| **Antenna impedance:** | 50Ω unbalanced |
| **Supply voltage:** | 13.8V d.c. ± 10% negative ground |
| **Supply current:** | Transmit: 45W: 10A *(7.5A)* 4.5W: ? *(2.6A)* Receive: 300mA *(300mA)* |
| **Frequency accuracy:** | ± 10p.p.m. over operating temperature range –20/+60°C |
| **Case size:** | 140Wx40Hx160D mm |
| **Weight:** | 1.25kg approx. |

**RECEIVER**

| | |
|---|---|
| **Circuit type:** | Double superhet (IF1 10.7MHz, IF2 455kHz) |
| **Sensitivity** (for 12dB SINAD): | <0.18μV *(0.17μV)* |
| **Image ratio:** | >65dB *(88dB)* |
| **Selectivity** (–6/60dB): | 12/30kHz *(15/22kHz)* |
| **Audio output:** | >1.5W in 8Ω for 5% t.h.d. *(1.5W)* |
| **Squelch threshold:** | *?(0.1-0.35μV)* |

**TRANSMITTER**

| | |
|---|---|
| **RF output power:** | 5W/45W into 50Ω *(4.5W/45W)* |
| **Maximum deviation:** | ±5kHz *(±4.5kHz)* |
| **Spurious emissions:** | >60dB below carrier |

(PW Lab test results in italics)

portional to the data rate. You have a choice of four different qualities:

1: 32kb/s (32 seconds of recording)
2: 16kb/s (64 seconds of recording)
3: 11kb/s (92 seconds of recording)
4: 8kb/s (128 seconds of recording)

The RAM is actually divided into eight segments, each of which can hold separate recordings. So you could, for example, record your callsign in one, your location in another, the name of the rig in a third, etc.

To give you an idea of the speech quality, the international standard for telephone speech channels is 64kb/s. That represents best quality speech you could possibly get from a clear telephone link. So 32kb/s, although slightly down on that, still represents good communications quality speech. The slowest data rate was still perfectly readable, but the input does need to be good quality to make sure you get a reasonable representation of the voice.

The degradation involved between the various data rates can be likened to a loudspeaker rattle that gradually gets worse as the data rate slows down.

Not only can you make recordings of your own voice to save your breath, you can also make recordings of other stations signals to show them how good, or bad, they sound. Added to that is the facility for other stations with a d.t.m.f. keypad to leave messages stored in your rig for you to replay later!

## Other Features

Yaesu seem to be including the ability to accept computer controlled operation with all their new equipment and the FT-212RH is no exception. The compact size of the FT-212RH means that the microphone socket has to double-up as the data port for the transfer of data from the computer to the transceiver. Once the connection has been established then, with a suitable computer program, the operating frequency and transmit/receive switching can be controlled by computer.

The packet operator has also been remembered as the transmit and receive audio signals are available on the microphone socket. There is even the facility to extend the squelch line to the microphone socket, though this does mean losing the tone-burst facility which is not so good.

The FT-212RH is equipped with a CTCSS encoder which enables sub-audible tones to be superimposed on the signal which can then be used by other stations for selective monitoring. In order to use the system effectively an optional CTCSS decoder (FTS-12) is required. When the decoder is enabled the FT-212RH will only receive signals that contain the appropriate sub-audible tones. This facility can be quite useful for filtering activity on a very busy calling frequency.

## On-Air Performance

The FT-212RH became a very popular rig during the review period. I found it to be remarkably simple to operate, despite its considerable range of features.

The audio quality was very good and there was plenty of volume for use in all but the noisiest of mobile environments without resorting to an external speaker.

I spent quite a lot of time experimenting with the digital voice system and found it to be remarkably good. In practical terms I think its main use is likely to be the recording and playback of off-air transmissions. The audio quality was very good at the fastest data rate and was still acceptable even at the slowest rate, providing a good quality source was used. For those who want to be rather more ambitious with the use of the voice system, the eight recording segments enable a wide range of short messages to be stored.

Tuning around the band was also very easy both using the direct tuning and the memories. I found the simple memory programming to be very useful, especially when operating in a mobile environment.

The healthy 45 watts of r.f. was also a great asset for mobile use, though the advantage was mainly noticed by the other half of the QSO!

I was also pleased to see that packet operation had been considered as the FT-212RH is so easily removed from the car that it is almost bound to be called on to double-up as a base station rig. Packet operation was perfectly satisfactory with my TNC-220, though it was a shame that you had to disable the tone burst facility in order to extend the squelch line to the microphone socket.

## Summary

The FT-212RH represents the state-of-the-art in compact mobile transceivers and certainly warrants close consideration if you are in this market.

The digital voice system option was certainly not just a novelty but a very practical and useful addition. Overall, the FT-212RH is a very well though out transceiver with very few vices.

The FT-212RH costs £349.00 and the DVS-1 (digital voice system) costs £79.00. Both units are available from **South Midlands Communications, School Close, Chandlers Ford Industrial Estate, Eastleigh, Hants. SO5 3BY.**

My thanks to the SMC for the loan of the review transceiver. **PW**

# Multi-Purpose Zener Diode Tester

*This useful little instrument, designed by E.W. Nield GW3ARP, will give a direct reading of Zener working voltage and efficiency, in addition to junction voltage measurements of transistors and diodes.*

Most of us have an assorted collection of Zener diodes from which we endeavour to select the one we need. This, at best, involves using a magnifying glass to read those cryptic letters and figures. The worst case is when diodes have lost all their markings. Next comes the fiddling around trying to rig-up a constant current supply and a voltmeter to measure the Zener's operating voltage. Finally, after a Zener of the correct voltage has been found, are we sure it still works satisfactorily?

The device described here avoids all this hassle. The diode to be tested is simply attached to the terminal clips and its working voltage read off an external voltmeter (multimeter). Is it in good condition? Pressing the "Test" button doubles the series current and any failure of the Zener to stabilise the voltage can be seen as a rise in meter reading. The increase in current is confirmed by an increase in brightness of D5.

## The Circuit

The principle of working is simple enough—a current is fed via S1 and the l.e.d. (D5) to the Zener under test, and then to Tr1 which is connected as a constant current stage, (see Fig. 1). The Zener voltage is read off on a multimeter, set to an appropriate range, connected in parallel with the diode under test. The current through the Zener is then doubled from the normal 10mA by closing S2.

## Diodes and Transistors

With S4 in position a, a 1kΩ load is shunted across the test leads. This limits the voltage across the leads to a safe voltage of around 20V and allows the following measurements to be made:

**Diodes:** It is possible to identify the anode and cathode leads of an ordinary diode, as the l.e.d. (D5), will only light when the anode of the diode under test is connected to the positive test lead. A silicon or germanium diode can be distinguished by noting the change in voltage reading when the "Test" button S2 is pressed. A silicon diode shows only a minute change, whilst a germanium diode displays an obvious increase.

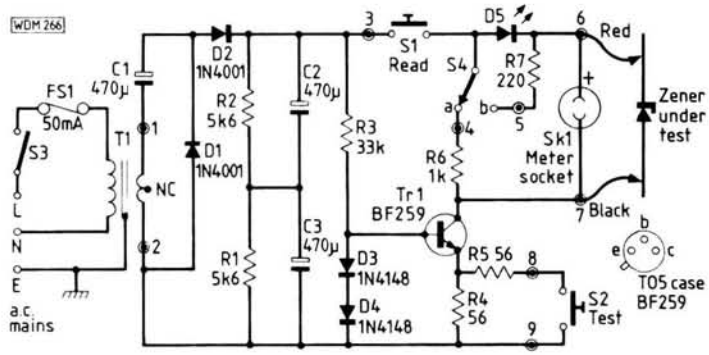



**Fig. 1: Circuit diagram of Zener tester**

**Transistors:** In the same way, unmarked transistors may be identified as *npn* or *pnp* types according to Fig. 2.

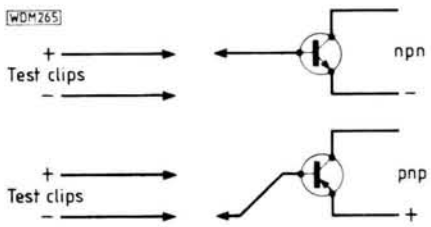



**Fig. 2: Test connection details of *npn* and *pnp* transistors**

**Internal view of author's prototype tester**

Unless connected as shown in Fig. 2, no current flows and the D5 fails to light. The base connection is identified in this process.

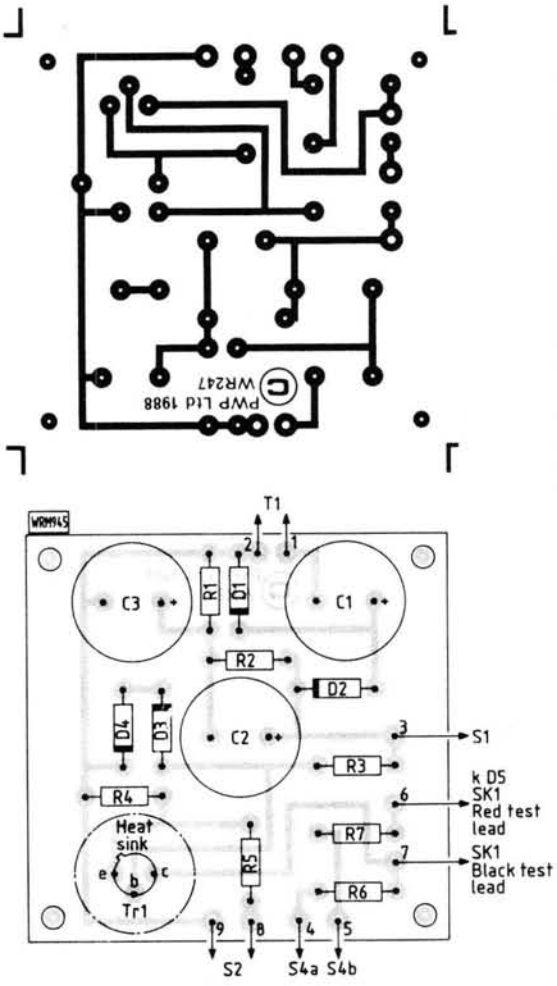
If the voltmeter is connected, the junction voltages will be displayed. A silicon transistor will show a steady junction voltage of 0.7V even after the "Test" button has been pressed.

A germanium transistor, however, will usually show an appreciable increase in junction volts, this is also true of small and medium current diodes. When dealing with large current germanium diodes or transistors, this rise is not so obvious, but here the junction voltage reading is lower than a silicon device, approximately 0.2V.

## Test Current

The voltages and currents in the test circuit have been adjusted to provide reliable indications of working efficiency, whilst avoiding overloading of the higher voltage types of Zeners. The test voltages and currents have also been chosen to make sure that the working parameters of Tr1 are not exceeded, particularly when diodes with low junction voltages are being tested.

**This project has been designed in accordance with UK practice and safety standards at the time of publication. Overseas readers contemplating construction must ensure that they make any modification necessary to comply with their local and/or national regulations and conditions**




## SHOPPING LIST

**Resistors**

| | | |
|---|---|---|
| *0.25W 2% Carbon film* | | |
| 56Ω | 2 | R4,5 |
| 220Ω | 1 | R7 |
| 5.6kΩ | 2 | R1,2 |
| 33kΩ | 1 | R3 |
| *0.5W 2% Carbon film* | | |
| 1kΩ | 1 | R6 |

**Capacitors**

| | | |
|---|---|---|
| *Electrolytic 63V radial* | | |
| 470µF | 3 | C1,2,3 |

**Semiconductors**

| | | |
|---|---|---|
| *Transistor* | | |
| BF259 | 1 | Tr1 |
| *Diodes* | | |
| 1N4001 | 2 | D1,2 |
| 1N4148 | 2 | D3,4 |
| l.e.d. 0.2in Red | 1 | D5 |

**Miscellaneous**

Aluminium project box; s.p.s.t. 250V miniature toggle switch; s.p.d.t. miniature toggle switch; Push-to-make switches (2); 2-pin DIN socket; 2-pin DIN plug; Insulated miniature crocodile clip—red; Insulated miniature crocodile clip—black; 12–0–12V miniature mains transformer 50mA type 12012DB(1); Grommets; Cable strain relief; 3 core 2A mains cable; Nuts; Bolts; connecting wire; Expandable rubber sleeves, type 399–580(2); 20mm chassis mounted fuse holder; 50mA 20mm fuse; Veropins; p.c.b.

(1) Electrovalue Ltd, 28 St Judes Road, Englefield Green, Egham, Surrey TW20 0HB. Tel: 0784 33603

(2) Electromail, PO Box 33, Corby, Northants NN17 9EL. Tel: 0536 204555



**Fig. 3: Full size p.c.b. track pattern and component placement diagram**

In normal use no temperature rise in Tr1 will be noticed since the test current only flows for a short period. Even if the test current was allowed to flow continuously no undue overheating would occur. However, a small heatsink could be fitted as a precaution.

The actual test current of the circuit can be checked by connecting a 100Ω 0.5W resistor across the test clips. There will be approximately 1V dropped across the resistor if all is well. With the "Test" button pressed, this voltage should increase to 2V, as the maximum current available from the tester will be in the region of 20mA. This means the accidental shorting together of the test leads is harmless, with a maximum current of 20mA available.

## Construction

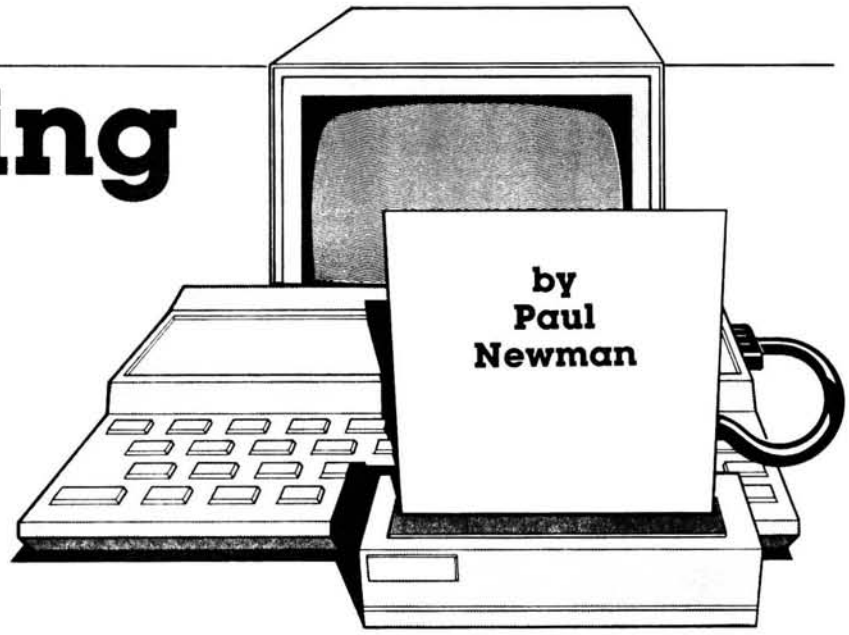
The author's original prototype was constructed on Veroboard and housed in a small aluminium project box. There is, however, a p.c.b. now available for this project, (see Fig. 3). Socket SK1, used to connect an external test meter to the project, is a 2-pin DIN. This type is normally used for loudspeaker connections, but in this case it was chosen as it is impossible to insert the plug the wrong way round.

As with any project using a p.c.b., all off-board connection should be made via Veropins. This facilitates easy connection of a test meter if any problems should arise on completion of the project. Having said this, please read the next paragraph carefully.

**Caution: This project has a mains voltage connection. Every effort must be made to insulate all joints that carry a mains voltage, including the mains switch and connections to the primary of the transformer. Insulation of such joints can be achieved with small rubber sleeves. It is also recommended that the mains plug fuse should have a current rating of no greater than 2A.** ***PW***

*Feature*

# Computing Corner




Some of you will remember me mentioning (quite some time ago now) the ZX COMLINK I which permits an unexpanded Sinclair ZX81 to operate modems or TNCs. I am pleased to say that this has been reviewed for us by Dave Ackrill G0DJA, and this forms the first part of this month's column.

The ZX COMLINK I is an adapter which converts ZX code from a Sinclair ZX81 computer into ASCII code suitable for RS232 applications. This enables a Terminal Node Controller (TNC) (for Packet Radio) or a telephone modem to send and receive information to and from a ZX81 with just 1K of memory.

The unit is about the size of a ZX81 16K rampack and slots into the multiway socket at the rear of the computer. It has a standard 25-way RS232 (D-type) plug on its rear face and a male-to-female lead will connect to most terminal devices.

The instruction sheet shows that six connections are required:

Pin 1—Ground (protective earth)
Pin 2—Transmit Data
Pin 3—Receive Data
Pin 4—Request to send
Pin 7—Signal Ground
Pin 20—Data Terminal Ready

although pin 1 is not connected within the unit, and pins 4 and 20 are taken to the same point on the internal circuit board via two fixed resistors.

Once connected up, a simple one-line BASIC statement is all that is required to make the unit run. The COMLINK signs on with a message to the ZX81 to show that it is working. At switch-on the unit defaults to 8 data-bits, 1 stop-bit and even parity. However, there are seven other data/stop/parity options available which can be selected as soon as the unit has signed on.

To use the unit with a Pak-Comm TNC 220 terminal node controller, he selected 7 data-bits, 1 stop-bit and even parity. The TNC has its own sign-on message and the display showed that both it and the COMLINK signed on without any problems. This proved they would "talk" to one-another.

For those who want to use a telephone modem or TNC which does not send back (echo) the keyboard characters as they are typed you can select a "local echo" facility to overcome this. The instruction sheet is clear and gives examples of how to use the unit where necessary. However, the unit has a lot of facilities so it is a good idea to keep the instructions handy when using it for the first time.

The COMLINK also extends the Sinclair ZX81 basic character set to allow "control" characters, like those found on more powerful computers. These are activated via the SHIFT button along with several of the keyboard characters. This means that CNTRL-C and CNTRL-Z are possible which is useful on some Packet Radio Mailboxes. The COMLINK allows the ZX81 to display both upper and lower case characters, again selectable from the keyboard.

The MACRO feature gives the operator up to nine stored messages (via simple BASIC lines which may be loaded from tape along with the start-up line). Those readers using RTTY will know how useful this facility is for sending station details, name, etc.

One feature not used was the HEX loader. According to the instructions this allows machine code programs to be loaded into the ZX81 via a modem or TNC. However, the code must be in INTEL absolute hex-format and the reviewer could not discover whether hex from other computers conformed to this format. It may be possible to exchange machine-code programs over the air using the "transparent" mode. Obviously, if the other station is using a ZX81 and COMLINK there will be no problem. But you will still need to know how to handle hex.

## Conclusions

The COMLINK is a very useful interface. It was more reliable than the reviewer's usual ZX81 RS232 interface but it will only run at 300 baud (the on-air data rate can be different). This would not be a problem on the older TNCs like the TNC-200 which have their baud-rate selected via external switches. Newer units like the TNC-220 default to 1200 baud but 300 baud can be selected simply by entering the TNC selection command at the ZX81 keyboard. Some TNC units will search through the baud rates and lock onto the interface baud rate. The Kantronics All-mode (KAM) is one of these.

Although this review covered Packet Radio the COMLINK could also be used with a c.w., RTTY, ASCII, FAX or telephone modem, so long as they output RS232 signals. 1200 Baud operation is not possible with the COMLINK although this is absolutely no problem on two grounds; (a) the on-air rate can be different and (b) no-one can type at speeds greater than 300 baud! (COMLINK designer's comment).

I am sure that many will find Dave's review of great interest and I'm very grateful for all his work. Interestingly, Dave found the system more reliable than his Spectrum setup and he's making arrangements to obtain a COMLINK. If anyone else is interested in obtaining a unit then I can arrange this without you having to be concerned with US dollar transfers. The total cost including postage will probably be well under £30.00 depending upon the value of the dollar against the pound! Contact me if you want further information.[1]

I am constantly being asked if there is any way in which programs designed for one micro can be loaded and run in another. Generally of course, my answer is always that there is none, so I'm glad that there is at least the prospect that CPC6128 owners will soon be able to load and run Spectrum BASIC tapes.

BETASOFT, the software house that produced BETABASIC, announce their intention to launch a Spectrum-ROM emulator for the CPC6128 should demand be sufficient. The program will permit Spectrum BASIC tapes to be loaded directly into the CPC and RUN without any further treatment. Machine-code programs will NOT run due to technical differences in hardware, interrupt handling, etc.

The chief advantage of this system is that it makes a large number of BASIC programs supplied on tape, available

## SCANNERS

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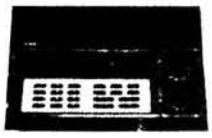

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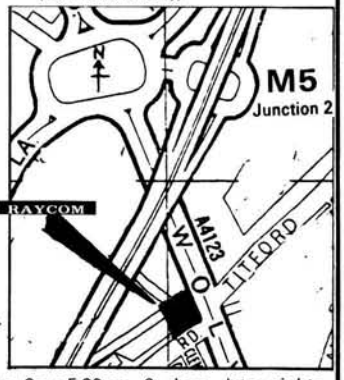


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to the CPC6128 user without any prior knowledge of either Spectrum or Locomotive BASIC. The GM4IHJ satellite programs would all run exactly as supplied on tape, for example.

If you are interested in this product (which will have an issue price of about £10.00) then please write to Dr A. Wright at the address [ii] or I'll gladly pass on comments myself.

Spectrum Plus-3 users will be pleased to know that the +3 version of BETABASIC is coming along well and looks almost certain to be available very soon.

Recently a number of QL users have taken advantage of the limited radio software library available through me, Hil G4YNV has been reworking a few of the more interesting items. He came across a serious bug in the "G6TJT ATV" program and has prepared a fix as detailed here.

Owners of JS-ROM QLs may have experienced difficulties in getting G6TJT's ATV program to do anything other than lock the computer up. The cause is an attempt to redefine the PRINT keyword; this worked on some earlier ROMs but wreaks havoc with the JS version. The way to a usable program is as follows:

1. Load the program—DO NOT run it!
2. Enter DLINE 26200 TO 26420
3. EDIT 10560 to read FOR n = 0,1,2 : PRINT#n,cs$;
4. SAVE the amended version.
5. To use the amended version, RESET the QL before LRUNning in MODE 8. NEW will not be enough presumably because the QL fails to clear the erroneous definition from the name-table.

## Briefly

Anyone seeking Radio Amateur Examination courses suitable for use in the home, or by the house-bound is asked to contact Peter G4EGQ[iii] who administers such courses under very flexible arrangements.

Many correspondents asked for the source of the items extracted for *Megahertz* (a French Radio magazine) mentioned in the July 1987 *PW*. Please enquire for opening times, photocopy service, etc., from reference [iv].

John G4VJK drew my attention to the PD Software Library[v] who hold a considerable Public-Domain software library including some radio software volumes. Micros supported include IBM/PC and MSDOS and CP/M operating systems.

I understand that a Spectrum FAX decoder will be available from JEP Electronics by the time this is read and I hope to include a review whenever possible, along with one on the CPC464/6128 Morse decoder.

Pearson Computing tell me that the minimum-hardware Packet Radio system for the Spectrum is still incomplete but work continues with hopes of a worthwhile product. To complete the round-up of software suppliers, Technical Software (GW3RRI) say that developments are always in hand but there was nothing specific to report as yet.

Several recent correspondents paid tribute to the assistance given by all major suppliers in overcoming difficulties of various kinds centred around getting various programs working with the Spectrum Plus-3. I understand that most problems are now resolved and Plus-3 versions of most major programs are available on disk.

Many thanks for your continued support for the column and I always look forward to your letters and comments.

## References


(i) Paul Newman G4INP, 3 Red House Lane, Leiston, Suffolk IP16 4JZ (s.a.e. essential).
(ii) BETASOFT, 24 Wyche Avenue, Kings Heath, Birmingham B14 6LQ.
(iii) Peter G4EGQ, 146 Elms Vale Road, Dover, Kent CT17 9PN.
(iv) British Library Science Reference and Information Service, 25 Southampton Buildings, London WC2A 1AW Tel: 01-323 7928.
(v) PD Software Library, Crowborough, Sussex.

# NEWS DESK ... compiled by G4LFM and G8VFH

## Morse Keys

G4ZPY Paddle Keys is a new name in the field of Morse Key manufacture. At the moment there are three keys in the range, the traditional "straight" key, a single and a twin paddle key.

The keys are made in highly polished brass and nickel plated brass, each being hand-built. The straight key is mounted on either Lakeland stone or Greek marble, the latter is available in five colours.

The single and twin paddle keys are G4ZPYs own design and come mounted on heavy steel bases. Marble bases are available to order.

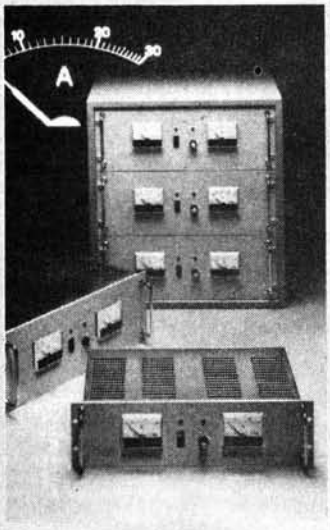
Other products available are iambic keyers, baluns and practice oscillators. An s.a.e. to Gordon G4ZPY will bring details of all the products available.

***G4ZPY Paddle Keys,***
***41 Mill Dam Lane,***
***Burscough,***
***Ormskirk,***
***Lancs. L40 7TG.***


## Rack Mounted PSUs

BNOS have announced a new range of high current rack-mounted linear power supply units.

They have been designed for applications where low noise and high reliability is important. The range covers output voltages of 2 to 30 volts and current levels of up to 100A d.c.




The units are housed in a 3U or 4U 19in rack with either analogue or digital read-outs. A full data sheet is available from:

***BNOS Electronics Ltd.***
***Mill Lane,***
***Stebbing,***
***Great Dunmow,***
***Essex CM6 3SL.***
***Tel: 0371 86681.***

## College Courses

**Liverpool:** RAE classes will be held at Sandown College, Faculty of Engineering, Sandown Road, Liverpool L15 4JB. The course starts September 13 on Tuesdays and Thursdays, 6.30-9pm. They will be covering the CGLI syllabus and providing Morse tuition to examination standard. Further details from the course tutor, ***J.C. Loughlin G4DKQ. Tel: 051-733 7211 ext 333.***

**Manchester:** RAE classes will be held at Pendlebury High School, Cromwell Road, Swinton, Mondays at 7.30pm commencing late September. The instructor is P. Whatmough G4HYE. Details from: ***G4HYE. Tel: 061-794 3706*** or from *Swinton Adult Education Centre.* ***Tel: 061-794 5798.***

**Manchester:** Morse classes will be held at Pendlebury High School, Thursdays at 7.30pm commencing late September. The instructor will be W. Stevenson G4KKI. Details from ***Swinton Adult Education Centre. Tel: 061-794 5798.***

## Can You Help?

Mr Tom Benfield is restoring a Nagard Oscilloscope type DS103. He would be pleased to receive any information on this oscilloscope or its power supply. Also any information on the company would be of help too. Write to: ***Tom Benfield, 47b Warneford Street, London E9 7NG.***

## CRUG Goes Public!

A few months ago the Commodore Radio Users Group started up, little did the originator envisage what was ahead. Around 130 or so people registered initially and it has been the general consensus of opinion that the group should produce their own magazine and be run along the lines of most other computer/radio user groups.

As from June 1, the CRUG became a "real" user group. A magazine will be produced four times a year and will be known as *Connections.* Subscriptions have been fixed at £8 for the first year and will be reviewed next year.

For further information on the group, contact:

***Commodore Radio Users Group***
***Simon Lewis GM4PLM***
***69 Irvine Drive***
***North Clippens***
***Linwood***
***Paisley***
***Renfrewshire PA3 3TB***

## 1901-2099 Clock

Maplin Electronics have introduced the 200 year calendar clock. It features an l.c.d. digital alarm clock and calendar with a permanent display of the time, year, month, day and calendar for the current month.

The time may be set to display in the 12 or 24-hour format. The date and calendar displays can be moved forward or back in one month steps to any month between the years 1901 and 2099.

The case which houses the 73 x 40mm display is in gold anodised alloy with dark brown end pieces. The price for the clock is £14.95 inc VAT.

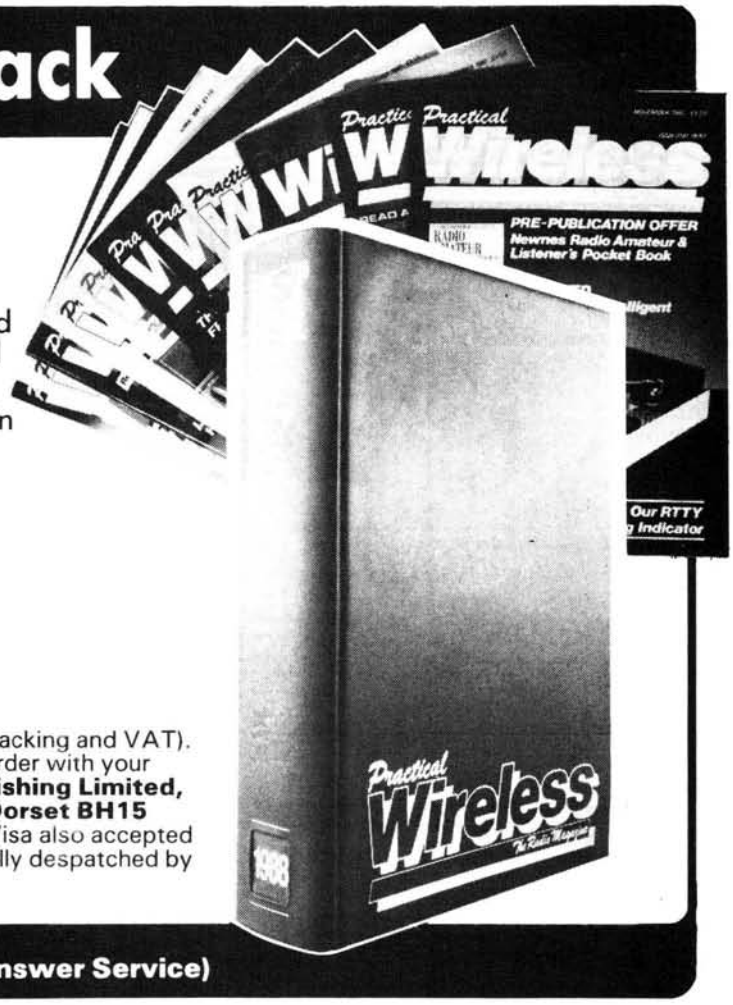
***Maplin Electronics,***
***PO Box 3,***
***Rayleigh,***
***Essex SS6 8LR.***

## Only the Name has Been Changed

As from May 1, the Earlestown branch of ARE Communications Ltd., separated from their parent company and is now known as Amateur Radio Communications Ltd. The address is 38 Bridge Street, Earlestown, Newton-Le-Willows, Merseyside, telephone 09252 29881.

The only thing that has altered is the name. The shop will be carrying on with the same policies as before. Peter Roberts G4KKN is now the owner and Frank and Elaine will still be there to help you with your enquiries. The shop is open Tuesdays and Saturdays, 10am to 5pm.

# Tidy up your shack

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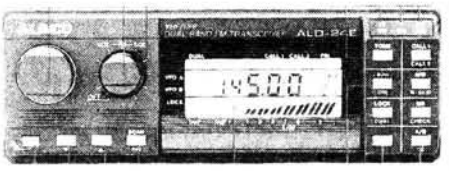

What can you say about this transceiver other than praise? The new ALINCO ALD-24E has brought the cost of dual banders down to a price that makes it a serious option to the 2 metre only rig. Just think of the pleasure of being able to select 2m or 70cm at the press of a button. No aerial switching (duplexer built in) and full duplex operation. The ALINCO actually has two completely separate transceivers built into its small case measuring 5.5" × 2" × 6.5". It has all the features of the ALR-22E (see below) at a huge saving over its competitors. We could mention the optional extended receiver coverage of 138-174MHz & 420-454MHz at no extra charge, but then everybody would want one! So we thought that we'd simply invite you to send for the full colour brochure instead.

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**THE RADIO COSTS £249**

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# Crops and Coils Part 1

## How It All Began

*The 1930's were difficult times for farmers. Cheap imported food threatened their livelihood and, if this were not enough, their problems were then compounded by the general strike. Rumours were rife, causing great confusion. Newspapers were limited to a single small page. Indeed, the traditional communications systems were virtually out of operation. But, there was a new way to disseminate vital information. That was by "wireless", George Pickworth tells the story.*

My grandfather was a farmer, and I can just remember him straining to hear the feeble sounds emanating from the trumpet loudspeaker. He was listening for vital information about prices and transport services that might still be operating, as he needed to get perishable products to the market. Little did he realise that one day, I too would rely on radio broadcasts for news and information. That came in 1948 when I began my career as an agricultural advisor in very remote parts of Africa. By then, I was the proud owner of an Eddystone 358 communications receiver.

My interest in radio and affinity for the magnificent communications receivers of that era, started when I rediscovered grandfather's old receiver in the attic and managed to get it working again. Like many receivers of the early 1920's vintage, the components were precision made with instrument quality controls. They were mounted on an ebonite panel that sat horizontally on top of the cabinet.

The tuning control and the two valves were on the upperside, the other components were underneath. It used a triode regenerative detector, transformer coupled to a triode output stage feeding a high impedance trumpet loudspeaker. A massive 6 volt accumulator provided power for valve heaters, while a dry battery supplied the anodes with 120 volts.

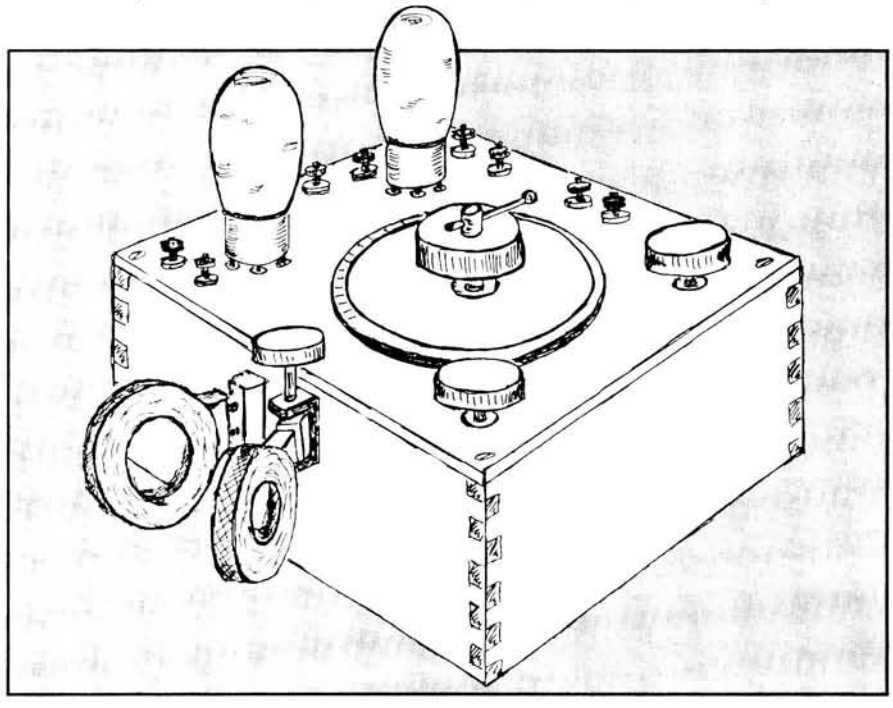


**Fig. 1.1: Grandfather's first valved radio receiver, circa 1925, using valves with 6 volt heaters.**

## Regeneration

Regeneration had just been invented by Major Armstrong when grandfather's first valved set was made. It followed the original design by having a "tickler coil" mounted on a hinged bracket. The technique was to first tune-in to a station, then swing this coil towards the tuning coil, so that regeneration (positive feed-back) brought the detector valve almost to the point of oscillation. This dramatically increased the sensitivity of the detector, but the two controls had to be operated in unison. This required considerable expertise to avoid actual oscillation and interference with other receivers in the vicinity. Indeed, inexpert operators caused so much interference, that it became compulsory for later generations of commercially built receivers to have regeneration limited to a point well below oscillation, and to carry a sticker to say they were "Approved".

By the mid 1930's, valves had been developed to give a useful gain at the lower radio frequencies, so highly sensitive regenerative detectors were no longer necessary for reception on the long and medium waves.

This gave designers the opportunity to develop detectors able to reproduce the high audio quality of the BBC broadcasts. A good example of such techniques was a bandpass r.f. stage followed by an infinite impedance detector. This gave just about the "ultimate" in sound quality.

## Short waves

Now that commercially-made long and medium wave receivers dominated the domestic scene, and that generation of experimenters who had pioneered with early receivers had either become radio amateurs, or developed other interests, my generation of experimenters was taking a great interest in the short waves. But that required a special kind of receiver.

Valves which gave adequate gain at the lower radio frequencies were almost useless at the higher frequencies, so receivers which depended largely on r.f. amplification were unsuitable for short wave reception. On the other hand, superheterodyne receivers, which achieved most of their gain at a low intermediate frequency, were basically suitable for short wave reception, but specialised commercial short wave receivers were not generally available. And only a few of those were superheterodynes.

However, domestic superheterodyne receivers were already available in the mid 1930's and many provided for short wave reception. But they had their drawbacks both for domestic use and for short wave listening.

Many complained that audio quality was inferior to "straight" receivers, while the inability of ordinary domestic receivers to resolve c.w. transmissions, and the problem "images", limited their appeal for short wave reception. Then there was the formida-

ble problem of resolution when covering a band some twenty times wider than the medium wave band.

As far as young experimenters were concerned, the limitations of the superheterodyne were academic. They had already discovered that the regenerative detector provided a far simpler, and infinitely less expensive way to explore the short waves. It had none of the problems inherent to a superheterodyne, nor did it generate signals which bedevil some modern designs.

The regenerative detector had a theoretical gain approaching a million, and gave an audio output directly from either a.m. or c.w. transmissions, right up to the very highest frequencies in use, managing all this in a single stage consisting of a valve and half a dozen other components. However, it was a highly critical device and in order to utilise its tremendous potential, it had to be "tamed".

This was an empirical exercise in which young experimenters excelled. The slightest change in the position of a component, the value of a resistor or condenser (or capacitor, as we call them now) could make all the difference between a good receiver and a superb one. My favourite design used a 6J7 pentode, with a variable resistor to control the voltage on its screen grid.

When compared with my modern transistorised receiver, I am convinced that many devices did approach the ultimate. But, whereas a modern receiver is easy to use, it required great skill to operate a simple regenerative receiver. I can think of no greater challenge to young experimenters today, than to build an operate a replica of those valved short wave receivers.

RF stages were generally avoided, until valves that gave a useful gain at the higher frequencies became available. Even then, not all constructors were convinced of their value. However, some did believe that one was warranted simply to isolate the antenna from the detector. Indeed, the loading effect of the antenna was a serious problem with regenerative receivers.

Experimenters evolved a simple method of describing their receivers. Each r.f. stage was indicated by a number, followed by a V which indicated the detector. This was followed by additional numbers to indicate the audio stages. For example, a simple receiver consisting of a detector, followed by a single audio stage was called a 0V1 receiver.

Notwithstanding the superheterodyne, the 0V1 became the classic short wave receiver, favoured not only by amateurs, but by ships' radio operators almost to the beginning of World War II.

## Conversion

One of the first refinements in regeneration had been to replace the swinging coil with a fixed coil, and to control feedback with a variable condenser. Most "bread board" domestic receivers, made in their thousands by an earlier generation of constructors used this method, and some were still in use as late as 1934. They were readily available and prized by young enthusiasts as they were ideal for experiments. Many were suitable for conversion into simple short wave receivers.

The components had screw terminals, so the only essential tools were a pair of pliers, a screw driver, a few drills and a bradawl to make pilot holes in the baseboard. Furthermore, they were designed for battery operation which was an advantage to young experimenters. Power supply was not a problem as most domestic receivers still used 2 volt accumulators and 120 volt dry batteries. All-mains sets were still "up-market".

Conversion of "bread board" receiver into short wave receiver meant reducing the capacity of the tuning and regeneration condensers (by removing half the vanes), and winding a new tuning coil to suit a required segment of the band, then wherever possible, by adapting the original former. However, it was more difficult to make a suitable r.f. choke.

It was usually necessary to replace the traditional ebonite panel with metal, to prevent hand-capacity from upsetting the tuning. However, a notable exception was the famous Eddystone short wave receiver, which minimised stray capacitance by using a glass panel.

Nonetheless, with careful layout and a metal panel, the upper frequency limit was determined mainly by the valve. It was not difficult to select valves that would work at frequencies as high as 20MHz.

## Construction

My first short wave receiver had a panel made of plywood backed with tinfoil. Holes for the tuning condenser and reaction control, were made with a red hot poker. The detector valve, a PM1HF was a transformer coupled to a PM1LF output stage. Simple as it was, sensitivity was sufficient to bring in a number of American stations. By using additional plug-in coils, such receivers would operate satisfactorily down to the long waves, provided that the restricted band coverage (caused by the reduced capacity of the tuning condenser) was acceptable.

As better valves became available, I progressed to superheterodynes and other complex equipment. Components made especially for amateurs and short wave experimenters were used. Construction became a real engineering job. We relied on sound mechanical principles to give stability and reset accuracy. Precision dials were by far the most expensive components.

Construction of these complex receivers gave me great satisfaction. Indeed, as I found during my own career, even if one is orientated towards science, those who also have the gift to use their hands are the most fortunate.

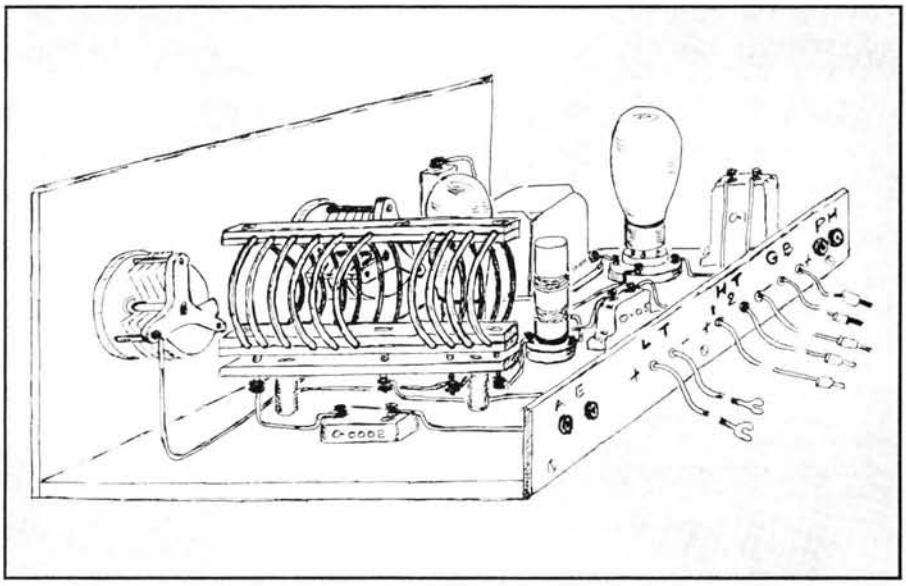


**Fig. 1.2: A short wave receiver made by the author in 1935 using the "bread board" design. The valves had 2 volt heaters and together with other components were salvaged from old domestic radios, and the plug-in tuning coils were home made.**

**In Part 2, George Pickworth continues his tale of a schoolboy Radio Experimenter in the late 1930s**

# Apartment HF TX Antennas

## Part 2

*In this, the second part of an article by Richard Q Marris, we'll look at some practical antenna designs. Many of the antennas described have been tried and tested under various circumstances and in most cases have worked very well.*

The dipole is probably the best known and most used antenna. It is a half-wavelength long, is centre fed, and has relatively low feed impedance. The basic configuration is shown in Fig. 2.1a. Alongside this is the generally accepted formula to find the length in relation to frequency, always assuming that the dipole is in the clear.

The r.f. voltage reaches a minimum at the centre, and is highest at the extreme ends. Conversely the maximum current is at the centre, and minimum at the ends. For practical purposes it can be assumed that the middle quarter wavelength produces the maximum radiation.

Approximate lengths for h.f. amateur band $\lambda/2$ dipoles are:

28MHz = 5.11 metres
24MHz = 5.96 metres
21MHz = 6.81 metres
18MHz = 7.94 metres
14MHz = 10.21 metres
10MHz = 14.3 metres
7MHz = 20.43 metres
3.5MHz = 40.86 metres

In practice, the length should be calculated from the formula in Fig. 2.1a, plus about 10 percent, so the antenna can be pruned back for resonance.

When it comes to "indoor" and "in-room" dipoles, additional factors must be taken into account. Being in a confined space, the surroundings (i.e. capacitance) will confuse the length required. Furthermore, if the dipole is bent then this invariably reduces the overall electrical length. This means that the physical length will have to be increased by an amount only determined by experiment. In addition both factors may well alter the feed impeddance and some sort of matching (e.g. a balun) should be used.

The only bands on which an "in-room" dipole could be practically used are 28MHz, 24MHz and 21MHz; maybe by bending and end loading 18MHz and 14MHz. It all depends on the individual circumstances which will be different for every QTH.

The best idea is to erect the dipole diagonally across the room, from opposite corners, and at least 150mm below the ceiling level. The big snag about this, with a dipole, is the feedline drops down in the centre of the room. This problem can be overcome by making the feedline detachable, so when the antenna is not in use it can be easily disconnected.

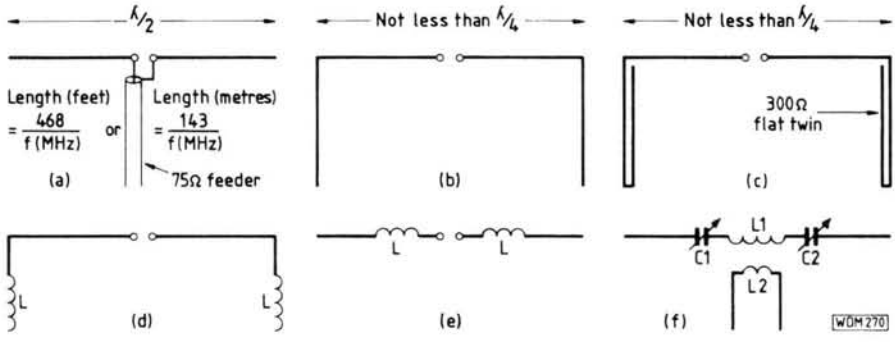



**Fig. 2.1**

The dipole in Fig. 2.1b has its ends dropped down, however the horizontal part should be at least a quarter wavelength long i.e. approximately 2.6 metres on 28MHz; 3.4 metres on 21MHz and 5.1 metres on 14MHz. If the ends are physically too long to accommodate, then they can be end-loaded with inductors (see Fig. 2.1d). These should be wound in the same gauge wire as the antenna.

Another method of end loading is shown in Fig. 2.1c where the ends are loaded with 300Ω flat twin feedline. It's rather tedious to adjust, but it works well. All the dipoles shown in Fig. 2.1a–d have worked successfully on the 14MHz, 21MHz and 28MHz bands. The inductance loaded dipole in Fig. 2.1e can be found in the *ARRL Antenna Book*, complete with the necessary lengths and inductance tables. The value of the inductors (L) depends on the length of the antenna and the position of the inductors in that length.

A practical antenna for the 14MHz band is one designed by K2EEE that appeared in *CQ* in the early 1960s, and is reproduced in Pat Hawker's *Amateur Radio Techniques*. This antenna is 4.88 metres long and could quite easily be reduced to manageable "in-room" dimensions by using sectional or telescopic elements, allowing easy storage and erection. A similar device, using telescopic elements, has in the past been tried on 21MHz by the author, with some success.

The loaded/tuned dipole shown in Fig. 2.1f, appeared many years ago in an ARRL publication.

The inductors give the effect of over lengthening a much shortened dipole, and the series variable capacitors C1 and C2, tune the dipole to resonance. The low impedance feedline is coupled to the dipole's centre inductor (L1), via L2. The dipole version of this antenna has not been tried, but the most obvious and useful improvement to the design would be the ganging together, with an insulated shaft, of the two tuning capacitors. It might form the basis of a 7MHz antenna, using very restricted element lengths of under 6.1 metres. There seems room for some experiment here.

## Strange Antennas

Though this article is basically concerned with "in-room" transmitting antennas, it is possible just once in a while to initiate an outside antenna through devious means. Here are two examples, both of which have been used in the past with some success.

The antenna shown in Fig. 2.2 is the result of being given an old fishing rod. The rod was made of cane, in 3 one metre sections, each joined to the other with a brass ferrule. This rod seemed to have good potential for a clandestine antenna which, when broken down,

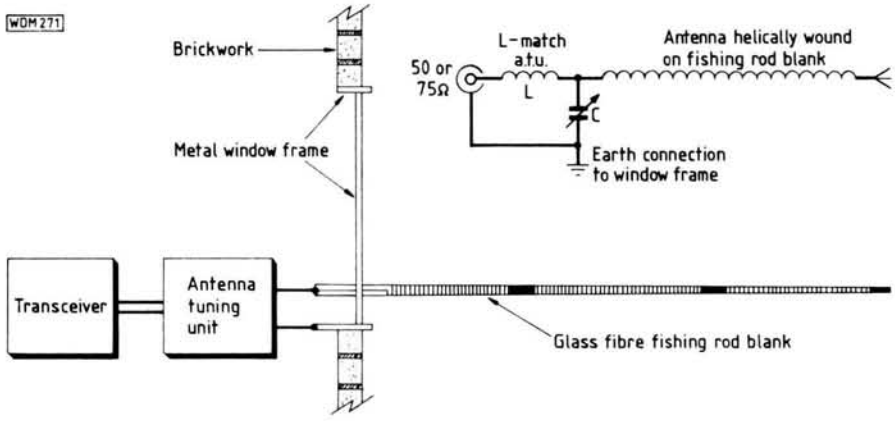



**Fig. 2.2: One of the author's "strange" antennas**

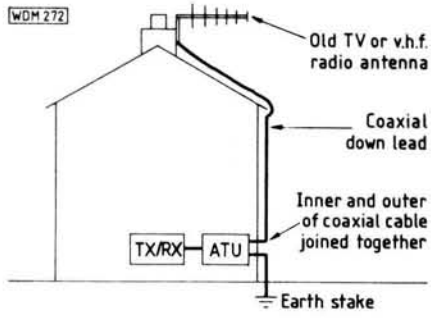



**Fig. 2.3: The "phoney" TV antenna that can get around local regulations**

would only measure approximately a metre; with the added advantage of quick and easy assembly.

The preparation of the rod for use as an antenna includes the removal of all the fittings except the handle and ferrules, then the whole thing was rubbed down with glass paper.

It was decided to use the rod as the basis of a 14MHz band 0.28λ helical wound antenna, and the resultant design can be seen in Fig. 2.2.

The 0.28λ antenna was chosen in favour of the 0.25λ version because of its higher feed impedance, consequently it's easier to load-up. For an electrical wavelength of 0.28λ, it is generally accepted that it is necessary to wind on about 0.56λ of wire. Err on the generous side and prune back if necessary. The winding was made of black pvc covered wire, with turns evenly spaced apart over each section of the rod. The wire was terminated at the end of each section by soldering to the brass ferrules.

The final three-section helical antenna including its mount, were given a coat of black marine varnish. A simple mount was devised to clamp the antenna, at 90 degrees, to the metal frame of a slightly opened window through which the antenna was poked. The window in this case was only 7 metres above ground level.

The transmitter was matched to the antenna via an "L-match" a.t.u. This arrangement can be seen in Fig. 2.2. The "L-match" was earthed to the metal window frame with a large jump lead type crocodile clip, this formed the groundplane; or whatever the antenna is loaded against! During the hours of darkness, this antenna was installed horizontally through the window, invisible from the ground; yet still capable of working DX using low power c.w.

An updated version of this antenna could be built on a glass reinforced plastics fishing rod blank, available from most fishing tackle shops, including ferrules. *Caution: check with the retailer as to the composition of the fishing rod blank, as some modern rods contain carbon fibre, which make them unsuitable for this type of project. Ed.*

A suitable QRP "L-match" a.t.u. with built in v.s.w.r. meter, appears in the *PW* reprint *Introducing QRP*. This design could quite easily be up-graded to take much higher powers, remember though, more power, more TVI!

## The Phoney Antenna

If you live in a private dwelling that has its own domestic TV and f.m. antenna system, but because of local planning regulations amateur antennas are not tolerated, you could be in luck. Why not get another TV antenna installed and use its coaxial down-lead as an end-fed long wire antenna? After all two TV antennas pointing in different directions are a status symbol, just like two cars!

The phoney TV antenna (Fig. 2.3) should be mounted as high as possible and the coaxial cable run down to the radio shack. At the antenna end of the coaxial cable, it is necessary to insulate the cable from the actual antenna terminations. The author used about 300mm of strong dark nylon rope to achieve this; the join being invisible from the ground.

The other alternative is ask your local "aerial" rigger to install the TV antenna; when he comes, just ask him to run the coaxial cable into the termination box of the antenna, but not to connect it. This may cause a few raised eyebrows, but instruct him to just tape up the end of the cable in such a fashion as to stop it becoming physically detached from the antenna. At the shack end of the coaxial cable, connect the inner and outer conductors together and then to the transceiver via an L-match a.t.u. and an s.w.r. meter.

The earth installation for this antenna can be either, if the shack is on the ground floor, an external earth spike, or a heavy wire gauge connection to the building's radiator or cold water system. Never use mains earth or pipes connected to gas utilities.

The new TV antenna is phoney, but its coaxial feeder when used in conjunction with the "L-match" a.t.u. and a good earth system, is capable of excellent results on both the 14MHz and 3.5MHz bands, even with low power c.w.

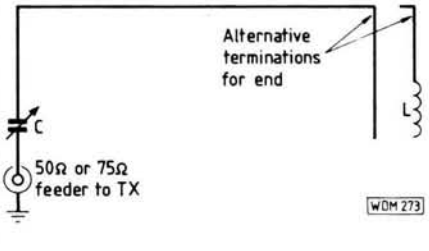



**Fig. 2.4: The λ/3 antenna, successfully used by the author on Top Band**

## End Fed λ/3 Antennas

This type of antenna has been used successfully by the author on all h.f. bands including Top Band. It usually appears as a vertical fed against a groundplane, but in the configuration shown in Fig. 2.4 it has proved to be a very good "in-room" antenna for both the 21MHz and 14MHz bands.

If this antenna is made 0.28λ long then, in theory, the feed impedance should be approximately 50Ω. This figure will increase to about 75Ω if its length is nearer 0.32λ. The reactive component can be tuned out with a series capacitor. If this type of arrangement is used, either a 50Ω or 75Ω coaxial feedline may be used, effectively eliminating the need for an a.t.u. Unfortunately, this only holds true if your transceiver output has a pi-network tuning system. The type of series capacitors used by the author have usually been good quality variables, with a value of around 60 to 100pF, either will do for the 14MHz and 21MHz bands.

Usually, a long wire or helical earth counterpoise has been used with this antenna. On occasions, when the transceiver was near a metal framed window, this was used as the earth; all have been successful.

The antenna is made from a length of pvc covered flexible wire, slung diagonally across the room. The horizontal part of the antenna is stretched absolutely straight, and at least 150mm below the ceiling. Assuming that there is about 1.2 metres drop down to the transceiver, then it is likely that you may have some antenna wire over at the far end, in which case this may be allowed to drop down a metre or so. On 14MHz it may be necessary to add an

end loading inductor, see Fig. 2.6.

Using the illustrated configuration of this antenna the maximum r.f. current point conveniently appears along its horizontal section. This, combined with its low feed impedance and not too critical earth requirements, makes it a most useful antenna for the 14MHz, 21MHz and, no doubt, 28MHz bands.

## Useful ATU

The a.t.u. shown in Fig. 2.5 is a necessary requirement for most of the end fed antennas mentioned in this article, with the possible exception of the antenna just described. The "L-match" is very simple to build and easy to operate, it will match just about any old length of wire to 50 or 75Ω feeder. The most crucial part of the "L-match" design is the *LC* or *CL* ratio, once this has been found, all will be well. The other important point to note about this a.t.u., is that it must be built in a screened box.

The a.t.u. shown in Fig. 2.5a is the most commonly used configuration. The "L-match" a.t.u. is fully documented, with designs in most amateur text books. *(Try reading Chapter 8 of* Simple, Low-cost Wire Antennas *by Orr and Cowan, Ed.)* However, most designs that appear show inductor (L) having switched or continuously variable, roller-coaster style tappings, so they can be used on more than one band.

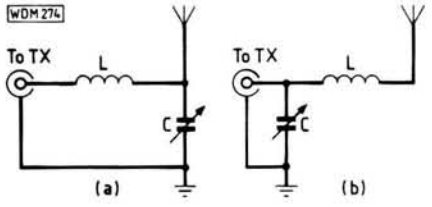



**Fig. 2.5: The "L-match" antenna tuning unit**

The trouble with such tappings is that, after a while, these go high resistance, etc., with resulting losses of r.f. This probably wouldn't even be noticed with a 50 watt transmitter and outdoor antenna. But with an "in-room" antenna and low power, such losses can have a significant effect on one's DX capabilities.

A conventional tapped "L-match" a.t.u. is used for initial experiments, with a new antenna design, but after that a separate a.t.u. is used for each band. These should have untapped inductors and high quality variable air-spaced capacitor. The philosophy behind this is, if you can save a few losses here in the system, and few losses there, then there may well be an odd watt or two extra available to be radiated to the world outside. After all, every little helps!

## L-match and End Fed

A typical example of an "in-room" antenna suitable for use on 1.8MHz, 3.5MHz, 7MHz, and possibly 14MHz, is shown in Fig. 2.6. It consists of the longest possible straight horizontal wire, slung diagonally across the room, with maybe 1.2 metres of wire dropped down to the "L-match" a.t.u. The wire has a loading coil at the far end, (L). The pvc covered flex should be at least 150mm below ceiling level and suspended either end with at least 300mm of nylon fishing line.

It should be noted that there is another optional loading coil, (La), shown between the antenna and a.t.u. This should not be needed with the possible exception of Top Band. The target for such an antenna is to get the high r.f. current located in the horizontal wire. The high r.f. voltage position

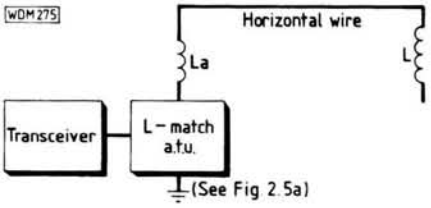



**Fig. 2.6: A typical example of an "in-room" antenna suitable for 1.8, 3.5 and 7MHz**

should, as far as possible, be towards the bottom of the loading coil (L) at the far end of the antenna.

The best idea seems to be to aim at an electrical length of 0.28λ. This is made up of the drop down section combined with the horizontal section and loading coil (L), together with the a.t.u. as shown in Fig. 2.5a. This means that the amount by which the wire falls short of 0.28λ must be made-up for in L. The inductor (L) should consist of the same pvc covered flex as used for the antenna, wound around a dowel or plastics tube of at least 16mm diameter, with turns slightly spaced. Obviously the larger the electrical size of L, then the longer the tube or dowelling will need to be.

A rule of thumb method is to put on twice as much wire as would be needed as if it were straight. For example, if you have calculated an extra 4.6 metres of wire needs to be added to the horizontal wire, but there's no room to physically accommodate it, then you make L using 9.2 metres of wire.

In effect, L is a helical portion of the antenna. In the case of 3.5MHz and Top Band, L would be a couple of metres long, and at least half would form part of the radiating section of the antenna. If insoluble loading difficulties should occur, then try inserting a small coil (La) made up from the same type of flex used on the antenna. The author once found this necessary with a Top Band version of this antenna, to lift the end impedance a little, due to a poor earth system.

## Earths and Things

In an apartment or flat, it is nearly impossible to use an external earth or ground, especially if you are on the first floor and above. On 3.5MHz and Top Band the author uses about 4.6 metres of heavy cable to connect the a.t.u. earth point to a cold water pipe. This works fine, but if you intend using this method of earthing, do ensure that the water pipe is metal and not plastics. *Also, as mentioned earlier, only use pipes carrying water and not gas, if the latter were used you could be responsible for a very large explosion. Ed.*

In addition, under no circumstances rely on the mains earth as the r.f. earth—it is necessary of course to connect the transmitter's mains safety earth.

Unfortunately 4.6 metres of wire connected to a water pipe, is not satisfactory as an r.f. earth on frequencies above 14MHz. This is because the wire represents a significant length when compared with the dimensions of the antenna. For example it is just under a λ/4 on 14MHz.

## The Helical Earth

By far the best r.f. earth for the 14MHz and 21MHz bands has to be the "helical earth" or counterpoise. It's a λ/4 device, and consists of a λ/2 wire space-wound over a dowel or plastics tube of at least 1.8 metres long.

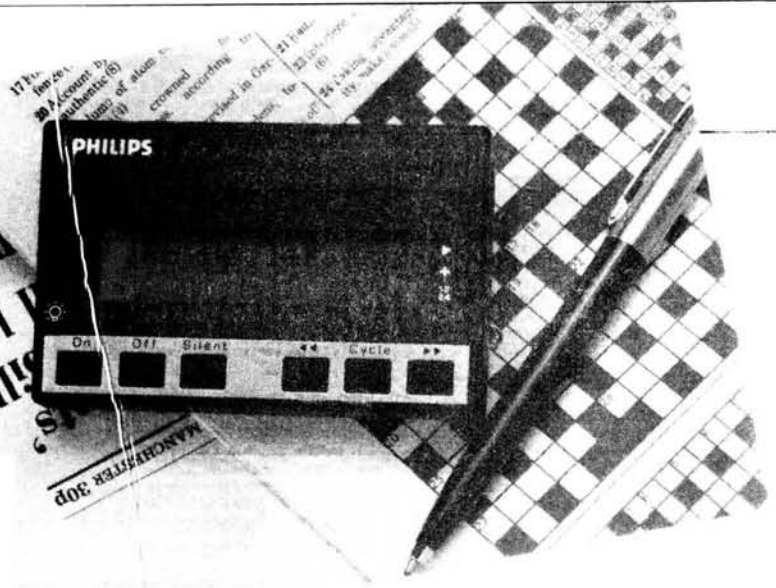
Contrary to expectation this helical earth should not be laid on the floor, but supported at least 300mm above floor level. Also, pointing the helical earth in various directions should be tried. There is a wrong and right direction, and it can only be found by trial and error. The wrong direction and position is where it picks up electrical interference, and/or the antenna will not load, and/or causes TVI, or a combination of all three.

The right direction and position is where the antenna radiates efficiently; there is little or no TVI and the least noisy receive situation.

On 28MHz it is easy to use a full size λ/4 wire counterpoise, but here again various positions should be tried. Anyway you may well be using a dipole on this band.

Another good earth as mentioned earlier in this article is the metal window frame. This has been found by the author over a period of time, to be particularly good for antenna systems working on the 3.5MHz and 14MHz bands.

**In the third and final part of this series details will be given for "In-room" loop antennas.**




# Communic

*The largest international exhibition of e ever held in Britain took place at the Natio from 10–13 May. This biennial event is m in all types of professional communicati exhibited are of interest to the amateur, he saw there.*

**Philips alpha-numeric pager with 16-digit l.c.d., 9 memories and 512-character capacity**

Over 450 exhibitors, including more than 70 from overseas, showed products ranging from new types of i.c.s for telecommunications to all types of data communications products, and from satellite and other antennas to mobile stations.

The emphasis seemed to be towards office communications equipment, for which there is a very extensive market, including tiny pocket pagers and a wide range of voice, text, data and image transmission systems for all types of user. A series of simultaneous seminars was given by people from various branches of the communications industry in an adjacent hotel.

## Microwave Links

In these days of technological information gathering, microwave traffic can become extremely dense at frequencies below 13GHz. The Nippon Electric Company (NEC) of Japan demonstrated a "Pasolink 50" single-channel video link operating at 50GHz for the transmission of image, video, voice, facsimile or data with a minimum of interference. The transmitted power was 15mW. A range of at least 7km (typically 10km) was claimed with data rates of 2 or 8Mbit/s (megabits per second). A 25mm diameter conical horn antenna can be used to provide a 20dB gain and a 17° beamwidth, while a 300mm Cassegrain reflector will provide a gain of 40dB and a beamwidth of 1.5°. Modulation was f.m. (f.s.k.). A similar "Pasolink 23" operating at 23GHz can transmit at a data rate of 8Mbit/s over a distance of 15km with a bandwidth of 5.3MHz.

Short-haul microwave radio systems were also introduced by DMC Telecom UK Ltd of East Kilbride, Scotland, for use at 18GHz (four 2Mbit/s digital signals) and 23GHz (sixteen 2Mbit/s digital signals). These systems include built-in multiplexers. For the moment they will be manufactured by Digital Microwave Corporation in the USA, but DMC Telecom UK will produce them later.

## Devices and Circuits

The Electronic Components Group of Siemens claimed to have one of the widest ranges of telecommunications i.c.s on the market, including ISDN (Integrated Systems Digital Network) basic (144kbit/s) and primary (2.048 and 1.544Mbit/s) access. Recently, the Group introduced a user board that allows IBM or IBM-compatible personal computers to access the integrated services network.

Highlighted on the Advanced Micro Devices (AMD) of Woking stand was the first demonstration in Europe of the Am29000 32-bit RISC microprocessor which, it is claimed, can run three to five times faster than any other device currently available on the market. AMD also ran a live demonstration of its ISDN product with a video link which uses a camera, monitor and two closed circuit television systems to transfer video images over standard telephone lines.

Dale Electronics of Camberley gave details of amplifiers for d.c. to 2GHz manufactured by Mini-Circuits of New York. These MAR-cascadable amplifiers are a family of silicon bipolar i.c.s fabricated with nitride self-alignment and ion implantation for precise control of doping with passivation for high reliability. Advice on grounding is given in the booklet. Input and output impedances are 50Ω for ease of use. Gains of 11dB at 2GHz, 16dB at 1GHz, and 19dB at 500MHz are available from the MAR-6 amplifier.

In recent years there has been increasing concern over possible hazards encountered by exposure to r.f. and microwave energy. Dale Electronics Ltd showed an r.f. exposure measurement system from the US manufacturer Holaday Industries Inc. The 6-minute averaged value required to meet the ANSI (American National Standards Institute) exposure standard is calculated by the built-in microprocessor and is displayed by an l.c.d. readout which is updated every five seconds. Accurate time-averaged readings can be important for those who climb through the high-field regions of transmitter towers.

Aspen Electronics Ltd of Ruislip gave details of coaxial and waveguide switches for frequency ranges of 0–18GHz and 0–12.4GHz. They are actuated by a 28V d.c. supply. The range includes single-pole, double-throw coaxial switches, transfer coaxial units, and multi-position coaxial switches.

British Telecom had a very large and prestigious stand which included a demonstration of their "Password Electronics" system. This is an integrated on-line data source which combines electronics product descriptions, a supplier directory, up-to-the-minute news and an electronic mail facility. The products can be identified, sourced and ordered—all from within the same system. It avoids the necessity for design engineers to scan through catalogues and publications for new product information. For example, keying in "tantalum capacitor" and "surface mount" will cause data on all such products released in the UK to be displayed on the screen.

British Telecom notified journalists in advance that it would have two Press rooms with staff in attendance, and that complimentary Phonecards

# ations '88

*communications equipment and services*
*onal Exhibition Centre near Birmingham*
*ainly intended to appeal to those involved*
*ons work, but many of the developments*
*too. Brian Dance reports for* PW *on what*

**Mezza—**
**British Telecom's advanced multi-user management group product.**
*©British Telecommunications plc 1985*

would be available for journalists from there. Telecom's attempt to promote their Phonecard fell very flat on the second day when their Press rooms were left unattended for a long period, after which they admitted they had no more Phonecards available. All of the normal payphones seemed to have been removed from the Press room, so one limitation of the card phones became very clear. Only journalists who brought their own Phonecards with them could make a call from the Press room at that time!

Communicate Ltd of the Imperial College of Science and Technology Centre, Ascot, believes that major growth is imminent in the local networking of personal computers and that eventually the majority of them will be networked in some form or other. This Company's PROCOM 20+ enables an IBM or IBM-compatible personal computer to operate as a fully featured telex terminal in the background mode without interrupting the routine applications of the computer.

## Mobile Communications

Pace Communications Ltd of Southampton showed their new "Landmaster IV" 16-channel, 5W synthesised hand-portable mobile radio. Also on show for the first time was a 6-channel, 25W "Fleetmaster" mobile radio; this will be available from September, initially in high-band and low-band v.h.f., to be followed soon by synthesised multi-channel versions including models for u.h.f. and Band III.

Samleco Communications of Amersham has introduced a "Radionote III" portable messaging terminal for use on Band III. It provides a simple, convenient and efficient way of transmitting and receiving data to and from mobile vehicles equipped with radio-communications equipment. This lightweight system incorporates a 40 column by 2 line l.c.d., and a 40 column by 30 line thermal dot matrix printer designed for mobile use. A message to be transmitted can be typed directly into the keyboard or a previously compiled message can be extracted from the memory and transmitted. There is 32K of operating system memory plus 32K of user memory.

A portable reporter radio link from Wood and Douglas is claimed to fully meet the needs of reporters for all-in-one outside broadcast sound link equipment. The design of this PMRL-030 evolved from consultation with the broadcast industry world-wide; it integrates an extended audio u.h.f. transmitter with a v.h.f. cueing receiver and an "off-air" station monitor. Power is from a sealed lead-acid battery with the option of an external d.c. feed to power the unit and to charge the internal battery.

Air Call Cellular Radio Ltd of Colindale, London, exhibited cellular radio transmission equipment which enables a total office communications system to be operated from within the confines of a car. A user can access a multitude of public and private databases and electronic mail or even gain access to his own computer facilities.

Amongst the more exotic equipment on display was a caesium beam primary frequency standard from Time and Frequency Ltd of Israel. This offers an accuracy of $\pm 3$ parts in $10^{11}$ over the temperature range $-28^{\circ}C$ to $+65^{\circ}C$ in magnetic fields of up to 0.2mT (millitesla) or 2 gauss. There is a $\pm 5$ parts in $10^{12}$ accuracy option within a $0^{\circ}C$ to $+50^{\circ}C$ range. Long-term stability is $\pm 7$ parts in $10^{12}$ over the life of the caesium beam tube (minimum three years).

In one of the mobile caravans on the adjacent car park, the Radio Communications Division of the Department of Trade and Industry (DTI) discussed their work on the monitoring of the radio frequency spectrum. The DTI monitors frequency channels from the long wave band to the microwave region (at present up to 18GHz). It checks private radio bands (such as those used by taxis, etc.) in order to monitor the usage of each band, making checks on channel congestion, and checking that no organisation is unfairly hogging part of the radio spectrum. The DTI also checks broadcasting station transmissions. In answer to a question about amateur band monitoring, the DTI staff said they normally leave this to the RSGB.

Inmarsat (International Maritime Satellite) currently provides a range of satellite communications facilities and services to nearly 7000 maritime earth stations. This London-based organisation of 54 member nations has eight satellites covering all ocean areas with four other satellites under preparation. In their mobile vehicle, Inmarsat staff said that after moving into the aeronautical field in 1986, they are now entering the land mobile field with smaller "Standard-C" earth stations operating at 600bits/s and weighing under 2.5kg with a tiny antenna. Land-based applications include the provision of emergency transportable communications at times of human disaster or natural catastrophe. A range of two-way messaging and position reporting services for land mobile users is also being developed.

The next Communications exhibition will be from 15 to 18 May 1990. ***PW***


**Far left: Cellular car 'phone**

**Centre left: PROCOM 20+ telex card for PCs, by Communicate Ltd.**

**Near left: "Landmaster IV" 16-channel, 5W hand-portable by Pace Communications (UK) Ltd.**

# Practically Yours

*By Glen Ross G8MWR*

When testing audio frequency amplifiers and power output stages it is often more convenient and informative to do the tests using a squarewave instead of the more usual sinewave. The squarewave is particularly difficult for the amplifier to handle due to its very fast attack and decay times and also due to the fact that a squarewave by definition contains odd harmonics from the fundamental to infinity. It therefore requires an amplifier with a very wide frequency response and a very fast slew rate to deal with this type of signal.

## The Oscillator

Many people have a sinewave oscillator available if in no grander a manner than the single frequency audio output of a cheap signal generator. Even this simple approach will enable you to find out a lot about your amplifier. A far better understanding is, of course, possible if you have a wide range generator available. What we now require is a means of changing the sinewave output of the generator to a squarewave.

## Sine to Square

The circuit of a converter is shown in Fig. 1. It uses two BC108 transistors wired up as a modified form of Schmitt trigger with a very rapid switching time. The output from this circuit is a squarewave containing harmonics up to about 50kHz. The capacitor C1 is included to assist a fast switch-on time for Tr1. This component also helps to keep the mark-space ratio reasonably constant at high input frequencies. If the oscillator used to drive the converter has a d.c. voltage superimposed on the output then a 100µF capacitor should be included in the input to the unit.

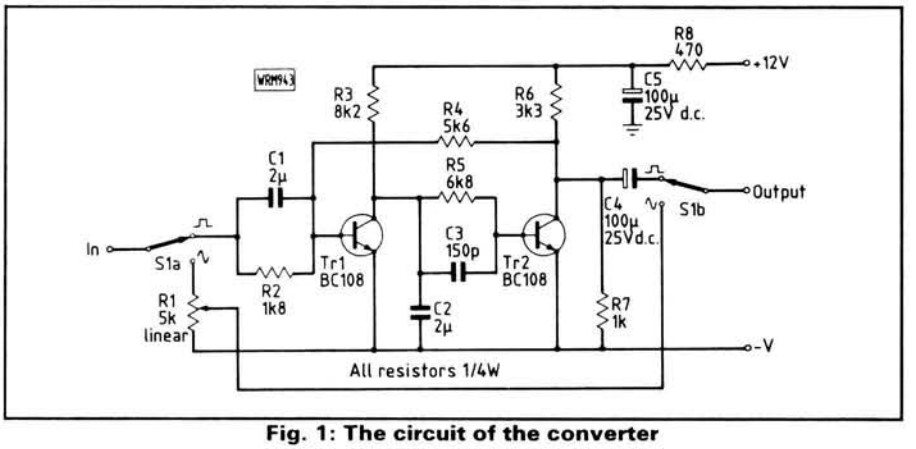



**Fig. 1: The circuit of the converter**

## Output Level

The output level is virtually constant irrespective of frequency and drive voltage, provided this is high enough to get the unit to switch. Because of this, it is easy to arrange a reasonably accurate output attenuator. This is shown in Fig. 2 and enables the variable control to be set to give any output voltage up to the maximum set by the range switch. A suitable scale can be drawn for this control; simply remember that an output voltage of half that set by the range switch is obtained with the variable set at half rotation and that other voltages are pro rota. A scale divided into ten equal sections is all that is required.

## Switching

A switch is fitted to enable the unit to be bypassed when sinewave output is required. To enable the attenuator to be retained, a preset level control is fitted in the bypass loop. To set this, first measure the maximum output in the squarewave position. Now switch to sinewave and set the preset to give the same output as was obtained on the squarewave position.

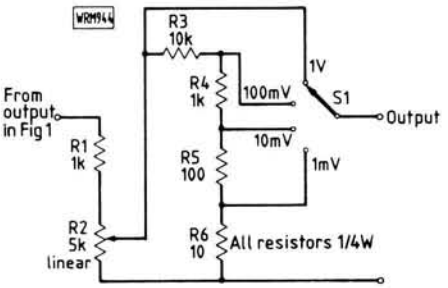



**Fig. 2: A reasonably accurate output attenuator**

## Construction

There is nothing touchy at all about the layout of this unit. The two transistor stages can be built on a small piece of Veroboard and the unit then mounted, with the attenuator if required, in a small diecast box. Suitable input, output and power supply terminals should be fitted to match your own requirements. The unit will run with a nominal twelve volt supply and draws only a few milliamps. ***PW***

# SWAP SPOT

Have Amstrad CPC464 with modulator (no monitor). Also Planet P.T.V.I. 5 inch monochrome portable TV, nearly new, runs from mains, car or batteries. Would exchange for general coverage receiver, solid state if possible or w.h.y? Tel: 0481 26168. *E396*

Have pair of 813 valves with matching bases. Would exchange for VFO-520. G3RB. QTHR. Tel: 091-253 0504 *E401*

Have Uniden CR-2021 receiver, 150kHz–26MHz plus f.m. band. Would exchange for VHS video recorder. Congleton, Cheshire. Tel: 0260 274470 *E404*

Have chainsaws Danarm 25 inch, Danarm 20 inch, Skill 12 inch. Would exchange for FT-101, FT-401 or similar rig. Bob. Tel: 0494 29868. *E408*

Have Pro alarm control panel, 999 caller, ultrasonic detector, cost £200, never used. Would exchange for good auto focus camera. E. Hockley, 61 Disraeli Terrace, Leeds LS11 6NT. *E409*

Have Trio TR-2400, Kenwood SW100 s.w.r., Yaesu FT-101ZD MkIII, Yaesu FC-107 a.t.u., Yaesu SP-107 speaker, new G5RV, new base station mike, all items mint, most boxed. Also much Commodore 128 (some 64) software and hardware. Would exchange for satellite TV gear or w.h.y? Tel: 08482 314. *E410*

Have various Brooke Bond tea cards. Would exchange 25 cards for Mullard OC44 or OC71 transistors, 10 cards for Mullard OA81 or GEC34 crystal diode. Soar, 15 Brand Street, Hitchin, Herts SG5 1JE. *E416*

Have Gould OS4000 digital storage oscilloscope with output unit 4002. Also 10 amp Variac in case with current and volt meters, plus 10 amp 12 volt d.c. supply. Would exchange for h.f. transceiver or 28MHz linear amp. G3EAY. Tel: Saffron Walden 30763. *E419*

*Feature*

# Amateur Radio in Australia

*My marker of the warmer months, the constellation Orion, has finally slipped from view and frosts have started at my QTH. Which of course leaves longer evenings for radio, says Greg Baker in Part 4 of his occasional series.*

## Traffic Networks

A sparse population and a stable continent give Australia few emergencies or natural disasters. Nonetheless, Australian amateurs have two emergency traffic nets training for future need. They are WICEN, the Wireless Institute Civil Emergency Network and ATN, the Australian Traffic Net.

WICEN is an emergency traffic net similar to RAYNET or the USA's ARES. In VK2, WICEN emerged from the experience of devastating floods in Maitland (120km north of Sydney) in the 1950's. Because of their range of frequency choice, WICEN Australia-wide has proved useful in a number of emergencies over the intervening years, from the disaster resulting from Cyclone Tracy's destruction of Darwin in 1974, to the Victorian Ash Wednesday bushfires in 1983, to the North Queensland's Cyclone Winifred in 1986.

Because it can only be activated by emergency authorities, in normal times WICEN maintains skills by assisting at sporting events where radio communications are needed. Examples in VK2 were a cave rescue exercise and a motor vehicle sprint, and in VK3, a long distance cycle race.

The VK2 cave rescue exercise was organised by the Sydney-based Cave Rescue Group (CRG). It is an annual event and the largest such exercise in the southern hemisphere. Running over three days, it involved thirty members of the CRG and about 160 speleologists and emergency services personnel from all over Eastern Australia. The caves used for the exercise were those at Bungonia (150km south west of Sydney), 158 caves scattered over an area of about 20 square km.

As is usual in such an exercise, WICEN used a 144MHz field repeater located on a dominant hill top. Jeff VK2BYY operated a controlled network from a tent a hundred metres from the repeater keeping in contact with WICEN operations assigned to groups of cavers dotted over the area.

The WICEN function was to pass routine CRG traffic, simulated emergency traffic and be ready in case of real emergency. Most traffic was duplex v.h.f. f.m. via the repeater, though a novel feature was the use of VK2PJ's car mounted 430MHz-144MHz translator for use with u.h.f. hand helds.

The motor sprint, at Amaroo a few kilometres north west of Sydney was a straightforward exercise involving only a half dozen WICEN operators and led by Peter VK2EMU. Its main purpose was to train new members in WICEN message handling techniques. Because of the simplicity of the task —making sure the track was clear before each sprint—Simplex 144MHz v.h.f. f.m. only was used.

A recent VK3 WICEN exercise was to provide communications for the annual Bairnsdale to Melbourne Great Bike Race. The 2500 riders in the race, really a giant fun ride, covered the approximately 400km from Bairnsdale on the coast east of Melbourne in just over a week. WICEN volunteers complemented St. John's Ambulance communications, together ensuring safety and good race management for all riders on this marathon event.

Because of the wider range of communications equipment in the hands of emergency services and the greater number of radio equipped vehicles with services such as police, ambulance, bushfire brigades, forest fire crews, National Parks and Wildlife Service fire crews and State Emergency Services, WICEN is beginning to find their role more circumscribed. This means that WICEN is having to adapt to roles not able to be effectively carried out by the emergency services. For example, most official emergency traffic is on simplex high or low band v.h.f. which limits range somewhat. WICEN is often able to offer greater range possibilities by use of the h.f. bands, by arranging RAAF helicopter placement of portable v.h.f. amateur repeaters on suitable mountain tops and by interlinking permanent repeaters as previously reported.

Upcoming VK2 WICEN exercises are Sydney's annual City to Surf fun run in August, the Bateman's Bay car rally in state forests 220km south of Sydney in September and at Outward Bound's Hawkesbury River canoe race in October. In addition there is talk of WICEN involvement in a Sydney to Melbourne bicycle race in 1988.

Able to co-operate with WICEN is ATN. ATN is modelled along the lines of the USA's NTS (see *PW* May 1987). It is self-activated, operating 365 days per year with routine third party health and welfare traffic on several frequencies, and for longer periods on a wide range of frequencies in time of communication need.

Current ATN routing schedules are, for Australian east coast traffic, the Australian Traffic Net on 3.570MHz at 1030Z daily, and for messages to and from VK6, the Trans Australian Traffic Net on 7.060MHz or 14.280MHz at 1100Z Monday, Wednesday and Friday.

Australia currently has international third party traffic agreements with USA, Canada and Israel. International traffic is carried on four nets, three of which are to North America. The Australian Traffic Network to North America is on 7.228MHz at 0730Z daily, the International Assistance and Traffic Network is on 14.303MHz at 1100Z daily and the Australian American Traffic Network is on 14.280MHz +/– 10kHz at 0500Z daily. The Australian Israeli Traffic Network is on 14.280MHz +/– 10kHz at 1400Z daily and at 0500Z Australian Fridays and Saturdays.

In addition to these routine daily message handling schedules ATN maintains emergency preparedness by a regular Simulated Emergency Test (SET) designed to test ATN Emergency Communications (ECom) plans. This year's SET (a simulated cyclone taking out Sydney's telephone network) was held in late June. ATN stations were linked with the CB emergency traffic net via a "gateway" of co-located amateur and CB transceivers. CB operators carried local Sydney test traffic while ATN moved messages into and out of Sydney, both Australia wide and to and from North America.

▶42

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**39▶**

Because of ATN assistance with recent overseas disasters and as a result of SET, ATN is more visible to the public than WICEN. Given the pressures on the amateur frequency spectrum and the dwindling amateur numbers, such a high profile has been a useful public relations exercise for amateur radio.

During the 1985 Mexico earthquake ATN passed 600 messages for concerned relatives and for the Mexican embassy in Australia. In 1986, ATN handled 200 health and welfare messages into San Salvador, the earthquake devastated capital of El Salvador. An ATN assisted Vanuatu amateur operators passing 60 messages into and out of Port Vila after the March 1987 Vanuatu cyclone. The passing of all these health and welfare messages to countries other than USA, Canada and Israel was made possible by temporary inter-government arrangements which have usually been readily agreed during the emergencies, the Australian government being always willing to attempt to negotiate these rights.

Despite this, however, Australian amateurs are not permitted by the DOC to actively solicit third party traffic except during a natural disaster or declared emergency. Even though the position of the amateur service is unique in that it is unable to accept payment for their services, DOC feel that it would be a precedent to allow amateurs to solicit traffic.

ATN hotly disputes that this would be a precedent especially at hobby radio displays, but DOC currently remains adamant. This does not affect the ability of VK amateurs to send messages in normal times when requested to do so by members of the public. This is popular at hobby radio displays where greetings via amateur radio give both good PR for the hobby and amateur self training in relaying written messages.

This leads to some joint VK-ZL news. By the time of the March 1987 New Zealand Bay of Plenty earthquake, public awareness of the potential amateur radio benefits was relatively widespread in Australia. Messages began to arrive with ATN operators who were in contact with Joyce ZL1CAB in the earthquake area. Despite an appeal to the New Zealand Post Office, the passing of third party traffic was not permitted by ZL authorities. This stand was in turn supported by the ZL amateur organisation New Zealand Association of Radio Transmitters (NZART). ATN members holding traffic were forced to decline and return traffic. Articles in support of the possible amateur role and critical of the New Zealand Post Office appeared in several newspapers including the Wellington Dominion.

Since then, Robert ZL3TJP with the assistance of ATN co-ordinator Sam VK2BVS, has prepared a 140-page submission of New Zealand amateurs and NZART urging the sense of third party traffic nets within New Zealand and international agreements with Australia and New Zealand's Pacific neighbours.

**VK amateurs, s.w.l.s and anyone else with information of interest to *PW* readers can contact me at PO Box 93, Braidwood, NSW, 2622, Australia.**

# Low-cost Indoor Antenna For 144MHz

*The humble wire coat-hanger is used by thousands as a car radio antenna. Now it's the turn of the radio amateur with this novel table-top antenna from F.C. Judd G2BCX.*

Many are faced with the problem of being unable to erect any type of 144MHz outdoor antenna. This means the only viable alternative is an indoor antenna. With the increasing number of people having no access to loft or roof space, it narrows the possible antennas down to the table-top, or "in-room", varieties.

The simple antenna described in this article is easy to construct and needs little by way of materials. These amount to four wire coat-hangers, two strips of 30A "choc-block" screw type connectors, a few woodscrews and a piece of wood for a base. No soldering is required except for a plug on the transmitter end of the coaxial cable. It takes very little time to construct and, aside from its application as a permanent indoor antenna, it could be taken away on holiday and used for portable operation. If the antenna is used outside, then in the event of wet weather, the antenna should be covered with a plastic bag.

The antenna arrangement is based on the popular "Slim Jim" design, an omni-directional antenna for 144MHz, designed some years ago by the author. (The original design is still carried in *PW* publication *Out of Thin Air.)*

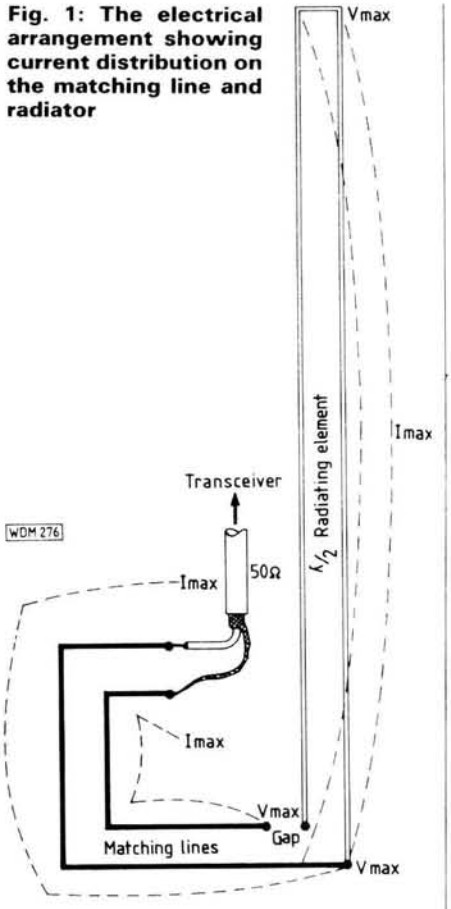
The method of construction and other modifications have not only allowed a significant reduction in size, but also provide a broader bandwidth, the v.s.w.r. being virtually 1:1 right across the 144MHz band. The antenna design lends itself to very easy matching and minimum v.s.w.r. setting.

## Some Technical Details

Current distribution around both the matching section and the folded λ/2 (half-wave) radiator are illustrated in Fig. 1. The 50Ω cable is connected directly into the end of the matching line, the far end of which "voltage-feeds" the radiating element at its base; the current maximum on this being at the centre.

The angle of maximum vertical radiation for an antenna of this nature, when operated in the near "free space" condition and several wavelengths above ground, is as shown in the computer print-out Fig. 2. This angle may be a little higher when the antenna is near ground, but probably not greater than 10 degrees (tilt angle in Fig. 2). In the horizontal plane the radiation will be omni-directional and of course vertically polarised.

**Fig. 1: The electrical arrangement showing current distribution on the matching line and radiator**




## The Wire Coat-hangers

These are made of springy metal rod about 2mm in diameter. They generally have a shiny surface and are usually provided free by dry cleaning companies.

(Do not use coat-hangers which have been anodised or coated with varnish.) The rod from which the hangers are made is quite easily straightened out, although any tightly twisted bits can be cut off. One hanger will straighten out to provide more than the length required for one of the radiating element wires.

## Construction

The major part of construction is the matching line, which is fixed to the base board as shown in Fig. 3. The author chose a piece of Melamine-faced chipboard for the base of the antenna, to which was added the appropriate edging strip and four small cabinet feet glued on its underside.

The illustration in Fig. 3. shows the positions of the three electrical connector blocks which carry the matching line wires. One of these connector blocks also provides a support and connecting point for the vertical radiating element, which is fitted at the points marked "X". However, before screwing down the connector blocks, cut from one of the lengths of coat-hanger wire the sections that will form the matching line as given in Fig. 4. These are connected, as in Fig. 3, to form a continuous pair of lines between the coaxial cable and the

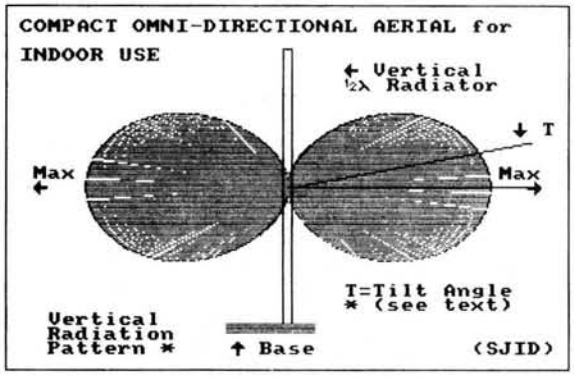



**Fig. 2: Vertical radiation pattern of the compact indoor antenna. See text regarding "tilt" angle**

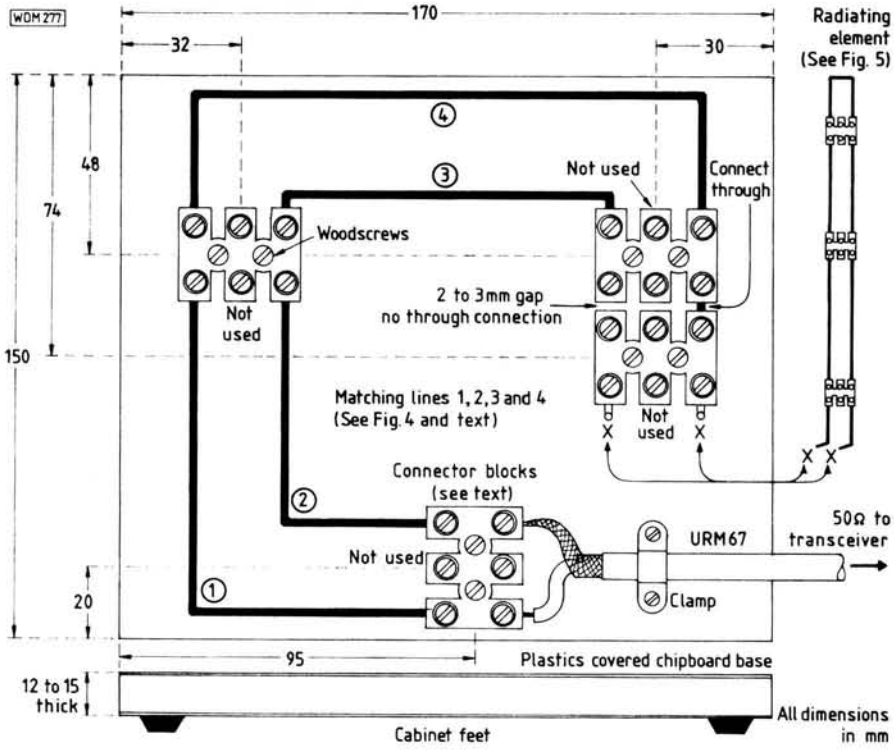



**Fig. 3: Layout on baseboard of the matching lines which are comprised of (1 and 4) and (2 and 3) sections. Note the bottom of radiator element wires are secured at (X, X)**

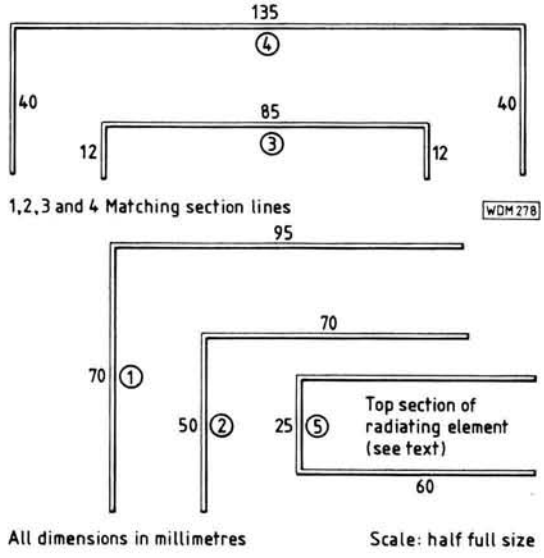



**Fig. 4: Wire sections 1–4 form the matching lines when assembled as in Fig. 3. Wire section No. 5 is the top section of the radiator and used for v.s.w.r. adjustment, as described in the text**

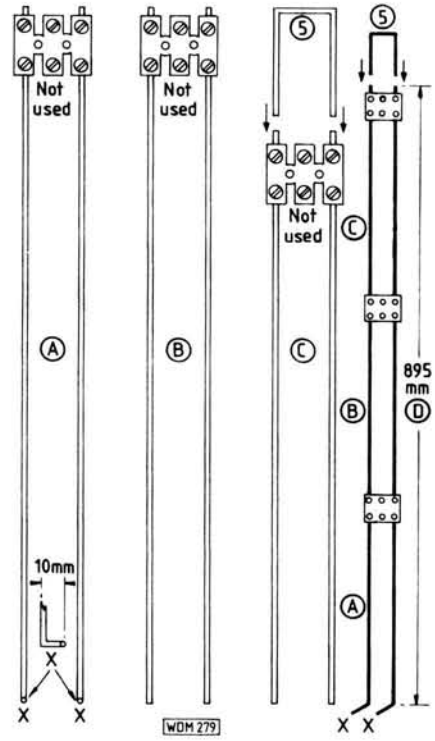
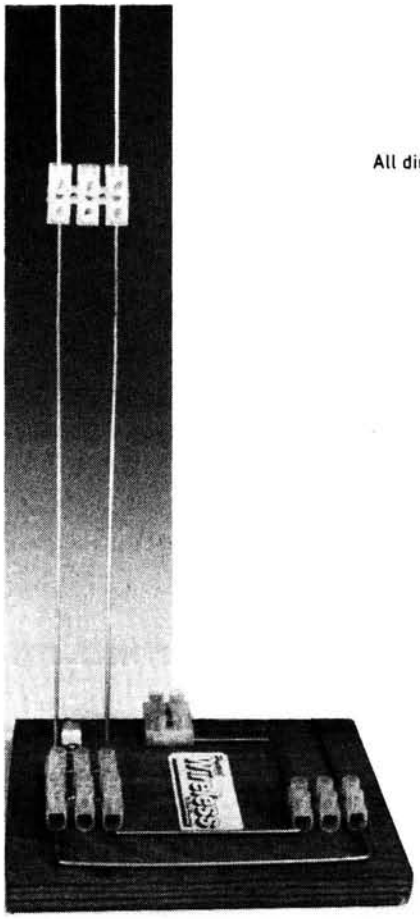



**Fig. 5: The radiating element consists of sections A, B and C. Together they form the vertical radiator, with an overall dimension of 895mm. Note including section No. 5. Also note right angle bends at the bottom of section A. These connect to points (X, X) on the base board as in Fig. 3.**



bottom of the radiating element. The positions of the blocks may require shifting slightly to obtain a symmetrical layout. After this has been achieved they may be screwed into place.

Next the radiating element, details for which are given in Fig. 5. The two long wires are cut to the dimensions given, then the electrical connector blocks are fitted. These give the vertical element wires the correct spacing, as well as support and their positioning is not critical. The very top section of the radiator is a separate "U" shaped piece of wire (No. 5 shown in Fig. 4). This part is slotted in to the top connector block, and consequently will provide a small variation in radiator length. With this method of adjustment, the antenna can be made to resonate, allowing minimum v.s.w.r. to be obtained.

The holes through the metal inserts of the connector blocks are large enough to accommodate the tops of the radiator wires in addition to the adjusting section. When the screws are slackened off, the "U" shaped section may be moved to give the required length.

## Tuning and VSWR

First, a few words about the coaxial cable which must be 50Ω. Low-loss cable such as URM67 would be preferred if the cable run is more than 6 metres long. The lower the cable attenuation, the more r.f. power there will be available for radiation by the antenna. Remember, for indoor operation every little counts, especially when it is realised that brick walls and tiled roofs may offer as much as 10dB attenuation, even when dry. If the cable run is short, i.e., not exceeding 6m, then lower quality URM43 cable could be used.

Final adjustment should be carried out at mid-band (145MHz) with a v.s.w.r. meter in line at the transmitter end. Stand the antenna on a chair or

table and make a quick check on v.s.w.r. It may be a little too high, in which case adjust the top section (No. 5) of the radiator up or down until the v.s.w.r. is brought to within respectable limits, 1.2:1 or lower.

Stand back from the antenna after each adjustment as "body capacity" can affect tuning. Some experimentation may be necessary to find the best position for the antenna, particularly in a ground floor room. Avoid placing the antenna near central heating pipes as well as known, but hidden, runs of house electrical wiring, in fact anything that is conductive in terms of multiple wavelengths.

At very low height, e.g. in a downstairs room, do not expect to work great distances. In this situation local coverage is about the limit. Tests carried out under these conditions showed that reliable contacts with stations using outside antennas could be made over distances of 16km.

## Connector Block

The connector blocks used in this project are available as standard with 12 ways and in four different sizes. The smallest are rated for a current of 2A, the next size for 5A, the next for 15A and the largest for 30A. The latter size is the one used for the antenna. These are 165mm long and 25mm wide consisting of 12 connection inserts. They can be purchased from any dealer of electrical goods and fittings. ***PW***

## References


The Slim Jim 2 Metre Antenna. F.C. Judd. *Out of Thin Air. PW* Publications.

Multi-wire Dipole Antennas. J.D. Kraus. *Electronics* (13) 26–27 January 1940.


# ERRORS & UPDATES

## UK Amateur Beacon Datacard May 1988

The callsign/frequency boxes for GB3AND and GB3FRS have unfortunately been arrowed to the wrong sites on the map. GB3AND is at the position shown for GB3FRS, and *vice versa.*

Apologies to Brian Bower G3COJ for mis-spelling his first name on the reverse of the card.

We have been asked to point out that all UK amateur beacons are co-ordinated by the RSGB and that licences, and site fees and insurance are paid for by the membership.

## The Eightypole May 1988

Some readers have used a thinner, lower-voltage rated, 7/0.2mm stranded wire for their Eightypole. To produce the correct winding pitch of 19 turns per 25mm, and therefore the correct inductance, a 1kV rated wire with an overall diameter of 1.2mm must be used.

## Getting to Know Your End-Fed λ/2 Antenna June 1988

The link turn should be wound centrally on top of the main coil, and not alongside it as shown in Figs. 3 and 4. The multiplier 10.1 shown in Formula 1 and 2 should in fact be 101.

## LED Brightness Controller June 1988

Since the publication of the original article, the author has informed us that resistor R1 is unnecessary and may be omitted. Once R1 has been removed, renumber all resistors consecutively, starting with the 2.2MΩ as the new R1. The text will then tie in with Fig. 1.

# BOOKSHELF

**GUIDE TO WORLD WIDE TELEVISION TEST CARDS**
**Edition 2**
**by Keith Hamer and Garry Smith**
**Published by HS Publications**
**Available from Practical Wireless Book Service**
**147 x 209mm, 52 pages. Price £2.95 plus 75p P&P**
**ISBN 9504304 0 4 2**


Television reception is taken for granted by millions of viewers in many countries and there are now few nations without at least one television service in operation. Colour television is a familiar part of everyday life and some networks are now experimenting with stereo sound television transmission. Continents are now linked by satellites providing instant colour pictures, sometimes direct to domestic installations. All this technology has developed in a relatively short time.

It was on 2 November 1936 that the first, regular high-definition, national television service began from the BBC transmitter at Alexandra Palace in London. In order to check the performance of the transmission network, a simple test card was devised and designated "Test Card A". This was only used internally by BBC engineers and was not transmitted publicly. Since then television techniques have improved dramatically and various test cards have been designed to enable television engineers and the viewing public to check receiver performance.

With the numerous television services in operation throughout the world, there is a great variety of test cards. The main purpose of this book is to assist long distance television enthusiasts (TV DXers) around the world with signal identification. For that reason, 240 test cards, identification slides and clock captions have been included.

The illustrations are shown in semi-alphabetical order, with the transmission and colour systems used generally in each country shown in parentheses below each photograph. It is hoped that this book will assist all television DXers in the pursuit of their most interesting hobby. Readers concerned with television graphic work or operators of amateur television stations should also find this publication of particular interest to them.

# Reading & Understanding Circuit Diagrams

## *(with a bit of theory thrown in)*

*Following last month's look at power supplies, R.F. Fautley G3ASG turns his attention to receivers in Part 6.*

The circuit diagrams of complete state-of-the-art equipments are complex and very difficult to follow even for those with a technical background and many years of experience. For this reason, it is necessary for the beginner who is anxious to learn, first to understand separately the circuit of each of the many stages and then finally add the bits which link them together.

Receivers fall into two main classes:
i: tuned radio frequency (t.r.f.) receivers.
ii: superheterodyne (superhet) receivers. The tuned radio frequency type, which is usually called just t.r.f. will be described first as it is by far the simpler of the two.

## The t.r.f. Receiver

The t.r.f., sometimes referred to as the "straight" receiver, usually consists of three parts:
i: a tuned radio frequency stage, from which the receiver gets its name
ii: a demodulator (or detector) either non-regenerative or regenerative
iii: an audio frequency amplifier.

## The Radio Frequency Stage

The purpose of this stage is to amplify signals received by the antenna and increase the selectivity of the receiver. The circuit diagram of a tuned r.f. stage is shown in Fig. 6.1. It also includes an active device to amplify the input signals from the antenna (or input signal) terminals and two tuned circuits to provide selectivity.

What's an active device to amplify?, you may ask. That's just a semi-conductor, or valve, used to increase the level of the antenna signal before "detection". In Fig. 6.1., the semiconductor is a field effect transistor or f.e.t. The circuit symbol marked Tr1, is for a junction field effect transistor.

Selectivity perhaps needs explaining. It is the ability to discriminate between signals of differing frequencies and a tuned circuit is the device to do just that. In Fig. 6.1, there are two such tuned circuits: inductor L1 with variable capacitor C2, and inductor L3 with variable capacitor C4. The operation of parallel tuned circuits was described in Part 2. At resonance, the circuit behaves as a very high impedance which is purely resistive. As you go further away from the resonant frequency, either higher or lower, it progressively reduces in value and becomes more and more reactive. Signals from the antenna cause current to flow through both L1 and C2 and at resonance, where the impedance is greatest, produce the highest voltages across the tuned circuit.

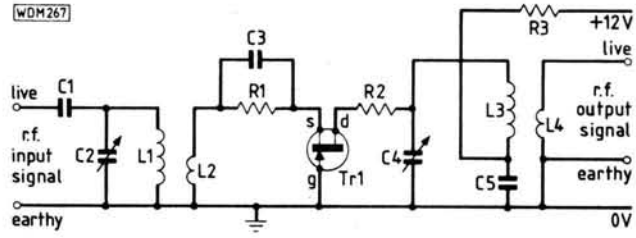



**Fig. 6.1: The r.f. stage using a junction field effect transistor (j.f.e.t.)**

Signals at other frequencies also produce voltages, but these voltages get lower and lower the further away from resonance the signals get. Also, the tuned circuit discriminates in favour of the frequency to which it is tuned, i.e. it's "selective". Signals amplified by the f.e.t. are tuned by L3 and C4 to further increase selectivity.

Capacitor C1 affects the "matching" between the antenna and the tuned circuit. "Matching" means transferring signals from one part of a circuit to another with (usually) minimum loss. In this case, it is the relationship between the capacitance values of C1 and C2 which affects the match. A theoretical understanding of this relationship is **not** necessary (fortunately) to understand the basic operation of the r.f. stage. Again, L2 (which is inductively coupled to L1) provides matching from the high impedance of the resonant tuned circuit, L1 & C2, to the lower impedance of the "source" input of the f.e.t. Finally, the output from the f.e.t. "drain" is tuned by L3 and C4. Its high resonant impedance is matched to a low impedance (quite often about 50Ω) by L4, which is inductively coupled to L3.

Just a little aside here—the actual number of loops used in the circuit diagram of an inductor **does not** indicate the number of turns on the coil, nor does the ratio of loops drawn on two coils inductively coupled indicate the actual turns ratio to be used. The symbols for L3 and L4 together simply represent a transformer with two undefined windings.

Components R1 and C3 provide the necessary d.c. biasing, R2 is a low value resistor to prevent possible parasitic oscillation (usually occurring at v.h.f.) and R3 is used with C5 to prevent r.f. signals straying into the d.c. power source (the 12V supply) where we don't want them.

## The Non-Regenerative Detector

The principle use for this type of device is to enable the reception of a.m. (amplitude modulated) signals, such as broadcast stations.

You may remember the crystal set described in Part 2. Well, that was one example of a non-regenerative detector, simply a half-wave rectifier which requires no external power supply for its operation. The difference between a receiver detector and a half-wave rectifier is simple **the use made of its output**.

In the case of the half-wave rectifier, the useful part of the output is the d.c. from the rectifier, the unwanted output being the so-called "ripple" voltage. With the detector circuit, however, the

reverse is the case. The d.c. output is not used (apart from uses as a.g.c. or automatic gain control, which is irrelevant at this time). The bit we really want of the detector output is the formerly discarded ripple, for this contains the transmitted information which we are endeavouring to hear!

Looking back to Fig. 5.5, the ripple voltage was the variation of d.c. voltage across the reservoir capacitor. The input a.c. signal in the detector is the signal from the r.f. amplifier stage, the frequency of which depends on the frequency of the broadcast station. Thus, the high frequency component of the rectified signal is, like the a.c. input to the half-wave rectifier, almost eliminated by the action of the reservoir capacitor. The big difference is that the rectifier input frequency was only the mains frequency (50Hz) whereas the receiver detector would be operating at almost any frequency above about 150kHz.

If we look at Fig. 6.2, it shows the detector output if the reservoir capacitor were to be removed. The high r.f. signal is represented by the close-spaced parallel vertical lines and the heavy line represents the "modulation"—the information (speech or music) that we want to recover from the amplitude modulated transmission to which the receiver is tuned. When a correct value reservoir capacitor is connected, the vertical lines (the r.f. component of the signal) almost disappear, leaving just the heavy line, the audio frequency modulation which we want.

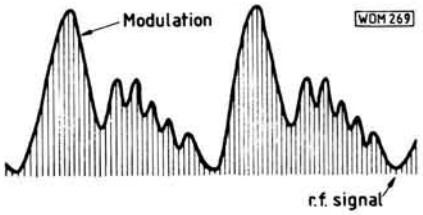



**Fig. 6.2: The rectified output from a diode detector without a reservoir capacitor**

What is the significance of the difference between mains and radio frequency as the input signal to the detector? The most important difference is that the reservoir capacitor may be many thousands of times smaller than that for the mains rectifier and still provide the same degree of attenuation of the r.f. component of the input signal.

This time, we **want** the ripple voltage and so the value of the reservoir capacitor has to be more carefully chosen. It must be large enough to remove the r.f. signal voltage, but not so large that it also swallows up the ripple voltage —the bit we want. This is not an awkward problem, for the **highest a.f.** (audio frequency) signals required to be preserved is about 20 000Hz (for the hi-fi fanatic) and for most broadcast reception only about 5000Hz. The lowest radio frequency to be received is unlikely to be lower than 150kHz (bottom end of the long wave band).

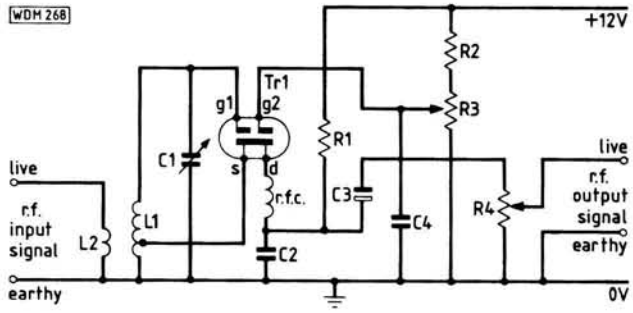



**Fig. 6.3: A regenerative detector using a dual-gate m.o.s.f.e.t.**

## The Regenerative Detector

The principle uses for this type of detector are the reception of a.m. broadcasting stations and c.w. (Morse) transmissions. To an extent, depending on the skill of the operator as very precise tuning is necessary, single sideband telephony can also be resolved.

Another new symbol to be introduced is that for the dual-gate m.o.s. f.e.t. or dual-gate metal oxide silicon field effect transistor. You can see this symbol used in Fig. 6.3. Yet another symbol, for the potentiometer (R3 and R4) needs to be remembered, these can also be seen in Fig. 6.3. Potentiometer R4 is just the familiar volume control (or a.f. gain control) and the use of R3 will be detailed later. By now you should be beginning to understand and recognise at least the component symbols—even if when joined together to form a circuit diagram they still appear to be rather vague!

Any regenerative detector is really an amplifier with just enough positive feedback (output signal fed back to the amplifier input in additive phase) for the circuit to be just on the verge of oscillation. This is the optimum condition for reception of a.m. signals. If the amount of energy fed back is increased **very** slightly so that oscillation just occurs, c.w. signals will pop out of the noise and a whole new world of signals will be received. This problem is outside the scope of this series, however!

Now to add a bit of circuit description. The r.f. input signals, either directly from the antenna or from the output of an r.f. amplifier like Fig. 6.1, are tuned by L1 and C1 and connected to one of two gate terminals, gate 1. Matching from the low impedance output of the previous stage to the high impedance of the gate input is provided by the inductively coupled L2 and L1. The tuned circuit L1 and C1 increases the overall selectivity still more, but what about the tap on L1? What does that do?

The tap enables a part of the output to be fed back in the correct phase to the input so as to cause the stage to oscillate. At least, it will if the gain of the stage is at least unity.

The gain of the f.e.t. is controllable by varying the d.c. potential applied to gate 2 of the device. So, by carefully setting that voltage, the gain can be made just sufficient for the stage to be on the verge of oscillation, which is the condition required for optimum reception of a.m. signals. The voltage is made variable by adjustments of R3, the regeneration (or reaction) control.

Now, a bit more theory. One effect of regeneration, or positive feedback, is that **negative resistance** appears at gate 1, and also across the tuned circuit L1 and C1. Negative resistance? Well, the ordinary resistance we associate with resistors and tuned circuits at resonance (high for parallel, low for series), although not usually referred to as such is really **positive** resistance. So **negative** resistance must be the opposite. We can't buy a negative resistor as a component, but the **effect** of negative resistance can be produced by positive feedback. The signal fed back increases the amplitude of the original input signal which is also what would happen if the resistance of L1 were to be reduced.

So, positive feedback has the effect of reducing the resistance of the coil. How does this help with reception? Well, if the coil resistance is reduced then the $Q$ of the tuned circuit is increased. Again, something new to contend with. What is meant by the $Q$ of a tuned circuit? It is the ratio of the reactance of the inductor (or for that matter the reactance of the capacitor) to the value of the inductor's resistance. Usually the resistive component of the capacitor is ignored as it is so very small compared to that of the inductor. The $Q$ of a coil is often called the "goodness factor" of the coil.

Why is $Q$ so important? There are two reasons: one is that the higher the $Q$ of the inductor, the higher is the resistance of the tuned circuit at resonance and so the higher the signal voltage developed across it; the other is that the higher the $Q$, the greater is the selectivity of the tuned circuit. Now you can see why it is referred to as the goodness factor.

The equation for the $Q$ of an inductor is:

$$Q = \frac{X_L}{r}$$

where:

$X_L$ is the reactance of the coil in Ω and r is the resistance of the coil in Ω

In the equation, the symbol "r" refers to the r.f. resistance of the inductor. At very low frequencies this value is close to the value measured at d.c. by an ohmmeter, but at high frequencies this can be considerably larger and depends on the physical shape of the coil as well as the thickness of the wire.

What about a numerical example? Assuming:

f=frequency of operation=14MHz
r=resistance of the coil at 14MHz=4Ω
L=inductance of the coil=5μH
$X_L$=reactance of the coil=2πfL

First, determine the reactance of the inductor at the operating frequency.

$$X_L=2\pi fL$$
$$=2\pi \times 14 \times 10^6 \times 5 \times 10^{-6}$$
$$=440\Omega$$

Now calculate the value of $Q$.

$$Q=\frac{X_L}{R}$$
$$=\frac{440}{4}$$
$$=110$$

It is obvious that if the resistance of only the coil is reduced, then the $Q$ of the coil will be increased. Now, if positive feedback has the effect of providing negative resistance to the tuned circuit, the effect will be that the original positive resistance of the coil will be reduced, and the $Q$ increased.

Another relationship necessary to appreciate is that between $Q$ and the effective parallel resistance of a tuned circuit at resonance. It has already been explained that, at resonance, the impedance is that of a high resistance, but how high? The resistance of a parallel tuned circuit at resonance is given by:

$$Z_{res}=X_L \times Q$$

where:

$Z_{res}$ is the resistance at resonance in Ω
$X_L$ is the reactance of coil at resonant frequency in Ω and
$Q$ is as expressed previously

Thus:

$$Z_{res}=X_L\left(\frac{X_L}{r}\right)$$

Or

$$Z_{res}=\frac{X_L^2}{r}$$

Now, what about selectivity? How does the $Q$ of an inductor affect the degree of selectivity or sharpness of tuning (sometimes called "stiffness" of tuning)?

An expression for the degree of selectivity is:

$$\frac{A_0}{A}=Q \times Y$$

where:

$A_0$=voltage gain at $f_0$
A=voltage gain at f

$$Y=\left(\frac{f}{f_0}-\frac{f_0}{f}\right)$$

$f_0$=resonant frequency in MHz
f=some other frequency above or below $f_0$ in MHz

Voltage gain refers to the output voltage from a stage for a constant input voltage at any frequency.

From this it can be seen that the higher the value of $Q$, the lower will be the voltage developed across the tuned circuit at frequencies away from resonance, which is the requirement for increased selectivity.

## Conclusions

The smaller the resistance of an inductor the greater is its $Q$; thus the greater is the effective resistance of a parallel tuned circuit, and also the greater is the tuned circuit's selectivity.

**Next month we'll finish the t.r.f. and look at the superhet receiver**

## Constructional

# Three Keys in One

*J. Worthington GW3COI, a diehard c.w. user, wanted a circuit that retained the individuality of the operator's hand when using bug keys.*

I was discussing the relative merits of the mechanical bug key and the iambic or plain electronic model with a friend. Like myself, he is a diehard c.w. user. We agreed that the former, although more difficult to use because of its need for hand-made dashes and possibly more tiring too, was unique in allowing its operator to emphasise certain letters and words when the occasion arose. For instance, when you wish to penetrate heavy QRN it is known that longer dashes are more easily read. Then again, if you wish to get a certain number or name across first time it is always politic to slow down and "emphasise" the letters in a way that only can be done on "up and downers" or mechanical bugs. I appreciate an electronic key can be slowed down, but it is awkward to do so just for one word and the result is somehow never as satisfactory.

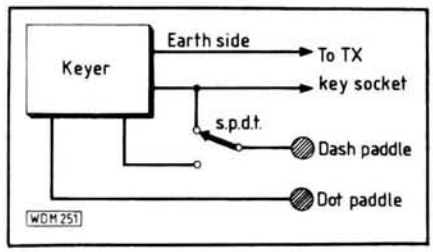



**Fig. 1: The wiring in of the single-pole two-way switch that transforms your Morse key**

My friend then went on to say that he was thinking of swapping his el-key for a bug as, "it would allow him better to express his individuality". At this I was slightly disturbed as I knew he tended to favour "Baghdad" Morse which, after giving the recipient a good laugh, goes on to make him reach for the off switch as it so distorts the proper code. Reactions to receiving this kind of Morse can be strong and various.

Perhaps it was the spur of this which produced a simple idea—it had to be simple because my friend is largely an "operator" type amateur who thinks a test meter is what umpires use at Lord's. It will be seen from the diagram that the wiring in of a single-pole two-way switch is all that is required to transform an el-key into an instrument that will perform as a mechanical bug by enabling the operator to make dashes; to act as a sideswiping hand key on the dash paddle and, of course, in its original role of an electronic Morse maker.

As a final bonus, in the "mechanical" position, it allows the operator to send a long dash for tuning purposes—a system which has finer control in obviating over running of p.a. stages! **PW**

## Theory

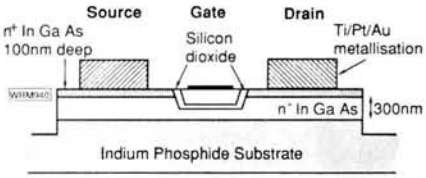
# The MISFET—

## A Challenge to the Power MESFET?

*The gallium arsenide m.e.s.f.e.t. (metal-semiconductor f.e.t. or metal Schottky f.e.t.) is one of the best microwave amplifier devices which has yet become commercially available for both small-signal and power amplification. In this article, Brian Dance looks at a new device which takes power amplification a step further.*

The performance of m.e.s.f.e.t.s at higher frequencies has improved as devices with smaller gate lengths have been produced. However, recent work has shown that the m.i.s.f.et. (metal-insulator-semiconductor f.e.t.) fabricated in gallium indium arsenide has some potential advantages over the gallium arsenide m.e.s.f.e.t. for power amplification. This has stimulated efforts to produce practical m.i.s.f.e.t. devices suitable for microwave applications.

The m.i.s.f.e.t. has the structure shown in Fig. 1, with an oxide gate insulation. As the gate breakdown is controlled by the insulator thickness and the dielectric strength and not by the semiconductor material, the channel doping can be optimised independently of the gate breakdown. The linearity of the m.i.s.f.e.t. is better than that of the m.e.s.f.e.t., since the input capacitance of the m.i.s. gate is less affected by the r.f. drive than in the




case of a Schottky gate. Linearity is also improved because the m.i.s.f.e.t. can operate with zero bias on the gate.

The gallium indium arsenide, actually $Ga_{0.47}In_{0.53}As$, has the highest electron mobility of any room temperature semiconductor material. It cannot be used for making satisfactory Schottky contacts for m.e.s.f.e.t.s, as the barrier height to metals is too low, resulting in low breakdown voltages and high leakage currents.

The gallium indium arsenide used to make m.i.s.f.e.t.s is lattice matched to the indium phosphide substrate. Silicon dioxide is deposited at a low temperature (75°C) for gate insulation using a self-aligned gate approach to minimise the gate overlap capacitances which can impair r.f. performance. The gate length used has been 1μm (micrometre).

Outputs of 857mW at 4GHz (power gain 12.7dB), 424mW at 12GHz (gain 7.2dB), 415mW at 20GHz (gain 3.0dB and 114mW at 32.5GHz (gain 3.1dB) have been produced by m.i.s.f.e.t.s of this type. Extrapolation of the performance at about 10–20GHz to higher frequencies indicates a cut-off frequency of about 45GHz (maximum frequency of oscillation).

It is expected that considerable improvements in performance will be obtained by fabricating gates of sub-micrometre dimensions. The m.i.s.f.e.t.'s high resistance to ionising radiation will be of considerable importance for military applications, where the devices may be used in a nuclear environment. **PW**

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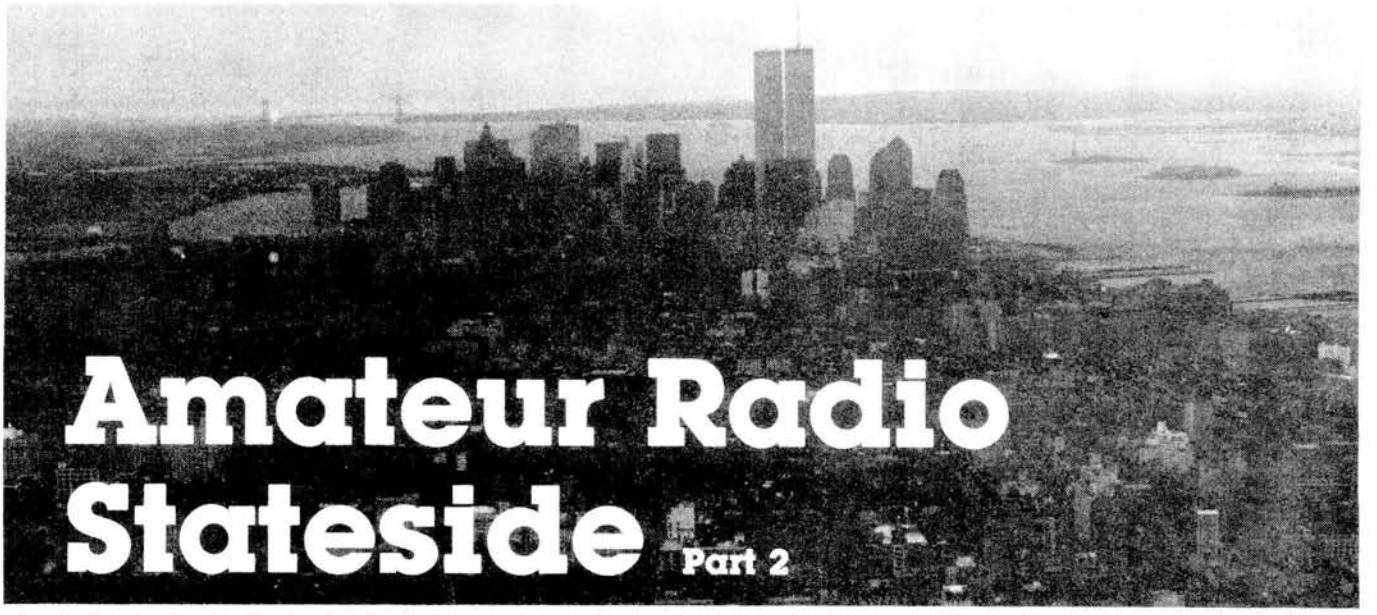


# Amateur Radio Stateside Part 2

★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★

*Last month, we left David Jardine G0FDV hovering on the steps of the ARRL Headquarters in Hartford, Connecticut. This month, he concludes his visit to the USA with details of what goes on behind the doors.*

★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★

## A Little History First

The ARRL was founded in 1914 by Clarence Tuska and Hiram Percy Maxim (he of the Maxim Silencer fame). When World War I broke out, amateur radio was just getting started in the USA. Obviously all licences were suspended at this time, in common with most of the world. Many amateurs joined the services, providing a valuable source of radio skill. After the war ended, amateur radio was still banned in the US, yet many of the former operators couldn't wait to start again.

Hiram Percy Maxim called the pre-war League's officers together and then contacted all the old members who could be found in order to re-establish amateur radio. Maxim went to Washington DC and, after a huge effort, he cut his way through lots of red tape and amateur radio was re-opened on 1 October 1919.

## The ARRL Nowadays

They're a friendly crowd at the ARRL HQ. The plush offices, out on Main Street, house the entire ARRL staff, the memorial station and even the editorial and typesetting staff for the organisation's publications.

The fully equipped electronics laboratories housed there are very comprehensive. The staff build prototypes and test the latest rigs on the market for the ARRL publication *CQ*. They have metal cutting equipment to make the chassis for projects and even wind their own coils. There is an r.f. proof room for testing receivers, because of the adjacent wattage from the W1AW transmissions!

W1AW was the callsign used by Hiram Percy Maxim, the first ARRL President, and now it's the callsign for the Memorial Station. This year (1988) sees the 50th anniversary of the Memorial Station.

Twenty-six one-hour code practice sessions are transmitted each week for listeners who are learning Morse code or just improving their proficiency in it. Each of these transmissions is made **simultaneously** on at least six h.f. frequencies as well as 50 and 144MHz and the OSCAR-10 satellite when it is in range. Another twenty-six transmissions go out each week on c.w. (at 60 w.p.m.), Baudot, 110 baud ASCII and AMTOR FEC mode.

Then, there are the fourteen voice transmissions. These are bulletins containing the latest news from the FCC and elsewhere pertaining to amateurs in general, news of special interest to Canadian amateurs, a propagation forecast (updated weekly) that is one of the best in its field, as well as daily updates on the positions of the various amateur and weather bureau satellites.

Other specialised transmissions include a weekly DX bulletin giving the latest information on where and when to find the rare countries, a weekly transmission on Baudot reporting the latest news from Region II of the IARU and a bi-weekly listing of up-to-date Keplerian elements for the amateur and weather satellites.

One of the high points for W1AW in recent years was in December 1983 when the station contacted astronaut Owen Garriot W5LFL in the *Columbia* Space Shuttle. Most local TV and radio stations were present, plus some of the National ones. Owen responded to W1AW's call . . . "W1AW this is W5LFL", this caused spontaneous applause from the onlookers.

The Grenada invasion by the US also gave W1AW some extra publicity in the news media. This was because

**ARRL Headquarters in Hartford, Connecticut**

the only source of information from Grenada was the amateur radio transmission from one of the medical students. Similarly W1AW has been used considerably for communication and relief efforts in various corners of the globe—especially in the Mexican Earthquake.

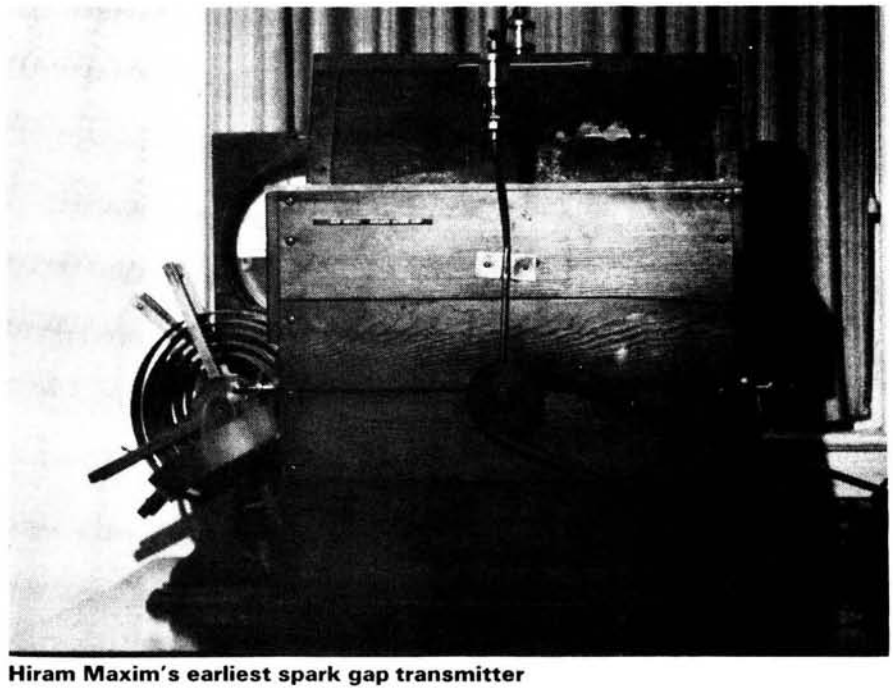
W1AW is active from 8am to 1pm (Eastern Time) Monday to Friday as well as 3.30pm to 1am on Saturday and Sunday. The visitor operating positions are available for use between 1 and 4pm weekdays and when time is available between the scheduled transmissions.

UK licensed amateurs are welcome to operate W1AW during these "off times". If you want to operate, however, be sure to have your reciprocal US Licence with you. Details of how to obtain this can be had from the RSGB.

They have equipment for 1.8MHz right up to 1296MHz available, using either c.w., phone, Baudot, ASCII or AMTOR. I noticed they use a Yaesu FT-767GX, subsequently amplified by gigantic linears. The code practice and bulletin station consists of three Alpha 77DX amplifiers, which put out 1500 watts each on 14, 7 and 3.5MHz, along with 600 watt amplifiers on 21 and 28MHz. High power stations are available for 1.8, 50 and 144MHz. There is also a complete satellite station.

There are four operating positions set up for use by visiting amateurs. One features a Collins KWM380 transceiver with a Henry 2kW linear amplifier. A second uses a Kenwood TS-820 with a Collins 30L1 linear amplifier, a HAL DS3100-ASR for Baudot and ASCII and keyboard c.w. as well as an AEA AMT-1 AMTOR terminal unit.

The third position, for low power operation, uses an Icom IC-751. Finally there is the v.h.f./u.h.f. and satellite station. This consists of Icom transceivers for 50, 144, 430 and 1296MHz, along with a Tempo 2000 amplifier for 144MHz and an ARCO amplifier for 435MHz. A video monitor displays the locations of the various satellites and



**Hiram Maxim's earliest spark gap transmitter**

provides azimuth and elevation bearings when they are in range.

For a description of the impressive antenna farm at the ARRL HQ, I can do no better than quote *Popular Communications* from their September 1986 issue.

"The rhombic and 80 metre dipole first erected in 1936 are still in use. A 120 foot tower supports two 4-element 20 metre Yagis, one at 60 feet and the other at 120. The top beam is rotatable, while the lower one is fixed at 285 degrees to maximise US coverage. The beams are operated in phase for code practice transmissions and bulletins, but each one may be fed separately for general operation. At the 90 foot level, there is a 2-element 40 metre Yagi, also aimed at 285 degrees. The top of the tower supports the centre of a 160 metre inverted V and a four-bay vertical dipole array for 2 metres. In addition, there are three 60 foot towers. One supports a five-element 10 metre beam and a six-element 6 metre beam and another holds a five-element 15 metre beam. The third is for the satellite station, and sports circularly polarised Yagis for 2 metres and 70cm, and an 'H' Yagi array for 1269MHz. A general purpose dipole, used primarily on 40 or 30 metres, completes the antenna set-up."

## Conclusions

The USA has a tremendous amount to offer. Before you say it's too expensive, you may be interested to know that in 1987, Continental Airlines offered 2-day packages at around £200 (including air-fare and accommodation).

There are other package deals too, and if you can incorporate a trip to the ARRL as I did, then it's worth it. Most continental airlines serve Hartford, Connecticut through Bradley International Airport. Once there, Amtrak provide a rail service and there are bus services available from Greyhound and Continental Trailsways. So you can see, getting around once you're there isn't too difficult.

My thanks must go to a few special people, without whom my trip wouldn't have been so enjoyable. My host at ARRL HQ was Bruce Williams WA6IVC, the Ad. Manager, then there was John Hunter K2VKA who played "host" whilst I was in the USA. I mustn't forget all those amateurs I met without whose help, friendship and enthusiasm this article wouldn't have been written. **PW**

**ARRL Headquarters—reception and radio museum**

**Census of Amateur Radio Licences in the USA (1987)**

| | |
|---|---|
| Novice Licence | 87 943 |
| Technician Licence | 89 835 |
| General Licence | 120 307 |
| Advanced Licence | 99 881 |
| Extra Licence | 40 486 |
| Club Licence | 3394 |
| Military Licence | 290 |
| Total | 442 136 |

# On The Air
## On The HF Bands

Reports to Paul Essery G3KFE
287 Heol-y-Coleg, Vaynor, Newtown, Powys SY16 1AR

Another month and another crop of mail. For part of the time at least, the summer's weather made the lower bands very noisy. My tri-bander is back in the air and the rotator "does its thing" even though I seem to have acquired a slight list to port when comparing beam with stub mast. Well—I never did like things too regimental!

### Sunspots

Since we hit bottom in autumn 1986, the rise has been pretty quick; the upward movement is always faster than the decay, but when I heard one knowledgeable observer hinting we may reach the peak as soon as autumn 1988, I reached for the calendar—odd, isn't it how, as one gets older so the years fly faster. But my own guess is probably a year further on—say autumn 1989.

### What's Happening

As always, too much happens at short notice; to get a grip on this one needs to subscribe to the RSGB's *DX News Sheet* or one of the other weeklies, such as *The DX Bulletin*, PO Box 50, Fulton, CA 95439, USA. Some efforts are at too short notice for even these! One could wish that many more operators would pass the word on as to their plans that much earlier.

Chagos activity from W4QM, operating as VQ9QM, is down for the next several months. However, the new QTH is near the BC station, so Top Band operation may turn out to be impractical.

The Soviet withdrawal from Afghanistan and the injection of some 100 UN observers, some known to be Finnish licensed amateurs, indicates that if you come across a 4U/OH, you should snaffle it quick.

As for the Russian Vietnam rumours, the story seems to be that several Soviet amateurs are attending some "do" there in October; they have applied for licences but have at the time of writing not received a reply.

Comments about the 3DA0 prefix from Swaziland, it seems the half series 3DA–3DM were allocated to Swaziland, the other half 3DN–3DZ to Fiji. Thus the 3D6 and 3D2 prefixes are in fact ambiguous. So, the Swaziland authorities are in the thick of it in issuing calls beginning 3DA plus a digit and suffix. I gather that the issue of half-series is likely to become more common as the demand for callsigns increases.

Hints about Spratly recur; but knowing that China, Vietnam, Taiwan, Malaysia and the Philippines all lay claim to parts of the area, I would think the chance of any operation that would be acceptable in DXCC terms is in the hen's teeth category.

Reverting to China, the word goes round that licensing in that country will become easier very soon—perhaps by the time this reaches you. BW will be the prefix for foreign operators; BG for individual Chinese stations, BY for clubs and BT for special event stations.

The comic situation in Thailand continues. Amateur Radio is now legal, but there are no licensed amateur stations—not even HS0A and HS0B. The foreign amateur element is built in to the new rules but only with those countries with which reciprocal licensing **will be negotiated.** It is understood that at the time of writing only Spain, Chile and USA have opened negotiations on this.

That KK4AJ Andorra activity came unstuck, at least partly. Dr. Wayne Tope got there, but the gear apparently didn't survive the trip. Nothing much heard since on this one.

### Insurance Contacts

Some considerable discussion on this subject, sparked by Berk SP6RT to some extent. There can be no doubt that people who make insurance QSOs are time-wasters—but having said that, there is no doubt in my mind that the business of using two letters as a call instead of the complete callsign, and of the DX station rarely if ever mentioning his own call, almost guarantees ambiguity. If every one in a pile-up used their complete callsign, if the DX came back each time with a complete callsign, very little time would be lost, but 90% of the ambiguity would disappear. I have a shrewd suspicion that the number of contacts that don't QSL to a DXpedition is more than anything else a measure of the number of questionable QSOs: people who entered the DXpedition log but either weren't on the band at all at the time or who thought the DXpedition was working someone else. One would hazard a guess that maybe 20% of the entries in a DXpedition log are questionable; and the corollary is that a similar percentage think they have worked the chap and exchange cards when the real QSO was with someone else.

### Letters

First, a letter from **Mike G3SED** (Horndean). He notes that there are now two beacons on Ascension Island, ZD8HF on 28.292MHz with 50 watts r.f. out and ZD8VHF which puts the same power out on 50.0325MHz. On 28MHz the beacon has a vertical, while on 50MHz a 5-el Yagi or a vertical can be selected. The keyer sends the appropriate callsign, followed by the Ascension locator II22TB, then six letter "A"s and the callsign again. This last portion is repeated twice more before repeating the whole message. The same keyer is used on both bands, save for the slight difference in callsign, and keying is therefore essentially synchronous, enabling arrival-time differences to be measured. Funding for the v.h.f. beacon was by the UK Six-Metre Group, while the 28MHz one was funded by ZD8MB, J4JCC, G3SED and G3JVL. Since they went on line on May 4, these beacons have been audible till 0100 in the UK.

**The next three deadline dates are: July 27, August 31 & September 21**

On that same day, the first Sporadic-E opening of the year showed on 50MHz; 9H1FL is known to have raised G3JVL, G3SED, G3DEZ, G4DBL/A in Wiltshire and G3GLK on the Isle of Wight. On May 6 a large Aurora opening occurred and G3SED worked GM1LUZ, GM8COX, GM8BZX, G1PAM (Salop), G0JHC (Preston), GM6VXB, GM3WIL, GM0FWV, PA2VST, G3FDW, GI8YDZ, G1MEJ and GM4DGT.

A similar number of stations were heard later the same evening when a Sporadic-E opening occurred. It yielded contacts with LA6QBA, 9H1CG, GM4UPL, 9H1BT and beacons noted being 9H1SIX, GB3RMK, CT0WW. In addition there were cross-band QSOs to SM7DAA and DL4DMQ.

Next, we turn to the report from **G3NOF** (Yeovil). Don found 28MHz somewhat patchy, with short-skip in the main. Between 0700–0900 he often found the short path to Asia, Australia and Japan was quite "giving"; Africans were heard in the mornings and the afternoons and S. Americans around the afternoon and evening slots. Don made s.s.b. QSOs with AX9NKG (Christmas Is), I0NLD/5H3, JA5QJD, RH8AD, TR8JLD, WP4AZT, XQ6CFE (=CE) and YU1FAG/5N0.

Turning now to 21MHz, Don found the JA short path open between 0600 and 1900, occasionally to 2300. The same path has also been good to Asia from 0700, with Pacific signals KH6, FK, KX, between 0800–1000, YB/YC at various times 1100–1800, Africans came in between 1000 and 1900, and the US evident between 1100–2300; The West Coast signals peaked between 1600–1800.

Contacts using s.s.b. were booked in with A71BJ, AL7HX, AX9NKG, BT0ZML, BY4RB, CI8C, CI8CW, FK8EB, FK8FR, FK0BA, HK6ISX, HL1AQB, HL1ASN, HL2INX, HL5BLI, many JAs, KA2CC, KL7CUS, KL7XD, KX6DC, NP4Z, OE1RUA/YK, PJ6/KV4AD, PY0FF, S79LB, UA0FF (Zone 19), UA0QBS (Z19), UA0SKL, UA0UF, UI8BBV, UW0LAP (Z19), UZ0AWB, UZ0QWB, YC1QL, YJ8NJS, ZD8MG, ZS3BI, 4F1BYN (=DU), 3D2MP, 7J6AAI (=JA), 5N9GM, 8A7ITU from Indonesia, 8J4XPO (JA), 9K2KW and 9N1RN.

As for 14MHz, G3NOF reports it as having DX at all sorts of hours round the clock. Good conditions were noted from the Pacific from the North and good long-path VK/ZL plus W6/W7. Around tea-time there have been good short-path Asian openings and Ws around almost all day. Don booked his s.s.b. in with AH6GE, EA2JG/SQ, FM5CL, FO5FO, FR4FA/J, FS9TI, FV3ITU, FY0EK, K9AJ/KH5K for country No 316, HC2DZ, HP1FR, J88AB, KH6FKG, KH6IJ, KH6/OE6BVG, N6DKP, N6ZV, NK4X/KP2, NL7KE, NL7MF, P43RR, PJ2/WB2LCH, PJ4CR, PS7KZ/AM, UZ0KWO, OH3/DK3OO, TY9SI, TY0LC, V47NXX, VI88NSW, VI88SA, VE6BI, VE7KY, VKs, VP2MT, W0RLX/KH5, ZF2ME/ZF8, ZK1XV, ZL5BKM (Antarctica), 4K0DR at the North Pole, 9M2CW and 9V1TJ.

**Phil Boorman** (Sittingbourne) found 28MHz yo-yoing between the very good days and the dead ones. He managed s.s.b. with PY1, PY3, PY7, LU4ACJ,

LU1HCO, VP8BLD (Mount Pleasant), 4X4s, then EDX by way of OH1, OH3, OH7, SM4JWI, HA5JI, OE6SRG, LZ1KKR, then UL7, ZC4EE and YI10BGD. For the c.w. there was LU7JI, using 30 watts to a home-brew beam. On the gotaway front this band showed Z21GU, VK3AKK, JA5BSQ, all around 0830. SORASD was missed for the third time! KH6FOD was noted at around 0800Z for almost an hour, with some of the more powerful G stations working him. Others included other VKs and EP2HZ. A first QSO on 10MHz yielded c.w. with OH7OI, using a ½G5RV, ten watts and an a.t.u. As for 7MHz, there were just the usual crop of Europeans and nothing Phil would classify as real DX.

**GM0FUW** put up a 14MHz dipole to replace his 18m of wire along the bargeboards of the house. It produced a welcome improvement in performance and the QRP raised Y23RJ, HB9LU/P, F2XP, I2XIQ and UA1WT, while the gotaways included VE1AZF, VK2CLV and 9Y4GR. Alas, at the end of April the winds fetched down the dipole, so Steve reverted to the wire. On 3.5MHz this gave G2OU, G5JL and G3BPE and on 21MHz YU2CDH and EA7DRK. Finally a little blast on the end fed wire on 14MHz yielded W3IIF, who had one kilowatt to a beam—a bit of a difference to Steve's indifferent antennas and HW8!

Now we come to **G2HKU** (Sheppey): Ted says conditions have been better and a bit more time has been available. He sent in the longest list I have seen. On top Band, ON7BW was worked on s.s.b., plus ON4CW on c.w. For the rest, c.w. all the way: 7MHz gave K7CW, while on 10MHz W4QEJ and SX1RAAG were booked in. The main area of activity was 14MHz, with VK3DEG, W6DU, K2OZ, LU6ELJ, YN3EO, W1CW, G4BUE/W4, K9QVB, K5MM, ZL3GQ, WA7OET, N2UU, W2FC, VK5SW, AX3DP, AX3XB, AX3KS, VK3MJ, VK1CC, W0TOY, AX4ZA, W6VD, VI88NSW, W6VX, NL7GP, W6OV, HC2DZ, W4BAA (Captiva Is.), W1HZ, AX3ITU, VK4VJ, VE2GTQ, K7GE/M/VE3, W5GEL, K5NA, 4X1FC (new call of Daniel 4X4OL), N4AR, W7SF, KR7G, BY1QH, W5ADZ, 8P6CF, LU4US, VK5TL, W2BA, PJ2AMN, VE6FT, W6VTK, WJ6U, CE2LZR, N6FSF and AI6V. As for 21MHz there were c.w. contacts to W4BAA, UA0L, UA9JH, UA9ODB and HK6ISX.

Ted says he was surprised to find the noise limiter on the KW Ten-Tec Paragon enabling him to copy c.w. right through the Woodpecker noise from Poltava. On the other hand it has also been of great interest, while using the Corsair, to use the Butternut HF6V with the bits for nine-band coverage and a G5RV, plus a couple of a.t.u.s to obtain comparative reports.

## Contests

As always, this bit is in the main thanks to the regular input from W1WY and his Contest Calendar.

July 30–31 is down for the first FADCA Packet QSO Party, 0001Z Saturday to 2359Z Sunday. The object is to work Florida packet stations. No other mode may be used to solicit packet QSOs. Score one point per QSO on each band. Multiplier is the number of Florida counties worked. Logs by September 1 to FADCA, 812 Childers Loop, Brandon, FL 33511, USA.

Frequencies to be used: 3.615, 7.068, 10.145, 14.115, 21.115 and 28.115MHz, l.s.b. Include a summary sheet with the log, including name and address.

The AGCW-DL QRP CW Contest comes up over July 16–17, 1500Z to 1500Z. Five classes: A 3.5W or less, B 10W or less single-op; C ditto, but multi-op, D QRO stations, over 10 watts, who may ONLY work QRP stations; E s.w.l.s. Class C may operate the full 24 hours, others must take a 9 hour break in two segments. Exchange RST, QSO number and power input, add X if using crystal control (Example 599001/2X, 579001/QRO). Score one for station in own country, two for a station in own continent, three for a DX station in a different continent. Double points if crystal controlled. The multiplier is one for each DXCC country worked, and one for each DX station worked defined as a before. Call areas in JA, PY, VE, W, ZS count as countries. The total score for each band is QSO points times multiplier. Total over all score of totals so found on each band. Separate log sheet on each band, plus a summary sheet showing scoring, name and address and other essential information. Mail within six weeks of end of contest to Siegfried Hari, DK9FN, Spessartstrasse 80, D-6453 Seligenstadt, West Germany. Include one IRC for a copy of the results.

## Final-Final

To make this piece "go" I need your reports. any h.f. band, any mode—c.w., s.s.b., f.m., SSTV, etc. Send your letters to me by the dates shown.

# VHF Up

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

A good aurora at the beginning of May and the first 144MHz Sporadic-E openings towards the end of the month are the main news items this month, plus some reasonable tropospheric propagation.

## Award News

Congratulations to **David Dibley G4RGK** from Marlow (BKS) who is the sixth member of the 430MHz QTH Squares Century Club. His certificate for exactly 100 squares confirmed was dated May 17.

Like many others striving for this goal, he found it very difficult to get many of the QSL cards. He points out that local squares, such as AI and BJ, remain unconfirmed in spite of his having contacted many stations in them.

Dave's station now comprises a Yaesu FT-101ZD transceiver driving a home-built transverter, the amplifier being a stripline design using two 3CX100A5 valves. The antenna array has been either four 20-ele home made Yagis or four modified 21-ele ones from the Tonna range. A two-stage pre-amp is mounted at the feedpoint.

22 countries are represented in his list which includes e.m.e. QSOs with KP4I (FK68) and K2UYH (FN20) ". . . made with an honest 100 watts to the antenna." One contact was via Ar with G2CIW, the rest by tropo. 33 QSOs were on c.w. and the others on s.s.b.

I see that five of the sixteen participants in the Squares table with over 100 confirmed on 430MHz are members of the QTHCC. I hope that some of the remaining eleven might have enough QSLs to qualify for membership. If so, please write to the Poole address for a copy of the rules and the application form. An s.a.e. would be appreciated.

## Beacon News

The UK Six Metre Group has sent details of two more beacons. The Gibraltar one, ZB2VHF is crystalled for 50.035MHz and gives 35W r.f. output. The p.a. is a modified CTE-767 CB amplifier which incorporates a low-pass filter.

A 5-ele Yagi antenna is available but consideration may be given to an omni-directional array for worldwide use. The keyer is made on a p.c.b. to a G4FRE design and sends, "ZB2VHF Gibraltar IM76HE GGGGGG" before repeating the callsign.

The original p.a. and regulated power supply were supplied by Nevada Communications Ltd, thanks to G3SED. The units were designed, built and tested by Mike Walters G3JVL and funded by the UK Six Metre Group from its beacon fund.

The Iceland beacon TF3SIX is of similar design and crystalled for 50.0575MHz, its p.a. giving 50W output. The antenna, designed by G3JVL, is a five-eighths wavelength vertical. The locator is HP94CC.

A similar keyer to the ZB2 one is used and sends, "TF3SIX Iceland IIIIII," followed by the callsign again. Frequency shift keying is used with the space 500Hz l.f. The TX was also made by G3JVL and funded by South Midlands Communications Ltd.

Richard Diamond G4CVI and Jonas Bjarnson TF3JB obtained the licence and the Hljodtaekni Radio Society donated the Yaesu p.s.u., the original p.a. unit again being supplied by Nevada Communications Ltd.

Both beacons have provisions for keying a second TX for another band.

A new beacon is now operational from the centre of Jersey Island using the temporary callsign GJ4HXJ. It is on 50.0655MHz and came on stream on May 9 at 1000UTC. It runs 10W to a halo antenna and eventually the call will change to GB3IOJ.

The f.s.k. message is "GJ4HXJ IN89WE" and the beacon runs continuously. It was financed by KWK Amplifiers (GJ4ICD) and Phil Johnson GJ3RAX. Logic

| | Band (MHz) | | | | |
|---|---|---|---|---|---|
| **Station** | **50** | **70** | **144** | **430** | **Points** |
| G4ZEC | — | — | 356 | — | 356 |
| G4OUT | — | — | 176 | — | 176 |
| G0HGA | — | — | 173 | — | 173 |
| G0HLT | 9 | — | 117 | — | 126 |
| G4WHZ | 6 | — | 106 | — | 112 |
| G4ARI | — | 10 | 80 | — | 90 |
| G4ZVS | — | — | 80 | — | 80 |
| G0DJA | 11 | — | 55 | — | 66 |
| G3FPK | — | — | 62 | — | 62 |
| G2DHV | 10 | 23 | 22 | — | 55 |
| G0GKN | — | — | 52 | — | 52 |
| G4VOZ | 11 | 29 | — | 11 | 51 |
| G4AGQ | — | 11 | 30 | 2 | 43 |
| G1SMD | 8 | — | 13 | — | 21 |
| GW4HBK | 5 | 14 | — | — | 19 |
| G1DOX | 3 | 5 | — | — | 8 |
| GU4HUY | — | — | 3 | — | 3 |

**Number of different stations worked since January 1.**

design was by GJ3RAX and TX driver by G3JVL, the p.a. again donated by Nevada. BNOS Electronics donated the output filter and the antenna was built and supplied by GJ1TJP.

This beacon was widely received in several countries by various modes within the first week or two of operation. Reception reports of any unusual nature should be sent to Geoff Brown GJ4ICD, TV Shop, Belmont Road, St Helier, Jersey, Channel Islands. The telephone number is Jersey (0534) 77067.

## DXpedition News

**Clive O'Hennessey GW4VVX** (GWT) has written to advise that he and Steve Jones GW6TGX will be active again from XS square between Aug 13 and 28. Look out for GB2XS and GB0LCS—the Lairg Crofters Show—the latter the weekend from the 19th.

The equipment will be as last year; two Kenwood TR-751E transceivers and two BNOS 200W amplifiers. A 13-ele Yagi at 9m a.g.l. from a site at Rosart, near Lairg, 150m a.s.l. should enable them to make long distance tropo QSOs.

A reminder of the Scilly Isles activity planned for Aug 4–14 by the Derbyshire Hills Contest Group on 70, 144 and 430MHz, see last month's VHF Up.

**John McGowan EI2FN** (Wicklow) has written to report that Seán Butler EI5CZB is planning to operate from a number of Irish counties in August. Those mentioned are Longford, Leitrim, Roscommon, Mayo and Sligo and he would like to know if any others are in demand.

Operating frequencies are 144.325MHz s.s.b. by EI5CZB/P and 144.075MHz c.w. by EI2FN/P during the afternoons and evenings. The equipment to be used comprises a Yaesu FT-480R, BNOS 180W amplifier, 12-ele "ZL" and 9-ele Tonna Yagis.

John and Seán hope this trip will enable certificate hunters to accumulate the 20 Irish counties needed for the "... beautiful WEIC award which is sponsored by the IRTS." Seán's QTH for further details regarding dates, unspecified in John's letters, is 12 Lr. Kindlestown, Greystones, Co. Wicklow, Irish Republic.

## Contests

First a remainder about the Worldwide VHF WPX Contest sponsored by *CQ Magazine* which lasts 48 hours form 0000UTC on July 17. A resumé of the event was published on page 44 in the June PW.

The 144MHz Low Power Contest is on July 30, 1500–2300UTC. Three sections, F for single-op. fixed stations, O for all others and L for the listeners. TX power output not to exceed 25W p.e.p.

On July 31, 0900–1500, there is the 432MHz Low Power Contest with the same categories. Power output from the TX not to exceed 10W. p.e.p. Both contests use the county/country multiplier scoring system so this will help those seeking out counties for the tables.

The next leg of the 10GHz Cumulatives is on Aug 7, 0900–2100UTC with the last session on Sept 11.

The 1.3 and 2.3GHz Trophy Contests are on Aug 14, 0900–1700UTC, both being two section events; F for single-op. fixed stations and O for all other. Scoring on 1.3GHz will be the usual radial ring system but one point per kilometre in the 2.3GHz affair. Entries for both events go to G4JLG at 40 Edge Fold Road, Worsley, Manchester M28 4QF.

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

| Station | 50MHz | | 70MHz | | 144MHz | | 430MHz | | 1296MHz | | Total Points |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Counties | Countries | Counties | Countries | Counties | Countries | Counties | Countries | Counties | Countries | |
| G1KDF | 34 | 6 | — | — | 72 | 12 | 48 | 7 | 21 | 5 | 205 |
| G1SWH | 26 | 7 | — | — | 69 | 9 | 41 | 6 | — | — | 158 |
| G6HKM | 2 | 3 | — | — | 66 | 13 | 41 | 8 | 16 | 5 | 154 |
| G4XEN | 33 | 3 | — | — | 58 | 13 | 39 | 7 | — | — | 153 |
| GM0EWX | 53 | 7 | — | — | 49 | 10 | — | — | — | — | 119 |
| G1IMM | 23 | 4 | — | — | 50 | 9 | 28 | 2 | — | — | 116 |
| G1EZF | — | — | 18 | 2 | 67 | 23 | — | — | — | — | 110 |
| G4DEZ | 26 | 5 | — | — | 24 | 8 | 24 | 5 | 12 | 5 | 109 |
| G8LHT | 5 | 2 | — | — | 47 | 10 | 31 | 7 | — | 1 | 103 |
| G0IMG | 28 | 5 | 16 | 1 | 39 | 8 | 5 | 1 | — | — | 103 |
| GW6VZW | 27 | 4 | — | — | 58 | 11 | — | — | — | — | 100 |
| GM0HBK | 26 | 8 | — | — | 46 | 15 | — | — | — | — | 95 |
| G6MGL | 19 | 10 | — | — | 49 | 10 | — | — | 4 | 3 | 95 |
| G4ARI | — | — | 16 | 2 | 58 | 9 | — | — | — | — | 85 |
| GW4FRX | — | — | — | — | 60 | 25 | — | — | — | — | 85 |
| G3FPK | — | — | — | — | 67 | 17 | — | — | — | — | 84 |
| G1DOX | 16 | 2 | 19 | 2 | 22 | 5 | 5 | 2 | 2 | 1 | 76 |
| G6MXL | 14 | 3 | 8 | 2 | 31 | 4 | 9 | 2 | — | — | 73 |
| G4VOZ | 14 | 4 | 31 | 3 | — | — | 16 | 5 | — | — | 73 |
| G8PYP | 11 | 5 | 1 | 1 | 36 | 7 | 6 | 2 | — | — | 69 |
| G2DHV | 5 | 1 | 12 | 1 | 28 | 6 | 7 | 1 | — | — | 61 |
| GW4HBK | 20 | 7 | 31 | 3 | — | — | — | — | — | — | 61 |
| ON1CDQ | — | — | — | — | 46 | 15 | — | — | — | — | 61 |
| ON1CAK | — | — | — | — | 44 | 13 | — | — | — | — | 57 |
| G8XTJ | — | — | — | — | 46 | 7 | — | — | — | — | 53 |
| G3EKP | 12 | 3 | 16 | 4 | 7 | 4 | 5 | 1 | — | — | 52 |
| G4AGQ | — | — | 9 | 1 | 28 | 6 | 6 | 1 | — | — | 51 |
| G4WHZ | 3 | 2 | — | — | 31 | 12 | — | — | — | — | 48 |
| GI4OWA | 6 | 6 | — | — | 30 | 6 | — | — | — | — | 48 |
| G1SMD | 12 | 3 | — | — | 20 | 4 | — | — | — | — | 39 |
| GM0JOL | — | — | — | — | 30 | 9 | — | — | — | — | 39 |
| G4ZVS | — | — | — | — | 34 | 5 | — | — | — | — | 39 |
| G0HGA | — | — | — | — | 30 | 5 | — | — | — | — | 35 |
| G0HDZ | — | — | — | — | 30 | 5 | — | — | — | — | 35 |
| G8PNN | — | — | 20 | 3 | — | — | — | — | — | — | 23 |
| GJ6TMM | 1 | 1 | — | — | 13 | 7 | — | — | — | — | 22 |

## Repeater News

The Kent Repeater Group's May Newsletter was much concerned with the Annual General Meeting and amendments to the Constitution. In the "Sits Vac" department I see a new Newsletter editor was desperately sought.

Elsewhere there are reports on the status of GB3KS and GB3KN on v.h.f. and GB3CK, GB3NK and GB3RE on u.h.f. Work on GB3CK following the storm damage of last October was carried out on April 16 in very wet weather and objective reports on any change in performance would be appreciated. G3TIS is the person to contact.

## Meteor Shower Data

One of the longest and more reliable meteor showers of the year is the Perseids which lasts from July 20 to August 23 according to the British Meteor Society's Radiant Catalogue. As far as amateur radio is concerned, peak reflexions should be around Aug 12 and the shower is available all day.

The NE/SW path peaks around noon and the efficiency is over 50% from 0800–1800. The period 2200–0600 is the least useful. The E/W path is pretty consistent between 1000 and 0200 and least so around 0600.

The NW/SE path peaks nicely around midnight but is not so good between 0500 and 1400. The N/S path shows a couple of peaks around 0100 and 1100 with drop-outs at 0600 and 1800. All times are UTC(GMT).

**The next three deadline dates are: July 27, August 31 & September 21**

## The VHF Convention

Those arriving at the RSGB's VHF Convention at the Sandown Park Racecourse on May 1 in time for the opening at 1030 had to queue for some 30 minutes in the rain. Once inside, the hall was packed and it required some pushing and shoving to get anywhere near some of the stands.

The usual traders were there selling everything from junk to posh transceivers. These events are ideal for home constructors since you can buy most of the bits and pieces for your pet project.

I had the pleasure of meeting many old friends and some newer ones who help support VHF Up. As usual, more people were missed than met.

The lectures were well attended but I only went to the excellent one given by Ray Flavell G3LTP on the ultimate possibilities of long distance tropo communication. One conclusion was that, given the right weather conditions, that elusive 144MHz contact between Europe and North America must be realised one day.

Ray put forward the suggestion that, just as white light when refracted through a glass prism is split into the familiar rainbow colours of varying wavelengths, so a similar thing happens to radio waves. The analogy is that the lower frequency, longer wavelength waves are refracted less, so travel further than the shorter ones. He suggested this explains why, taking due account of e.r.p. and path losses, 144MHz signals ultimately travel further than those at 430MHz.

Another conclusion is that the best period for long distance tropo propagation is the early autumn as far as Europe is concerned. The usual October lifts would seem to prove this idea.

## The 50MHz Band

A propos the "Australia on 52MHz?" item in the June VHF Up, **Dave Pape VK6ADP** kindly sent me a large map of

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Western Australia on which Wickham, the location of the beacon VK6RTT, is marked. It is about 1250km north of Perth in locator OG89 on the northern coast of the territory. Its QRG is 52.320MHz.

**Graham Rogers VK6RO,** a very active v.h.f. man, wrote to say quite bluntly that, "LA6QBA did not hear VK6RTT on 52.300MHz. There is no beacon in Australia on 52.300". A lead story in the April *RadCom* News Bulletin stated the call was VK6RTV on 52.300MHz. VK6RO confirms there was a beacon with that call on that QRG but it has been QRT for four years.

Regretfully I conclude that this reception report cannot be substantiated since LA6QBA cannot have copied either the defunct VK6RTV or VK6RTT on 52.300MHz.

VK6RO says that the 50–54MHz band is only available to the VK6 and VK8 areas with all others restricted to 52–54MHz except outside television hours (1600–2200UTC). Graham uses 50.110MHz and monitors 28.885MHz for crossband working and liaison to the UK.

Thanks also to **George Hewlett** (DVN) who also sent information about the whereabouts of Wickham, complete with a sketch map.

Whatever the official situation is in France, many Fs have been worked on 50MHz direct and some German stations have been transmitting in the band, too. Perhaps by the time you read this the Finnish stations will have appeared legitimately on the band.

There was a good Aurora on May 6. **Martyn Jones G4TIF** (WKS) worked GM6VXB (ZR), GM0EWX (WR) and GM3WIL (XP). **Paul Thompson G6MEN** (SPE) using 25W to a dipole contacted LA3EQ (CT), GMs 0EWX and 3WIL between 1515 and 1554. **Philip Ruder G6MGL** (LDN) worked GM4WJA (GRN) and G4UXH (CBA) in this event.

**Calum Macpherson GM0EWX** (HLD) made 69 QSOs in this Ar the majority in the period 1345–1715 and added quite a few new 1988 counties in the process, ". . . without once having to resort to c.w."

**Geoff Brown GJ4ICD** was tipped off about the event at 0845 but heard nothing in Jersey till 1515. From then until 1710 he worked around 40 stations in G, GI and GM.

Now to Sporadic-E. Openings were reported on May 4, 6, 7, 11, 15, 19, 21, 22, 23, 25, 26 and 27 in your letters. GJ4ICD submitted a very detailed account of Es propagation from 28MHz up enabling a picture of the way these events developed to be appreciated.

To summarise; 4/5 1350 9H: 6/5 1945 9H: 7/5 1209 F5GV in Cannes worked by G6MEN: 11/5 1228–1414 LA: 15/5 from 1425 for a couple of hours to 9H and CT: 19/5 1040–1310 GM and LA: 21/5 1800 CT: 22/5 0825 9H, 1330–1510 9H: 23/5 1750–1930 LA: 25/5 1405–1510 LA: 27/5 1320 LA, 1508 9H.

Most of all the above from Geoff's report which included a detailed account of the May 26 events. These started at 1700 with several LAs. GB3RMK beacon was copied at 2145 and GM0EWX and GM3JIJ (WIL) worked. At 2256 LAs were working CTs and CT1DTQ was S2 at 2310.

The following contributors caught various events as follows: **Tony Wayland G1HJW** (ESX) May 4, 6, 11 and 15: **Adrian Gee G1IMM** (CBE) May 15 and 22: **Bryn Llewellyn G4DEZ** (ESX) May 4 and 6: **Ken Osborne G4IGO** (SOM) May 6 and 15: G4TIF May 26 and 27: **Ela Martyr G6HKM** (ESX) May 23, 25 and 27: G6MGL May 15, 19, 23, 25 and 26: **Ian Harwood G8LHT** (YSS) May 23: **Steve Damon G8PYP** (DOR) May 11, 22 and 25: **Gerry Elliott GI4OWA** (LDR) May 6.

From Scotland on May 7, GM0EWX worked FC1GTU (JNO5) at 1215, then F1GHV and F1GXY (JNO6) and F5GZ (JNO5) at 1413. Calum later telephoned to report CT and 9H worked in May.

**Colin Robertson GM0HBK** (HLD) worked southern Gs and GJs 4ICD and 6OZB on May 26, 2115–2125 and on the 27th, CT1WW (WB) at 1732. From Wales, **David Lewis GW4HBK** (GWT) worked cross-band to DL on May 6 and to DL, OZ and EA on the 15th. On the 25th he contacted LAs at 1546–1618.

**Paul Baker GW6VZW** (GWT) has concentrated on 50MHz working LAs on the 11th and 25th. He has heard 9H stations but has yet to make a QSO. G6MEN sent copies of the European locator map with the key Es paths marked on for the openings on May 6, 7, 27 and 28. These illustrate very clearly the numerous paths.

It seems obvious to me that in May, June and July, E-layer propagation at 50MHz is almost as frequent as the so-called "short skip" experienced on the h.f. bands. This is borne out by the cross-band reports from which it is clear that 50MHz signals from the UK are reaching all over Europe.

Now to pick out some more interesting items from your reports. **Gerry Schoof G1SWH** (MCH) lists a QSO on May 27 with SV2DH on Mount Athos, an experimental station of the University of Athens.

Hal Lund ZS6WB in his *VHF News* often mentions SZ2DH and I see he reports that SV0FE and SV1DO in Athens have recently received 50MHz permits valid for two years. SV0FE is W0YZS who was a very active DXer in the USA and who holds the first 70cm Worked All States certificate.

The Ascension Island beacon ZD8VHF (II22) on 50.0325MHz was copied on May 15 by GJ4ICD 1800—1805 S2; G4RSI 1745; G1HJW 1720 S3 QSB and G4IGO thinks he may have heard it at 1942 but is not sure.

Most of the aforementioned readers reported tropo contacts too as did **Dave Ackrill G0DJA** (WMD), **John Acton G1DOX** (AVN), **Bob Nixon G1KDF** (LNH) and **Ron Oakley G8GRT** (CBE).

**Ron Glynn G1UNH** (WMD) writes that he has been QRV on the band since April 30. His station consists of a Yaesu FT-290R, Howes HC266 transverter and 3-ele Yagi at 5.2m a.g.l.

## The 70MHz Band

At his new Bristol QTH, G1DOX has a dual band beam for this band and 50MHz which has helped him work 19 counties up to May 22.

**John Jennings G4VOZ** (LEC) reports the best activity for a year and is pleased to hear new B licensees on and using c.w. when reception is poor. The Ar on May 6 was good but faded out before most folk were home from work. He now uses a transverter by R.N. Electronics with the 144MHz module in his Yaesu FT-726R.

One of the new stations John worked was Ron Reynolds G6WEM (ESX) who prefers the band to 144MHz. He says it reminds him of top band—pleasant and relaxed. He uses a Howes 246 transverter, 10W output, driven by a Yaesu FT-290R, the antenna being a 4-ele Yagi from Jaybeam.

**Ron Oakley G8GRT** (CBE) took part in all the Cumulatives working 40 different fixed stations and many portables in contests. He uses a Spectrum transverter and 17W to a loft dipole.

**Gordon Emmerson G8PNN** (NLD) has submitted an entry for the band this year and has worked down to Dorset and to a few interesting GM regions. GW4HBK reported on the May 6 Ar which brought him EI9FK at 1453 and again at 1535 for a ten minute chat on s.s.b. Others worked included G8VZT (SPE), GW4ALG (GWT), G4IJM (CVE) and the last QSO for Dave was G4VOZ at 1656.

## The 144MHz Band

The Ar on May 6 was quite an event. GM0EXN called me at 0840 to say it had started in the north of Scotland but it was several hours before I heard anything. **Eddi Ramm DK3UZ** (EN20c) telephoned at 1117 to report it very strong in Germany. He listed 28 stations worked between 1111 and 1642 at QTEs 0° to 70°.

Countries worked included GM, OE, OK, PA, RB5, SM, SP, RA3, UA2 and UP2 in some really choice squares. I would select Eddi's best DX as UZ3DD (SQ64c), SP9KUR/7 (KK20c), SP9PRO/7 (LK11g) and RA3LE (QO21h).

G1SWH lists PE1MHB and FC1FLA for two 1988 new countries in the Ar. G4TIF worked GM8DFX (XS) for his 188th square on the band as did Ela G6HKM, making 22 QSOs. Her tally included seven GMs and assorted PA, ON, DL, OZ and EI stations.

G6MEN worked PA3DVG (CN) at 1647 but he wishes c.w. operators would listen above 144.150MHz for B licensees. The trouble is that few, if any, overseas c.w. users know about this curious UK situation requiring voice identification. G8PYP made a couple of QSOs including G0DKM only 87km distant.

GM0EWX worked 24 stations on s.s.b. in this event but did not list any specific stations. Mervyn Rodgers GM0GDL (CTR) ". . . managed to work an Aurora at last." He was QRV from 1530 to 1650, all stations being best at a QTE of 90° and all, except one, were in the southeast of England. The odd one out was GW4UWR (XL) for a new square. He heard PA and ON in this event.

Congratulations to **John Lincoln** (HLD) who is now GM0JOL (ex-GM8DFX). He points out he is in Sutherland and not Caithness, the latter appears on his address for convenience of the Post Office. He worked a few Gs in the Ar plus PE1MDD (DN) but it "switched off" at 1630.

Now the Sporadic-E reports and the first opening seems to have been on May 15 at 1312 when G4IGO worked YU4EDO and YT2GL (JF) in the space of two minutes. A YU4PM? was heard by Ken.

On May 25, **Mike Ray G4XBF** (SRY) heard YO3JW (NE) at 1413 for about one minute. The next and first major event was on May 27 from about 0845 when YU, YO, HG and LZ stations were worked for about 45 mins.

**John Hunter G3IMV** (BKS) worked YU1GT (KE) at 1912 and other YUs in JF and KE. **Haydn Barker G6XVV** (YSS) worked nine YUs in previously worked squares. G6MGL contacted YO2IS, YO2AVM and YU7RF.

There was an afternoon opening around 1615 when YO3RG and YO3JW (NE) were worked. The next Es event was on June 2 in the early evening to the Mediterranean. At 1812 I worked 9H1GB (HV) and

**Paul Pasquet G4RRA** (SRY) worked EA7DZI (WW).

On June 4 at 1115, **John Nelson GW4FRX** (PWS) reported an incomplete contact with EA6FB (AY). **Mark Turner G4PCS** (BFD) worked EA5s in ZZ square.

Later that day a major opening occurred from about 1500 when hordes of strong stations were worked from many parts of the country. My closest contact was I4ERN (GE) at only 1246km which suggests very intense E-layer ionisation. Most all the stations I heard were Italians in GB, GD and HA squares typically, plus 9H5L/P (HV) and IT9JKY (GX).

As this event was well after our deadline, a full report will be given next month. Another event happened on June 5 from about 1300 when the star turn was ZB2IQ, the Gibraltar expeditionaries. Many southern Spanish stations were on but later the reflecting region moved north, too close for the more southerly stations but very favourable for the northern Gs and GMs.

On the tropo front **Bob Nixon G1KDF** operated from Ireland as EI3VVN/P from UO and VP squares as promised and initial reports suggest he did quite well. When in VP80c (Donegal) the weather sounded pretty unpleasant when I worked him at 1731 on June 1. He said he did not work much in the southeast from UO though, but G1SWH was lucky on May 28.

Another novelty was PA3BZL operating from a gas platform (BN57h) and worked by G1KDF, G6HKM, G6WEM and many others on May 14. On May 16, there was a tropo lift to Scandinavia, particularly for the east coast stations and LA8AK was worked in DS by John Fitzgerald G8XTJ (BKS) and G6HKM providing a new square for both.

Other readers reporting on the more usual tropo QSOs were G0DJA, **Philip Everitt G1CRH** (CBE), G1DOX, **Ian Cornes G4OUT** (SFD), G8PYP, GI4OWA, GM0EWX and GM0JOL.

## The 430MHz Band

G1DOX is using an indoor antenna at present with 5W but has worked into south Wales from Bristol. G1KDF was in the contest on May 7 but in 19 hours only worked 25 stations. On the 11th he added EI9Q (Waterford). G1SWH added seven more counties include EI3VVN/A in Kildare on May 28, which must be quite a rarity.

In the tropo lift on May 16, G3IMV added LA8AK and is now up to 121 squares worked. **Howard Staddon G6STI** (LDN) worked OZ6FH (ER), LA8AK and OZ1BUR (EQ) to bring his tally to 61.

Writing in mid-May, G4DEZ complained of heavy Syledis QRM but did manage to work the usual ON, PA and a few DL stations. G6HKM operated in the contest to give some points to others on May 29 and found four new 1988 counties, CWD, CNL, LCN and PWS. LA8AK and OZ6FH were contacted on the 16th.

From the Isle of Skye, GM0HBK has a new FT-726R with the 430MHz module so hopes to get going soon using a 24-ele Parabeam antenna.

## The Microwave Bands

G0DJA operated portable from Holme Moss in the April 17 leg of the 10GHz Cumulatives. Dave worked G3ZTR/P and G8AZA/P on Garrowby Hill near Scarborough at 90km, and G3FNQ/P 57km away on Ashes Beacon.

The following weekend he attended the Microwave Round Table at Yorkshire Television's QTH in Leeds. Test gear available included a digital frequency counter to 24GHz, a spectrum analyser to 15GHz and a signal generator to 10GHz. Topics discussed included 24GHz, narrow-band modes on 10GHz and microwave beacons. About 30 amateurs were present.

On May 7 Dave operated from Burrough-on-the-Hill on 10GHz and 24GHz in the IARU Contest. G6UED/P on Barr Beacon at 72km was the only station worked on 10GHz.

For the time being, so as not to frighten the neighbours, G1DOX has only put up a single 23-ele beam on 1.3GHz. Counties so far G6VKA (GLR) and G4JKN/P (DVN) on May 7. John is not yet QRV on 2.3GHz.

G1KDF was also on in the May 7 contest on 1.3GHz and Bob completed 22 QSOs. Best DX was PE0MAR while G4HWA/P (YSN) and ZO square was new all-time. In the lift on May 16, G3IMV worked SM6HYG (HS) and OZ1KLU (EQ) to make it 37 squares on 1.3GHz.

**John Tye G4BYV** (NOR) reports on the May 16 activity. PA0EZ (CM) worked LA6LCA (FT) on 10GHz narrow-band mode. That evening John worked SM6HYG on 2.3GHz and then tried 5.7GHz without success. SM6HYG is now QRV on 24GHz narrow-band. Carl has a good QTH and has worked G3LQR on 10GHz in the past.

John received RS59 reports from G6DER (ZN) and G8CHW (ZL) on his 3.4GHz signals. Talk-back to the latter was on 1.3GHz with a dish feed standing on a shelf in the shack! Anyone wanting first class coaxial cable for up to 2.3GHz is advised to contact Brian Clowes GW4HBZ who can be reached on 074-571 2777 in the evenings. This is "Cellflex" cable made by RFS of Hanover, West Germany.

G4DEZ reports the 1.3GHz band is open regularly to PA and occasionally to DL but that more activity is needed.

G6HKM worked G1KDF on May 4 for LNH and the next day G8OPR (HPH) and ON4ABK (CL). In the contest on May 8, Ela winkled out another seven table counties with DOR and PWS being all-time new ones. On May 16, SM and OZ were heard briefly but faded before she could call.

On May 15, G6MEN operated portable from Moel Sych (YM) at NGR SJ 066318. Paul lists seven contacts on 10GHz F3E with G3UYM/P (IO82NN), G8AGN/P and G3PHO/P (IO93AD), G3ZME/P (IO82QL), G3NKL/P (IO83QW) at 127km and G3OXL/P and G4XDM/P (IO82XL). Paul used the GW1GHZ/P call of the Back Packers Microwave Group.

## Gems of the Month

This contributed by GW4FRX and heard during a Megalift via Es to Italy. UK special event station, rather irately, "The Italian station. Will you please QSY. You are on the calling frequency." Response. "No! I have been here two hours. CQ Sporadic E . . ."

And from G3FPK in same event. S9-plus from at least a dozen stations on 144.300MHz on the proverbial piece of wet string. Then, "CQ DX . . . This station. Golf, the figure one *** . . . standing by for any DX call." What do these operators use for reception? A coherer perhaps!

**QTH Locator Squares Table**

| Station | Band (MHz) 1296 | 430 | 144 | Total |
|---|---|---|---|---|
| G3IMV | 37 | 121 | 405 | 563 |
| G4KUX | — | 107 | 365 | 472 |
| G8GXP | 45 | 151 | 331 | 527 |
| G4DHF | — | — | 307 | 307 |
| G4SWX | — | — | 293 | 293 |
| I4YNO | — | — | 270 | 270 |
| G4RGK | 38 | 107 | 262 | 407 |
| GJ4ICD | 59 | 119 | 253 | 431 |
| G4XEN | — | 106 | 252 | 358 |
| G1EZF | 32 | 93 | 249 | 374 |
| G0DAZ | — | 114 | 249 | 363 |
| G4DEZ | 44 | 36 | 246 | 326 |
| G8XVJ | 18 | 88 | 236 | 342 |
| G3FPK | — | — | 227 | 227 |
| G3UVR | 75 | 125 | 224 | 424 |
| G4IGO | — | — | 223 | 223 |
| G4SFY | — | — | 222 | 222 |
| G4MEJ | — | — | 213 | 213 |
| G6XVV | 25 | 64 | 211 | 300 |
| G4SSO | — | 81 | 207 | 288 |
| G8LFB | — | — | 204 | 204 |
| G4TIF | — | 107 | 188 | 295 |
| G3COJ | 44 | 103 | 186 | 333 |
| G3XDY | 81 | 137 | 185 | 403 |
| G4MJC | — | 33 | 184 | 217 |
| GM4CXP | — | 31 | 184 | 215 |
| G6DER | 76 | 110 | 183 | 369 |
| G6HKM | 29 | 101 | 180 | 310 |
| G4XEK | — | — | 178 | 178 |
| G3JXN | 87 | 133 | 175 | 395 |
| G1EGC | — | 80 | 173 | 253 |
| GW4FRX | — | — | 173 | 173 |
| ON1CAK | — | — | 172 | 172 |
| G4DOL | — | — | 172 | 172 |
| G3NAQ | — | 80 | 160 | 240 |
| G1GEY | — | 68 | 158 | 226 |
| G1KDF | 33 | 91 | 150 | 274 |
| G6DZH | — | 87 | 149 | 236 |
| GI1JUS | — | — | 149 | 149 |
| G8HHI | 31 | 106 | 148 | 285 |

| Station | Band (MHz) 1296 | 430 | 144 | Total |
|---|---|---|---|---|
| G4MUT | 28 | 90 | 145 | 263 |
| G6MGL | 59 | 89 | 141 | 289 |
| HB9AOF | 55 | 80 | 141 | 276 |
| G8ATK | 42 | 89 | 138 | 269 |
| G8MKD | — | 49 | 137 | 186 |
| EI5FK | — | 35 | 137 | 172 |
| GJ6TMM | — | 38 | 133 | 171 |
| GM0BPY | — | 57 | 129 | 186 |
| G8ZDS | — | 43 | 129 | 172 |
| G8PNN | 62 | 97 | 128 | 287 |
| G1LSB | — | 126 | 125 | 251 |
| G6STI | 21 | 61 | 124 | 206 |
| G4TGK | — | — | 118 | 118 |
| G8XTJ | — | — | 108 | 108 |
| GW6VZW | — | 6 | 106 | 112 |
| G8LHT | 3 | 63 | 103 | 169 |
| G4AGQ | 1 | 41 | 103 | 145 |
| G4NBS | 59 | 103 | 102 | 264 |
| GW8VHI | — | 48 | 102 | 150 |
| G4CQM | — | 52 | 100 | 152 |
| G6AJE | 5 | 57 | 95 | 157 |
| G1IMM | — | 13 | 94 | 107 |
| G4FRE | 63 | 136 | 84 | 283 |
| GI4OWA | — | — | 79 | 79 |
| G1SMD | — | — | 77 | 77 |
| G4FVK | 20 | 46 | 75 | 141 |
| GM0HBK | — | — | 75 | 75 |
| G0FEH | — | 18 | 70 | 88 |
| G6MXL | 10 | 36 | 66 | 112 |
| G1CRH | — | — | 62 | 62 |
| G0HDZ | — | — | 61 | 61 |
| PA3EUS | — | 18 | 57 | 75 |
| GM0GDL | — | 17 | 56 | 73 |
| G8PYP | — | 6 | 54 | 60 |
| GU4HUY | — | — | 54 | 54 |
| G1NVB | — | — | 49 | 49 |
| G4ZTR | 29 | 29 | 37 | 95 |
| G1VTR | — | 23 | 32 | 55 |
| G2DHV | 2 | 6 | 31 | 39 |
| GM0JOL | — | — | 27 | 27 |

**Starting date 1 January 1975.** **No satellite or repeater QSOs.**

**"Band of the month" 144MHz.**

After my wafflings about early morning DX last month I have continued to get very good results at around 0700UTC, with many VKs logged. It's also worth keeping an eye open for 28MHz activity as I've logged a couple of very good openings to South America this month. One interesting special event station copied was IQ5LDV on 14MHz RTTY, the special occasion being Leonardo Da Vinci's birthday! The 14MHz activity has been good with the following being an extract from my log: VK7AE (Australia), SU1ER (Egypt), TI2J (Costa Rica), 3A2EE (Monaco), 9H4B (Malta), 4N7S (Yugoslavia).

## Mailboxes

The mailbox has become an accepted part of amateur life and is to be found on RTTY, AMTOR and Packet. I think it's about time I devoted some space to this interesting form of communication.

Despite the profusion of mailboxes, I'm sure there are many amateurs, especially newcomers, who steer clear because they don't realise what mailboxes can do for them.

First of all what is a mailbox? Most mailboxes consist of a computer with plenty of memory and a disk storage system. This computer is then connected to an amateur radio station running the appropriate mode, i.e. RTTY, AMTOR or Packet. In order to make the whole system work as a mailbox a special computer program is required and fortunately there are several programs available in the public domain. One of the benefits of using public domain, i.e. free, programs is that once you have learnt to use one mailbox you can easily find your way around most of them. Probably the best mode for standardisation is Packet, as some 29 of the present 40 UK v.h.f. mailboxes use the program by WA7MBL.

What can you use a mailbox for? The most obvious use of the mailbox is to leave messages for colleagues. Once the message has been stored, the mailbox will automatically let the recipient know that there is a message waiting next time he or she logs in to the mailbox. As well as being able to leave messages for colleagues, most mailboxes let you leave general messages for all to read. This type of message is particularly useful if you are looking for help with a problem or if you want to make a general announcement. In addition to these two basic message types there are usually a selection of files containing a range of useful information.

Where do you find mailboxes? Starting with Packet radio, they are to be found on 144.65MHz and can be accessed quite simply by "connecting" to the mailbox callsign. With the speed at which things change on the Packet scene the mailbox is the only practical way to keep up to date.

Your next question will be what's the callsign of my local mailbox? Well, here is the latest information that I have regarding UK v.h.f. Packet mailboxes. G0BSX (Plymouth), G0DQW (Shrewsbury), GM0FRI (Oban), G1APC (Swindon), G1AWD (Reading), G1BYS (Bromley), G1DIL (Wolverhampton), G1KVD (Taunton), G1HZI (Hexham), G1NNB (Witham), G1SJU (East London), G1UWS (South London), GM1VBE (Glasgow), G3LDI (Norwich), G3OUF (Potters Bar), GM3SAN (Glasgow), G3VMR (Maidenhead), G3VOM (Manchester), G3WGV (Wokingham), GI4AHP (Belfast), GM4AUP (Airdrie), G4BVE (Crewe), G4CLI (Wakefield), G4DGK (West Drayton), G4IDX (Ashford), G4JBX (Tamworth), G4KCM (Southampton), G4KLX (Wirksworth), G4LBJ (Liverpool), G4MTP (Daventry), G4PHL (Sheffield), G4SPV (Stevenage), GI4WRI (Randalstown), GU4YMV (Guernsey), G4ZBA (Norwich), G8AND (Sutton Coldfield), G8EIA (Middlesbrough), G8IMB (Bristol), GM8SNE (Dalgety Bay) and G8UFQ (Grimsby).

All these stations have applied for licences. As and when these are granted the callsign prefix, in most cases, will change to GB7, i.e. G4KCM will be GB7KCM. One other change is that the suffix, –2 is currently being added to all mailbox callsigns to indicate the band being used.

if you want to find some h.f. Packet mailboxes the best place to start is 14.105MHz as this is the most popular frequency. Personally I'm not too impressed with h.f. Packet operation as there are too many stations trying to concentrate activity on one frequency. The resultant collisions slow the data to the point of being useless. When it comes to h.f. I think you've got a job to beat AMTOR, after all it's what the commercial stations use.

If you are interested in trying some AMTOR h.f. mailboxes, the following is a list of all the active mailboxes. The format used is: callsign, selcall and operating frequencies:

9M2CR. NMCR. 14.078MHz
DF2WY. DFWY. 3.5818MHz
DJ9JC. DJJC. 3.581, 7.038, 14.075, 21.081 & 28.075MHz
DJ4KW. DJKW. 3.586, 7.030 & 14.075MHz
DK0MAV. DMAV. 3.589MHz
DK0MTV. DKTV. 3.581, 7.038, 14.075, 21.081 & 28.075MHz
DK4PR. DKPR. 3.581, 7.038, 14.075, 21.115 & 28.075MHz
DL6FZ. DLFZ. 3.581, 7.030, 14.075, 21.075 & 28.075MHz
G3PLX. GPLX. 3.588, 7.030, 10.140, 14.075, 21.075 & 28.075MHz
HB9AK. HBAK. 3.581, 7.030, 10,146 & 14.075MHz
HB9BJJ. HBJJ. 7.032, 10.140 & 14.075MHz
LA9OK. LAOK. 3.588, 7.030, 10.146 & 14.075MHz
OH1BM. OHBM. 3.584, 7.030 & 14.075MHz
PA0RYS. PRYS. 3.588, 7.030, 14.075, 21.075 & 28.075MHz
SK6SA. SKSA. 3.581 & 28.081MHz
SK7CS. SKCS. 3.582, 7.032 & 14.072MHz
ST2SA. STSA. 14.078MHz
VK2AGE. VAGE. 14.075MHz
W3GL. WWGL. 3.645, 7.035, 10.140, 14.078 & 21.075MHz

**The next three deadline dates are: July 27, August 31 & September 21**

As you can see there are quite a few to choose from! I have only listed one frequency per station per band in order to save space, but many of the stations are capable of operating on several frequencies in each band.

Finally RTTY is not forgotten as there are some RTTY mailboxes on h.f. One that I have used recently is IK6GZM. This station can be found on 14.085MHz and is best located by tuning to this frequency and waiting for IK6GZM to send a beacon (this happens quite frequently). Once you have tuned in to the beacon the station can be called by sending:

RYRYRYRYRYRY
IK6GZM DE your call

Don't forget to use 45 baud 170Hz shift. Once you have made contact just follow the instructions. The only other RTTY mailbox I know of is ZS6CDY which operates on 14.093MHz. One very novel feature of RTTY mailboxes is that they usually allow you to change the baud rate, this can be very useful if you have a good link.

Most of the current mailboxes have reached a high level of sophistication and are able to automatically forward messages to users via other mailboxes. You can even send a message from a h.f. AMTOR mailbox to a user on a v.h.f. Packet mailbox, with the forwarding carried out automatically during quiet periods!

One of the golden rules when using a mailbox for the first time is to read the help file. This file is available on most boxes and provides a breakdown of all the commands and usually gives some examples. Another point is to always choose a quiet period if you are intending to download long files.

One final and important point concerning mailboxes is that the system operators (sysops) provide the service and commit hundreds of pounds worth of equipment entirely out of their own pocket. So please treat them with respect and the occasional thank you to the operator wouldn't go amiss.

If you've any news or comments on the use of mailboxes then please drop me a line. You can even send me a message via the G3PLX mailbox if you like!

## BARTG Rally

The BARTG event is the number one rally for data mode enthusiasts and is not to be missed. This year the rally will be held on Sunday August 28 (Bank Holiday weekend) at Sandown Park Racecourse. The venue is located on the A307 Portsmouth Road near Esher and just South of Kingston-on-Thames. For those travelling from afar access is quite easy via the M25 and you will be pleased to hear that there is plenty of free parking.

In addition to the usual trade and club stands there will be a car boot sale so there should be plenty of "goodies" to be had! One point to remember is that a computer is only as good as the software it runs, so make certain there is suitable software available before buying!

With luck I should be at Sandown, but as our first baby is expected in early September I might be unavoidably detained!!

## Equipment

Several interesting items this month starting with the TOR-1 from ICS Electron-


**The ICS TOR-1**

ics. This new Teleprinter Over Radio (TOR) device has been designed primarily for the commercial market, but can also be used to run AMTOR. It operates ARQ, FEC and SELFEC and is apparently very user friendly. To complete the installation the TOR-1 requires an ASCII terminal with an RS-232 interface and a suitable transceiver. The price is £499.95 which is actually very reasonable for a commercial TOR system. The second item from ICS is a new low cost Packet radio TNC (Terminal Node Controller). Manufactured by AEA the PK-88 is one of the new breed of budget priced TNCs and sells at £109.95 inc. VAT. The PK-88 is developed from the PK-87 and features a v.h.f. modem, personal mailbox facility, 32K RAM and RS-232 or t.t.l. interface levels. The size has also been reduced to 35mm x 150mm x 190mm, it seems that each new development brings more features in a smaller space which must be good news.

Thanks to Siskin Electronics, I have managed to get my hands on a PAC-COMM TINY 2 Packet radio TNC. The TINY 2 is another of those miniature TNCs that have been selling like the proverbial hot cakes. I should hopefully be able to give you my impressions during the next few months.

# Amateur Satellites

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

## *Phase III-c*

The non-serialised inserted ARIANE-2 V-23 lift off carrying INTELSAT-5 was a total success, achieved at 2358UTC on May 17 from the French Guiana ELA-1 launch pad. Apart from the short delay imposed by a 15 minute hold up in the countdown to allow a threatening local thunderstorm to pass, it having been predetected by the newly installed ONERA radio interferometry system, all went according to plan with the launch resulting exactly one minute before the close of the window. INTELSAT-5 was first placed into an accurate 463km perigee highly elliptical transfer orbit, and then into the final precise geostationary orbit by its own F-13 apogee kick-motor. INTELSAT-5 F-13 is a 1.980kg telecommunications system operating in the "K" and "C';' bands, and is a back up to one launched in December 1981, which is now rapidly running out of propellant to fuel the motor which maintains the GEOSAT on station.

At the time of writing this column on June 1, all is now ready for the launch of Phase III-c on the new ARIANE-IV V-22 mission. The vehicle has been moved on its mobile launch table from the ELA-2 vertical assembly building to the launch zone, and all is aboard. Since our last column, a small postponement took effect, initially putting the launch to June 8 around mid-day. Following this, a few minor problems were exhibited by the 1st stage turbo-pump of ARIANE-IV, and at first it was thought that a delay, of some nine days would be needed for a refit. Inspection showed that the problem was minor, taking only two days of delay, and the launch was then set for June 10 with windows from 1112 to 1203, and from 1325 to 1444UTC.

If, as confidentally expected at this time, the lift off took place at 1112 on June 10, the following Keplerian element set should give you the parameters of the intended orbit, with only a small adjustment of the decimal epoch day required to correct if the launch was delayed, or a few fine tweaks to the figures when the precise values are known by actual NORAD/NASA measurement.

| | |
|---|---|
| Epoch Year | 88 |
| Epoch Day | 162.52220 |
| Inclination | 9.996 |
| R.A.A.N. | 238.50 |
| Eccentricity | 0.73099023 |
| Arg. of Per. | 178.155 |
| Mean Anomaly | 36.510014 |
| Mean Motion | 2.259879 |
| Decay Rate | 0.00 |
| Orbit/Rev | 0 |
| S.M.A. | 24528.91km |

The satellite may still be in this initial parking orbit by the time you read this column, awaiting spin-up and the precise values required in order to ascertain the exact thrust angle and burn time(s) needed to nudge the spacecraft into the optimum position with the minimal kick-motor fuel consumption. On the other hand, it may well be in an intermediate orbit, which cannot at this time be exactly forecast. The planned and expected intermediate orbit is given by the following set of Keplerian elements, which are a synthetic set only, and should only be used until a precise set is given by measurements, and announced on and in the AMSAT media.

| | |
|---|---|
| Epoch Year | 88 |
| Epoch Day | 183.0 |
| Inclination | 57.0 |
| R.A.A.N. | 0 |
| Eccentricity | 0.685 |
| Arg. of Per. | 178.0 |
| Mean Anomaly | 0 |
| Mean Motion | 2.19351693 |
| Decay Rate | $6.0^{-8}$ |
| Orbit/Rev | 48 |

If these are put into your computer or calculator at this time, even if the satellite is still in a lower perigee orbit, it will give you an excellent idea of the appearance, duration, and DX capability of the close to nominal orbit and a good familiarity with its possibilities, which we have not experienced before. If you do not have a computer, then look at Figs. 1 to 8, print-outs from the SV1KC "sopp4" program for OSCAR-10 adapted for OSCAR-13 with the previous intermediate elements inserted, run from Saturday July 16 for 24 hours of tracking. At Friday midnight, by Fig. 1, the satellite is descending to perigee, as shown by the arrow in the column under M, and is at azimuth (AZ) 48 degrees, and elevation 9 degrees. It is in mutual range of those cities marked by the asterisk, thus providing QSOs (if operational) with Europe, Asia, Australia and Alaska. Only 15 minutes later at 0015UTC, shown by Fig. 2, in comes San Francisco, W6, whilst we lose Perth in VK6, and then the satellite goes sub-horizon to the UK until it re-arises.


**Fig. 1**

At 0345UTC, as shown by Fig. 3, we now have mutual visibility with Rio and Capetown, e.g. two new continents, South America and South Africa, and Antarctica too for good measure. This means within the last few minutes of the sinking the first few of the rising satellites we might have literally worked all continents.

At 0430 on Fig. 4 in comes New York, which we keep with Rio and Capetown until 0715, when, as shown by Fig. 5 we are joined by San Franciso. Finally, on Fig. 6, we lose the satellite soon after 1145, to have it return again befroe 2345UTC. Shown pictorially in Fig. 7, is the situation on a mercators map as seen at 0700UTC, with all the non-shaded areas in the footprint.

Remember that with the final orbit, with an inclination and apogee this high, we shall not only see the apogee over our hemisphere, but that occurring on the opposite side of the earth also, and thus have the satellite DX capability virtually world-wide (with the singular exception of the immediate antipodeal area) on a daily basis.

It is expected that Mode "L" activity will be very high, as the ease of getting into the satellite with only a maximum of 10 watts to a 17dB gain antenna required for the 1269MHz uplink will bring this mode to many operators using modest equipment.

**STOP PRESS!**

**OSCAR-13 was launched just 6 minutes late at 11 hours 19 minutes and 4.33 seconds UTC on Wednesday June 15—More next month!**

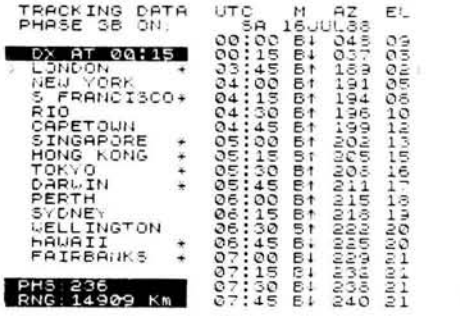


Fig. 2


Fig. 3


Fig. 4


Fig. 5


Fig. 6


Fig. 7

However, as previously mentioned, we cannot expect immediate communications via the OSCAR-13 transponders, as it could take up to six weeks to finally position and test out the satellite systems. Other than unspecified test periods, the beacons only will be on until the new spacecraft is open for general amateur radio communications, which will be announced.

## RS-1

Whilst this satellite has been heard once more by many over the past month, a (hopefully) unusual catastrophe has met the rocket which placed it and its accompanying companion RS-2 into space. The launch vehicle exploded violently as it was southbound near India just after 1200UTC on May 9. It scattered high velocity fragments over a rapidly enlarging area, of which at least 12 have been located and tracked by NASA so far. This is the first time that a rocket has exploded in this high orbit, although lower period satellite carriers have done so. It is also rather unusual for a rocket to explode on its own volition after so many years in space when all the fuel might be thought to be evaporated during the nine and a half years that this vehicle has been in orbit, leading to the theory that it might well have been hit by a high speed impact of a fragment from a previously exploded rocket. As there are some 7600 tracked objects now in earth orbit, and a lot more non-tracked, the "billiard ball" effect of this serial possibility is quite serious.

The computer simulation shown by Figs. 8 and 9 gives a visual portrayal of the orbiting objects around our near earth space, consisting of existing fragmented debris, third stages, fairings, nose cones, camera lens covers, jettisoned refuse from manned orbiters, etc., plus, of course, the satellites themselves, both decayed and operational. They average a velocity of some 28000+km per hour and many are relatively contra-rotating, giving a possible impact velocity of some 57000+km per hour, or 16km per second. Many of these objects have considerable mass to boot. The exponential effect of each impact potentially creates others, which in turn

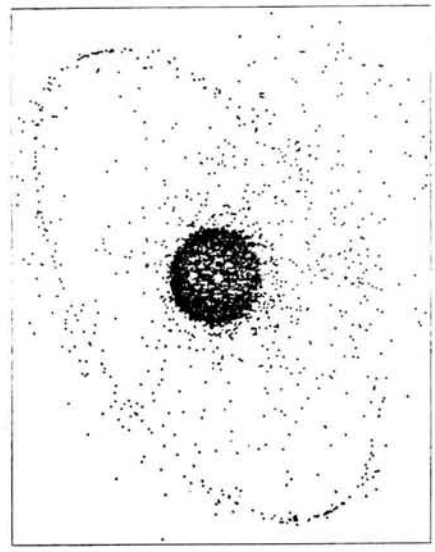

Fig. 8

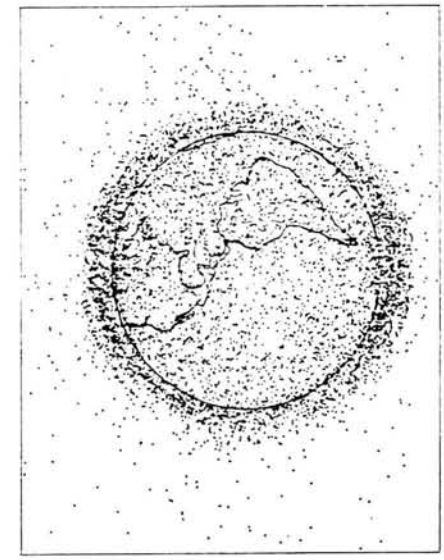

Fig. 9

create even more, until finally we all give up satellite communications in order to take up meteor scatter.

One of the basic causes of explosions in space is the corrosion of the tanks holding non-spent fuel. When the oxidiser (which promotes the corrosion) eventually meets the fuel, spontaneous ignition and detonation can result. (NB: This is NOT the big-bang theory!) When the long term effect began to look serious some five years ago, action was taken to expect all space nations to vent excess fuel from their vehicles so as to prevent the problem. It was the third stage of the ARIANE launcher, you may recall, which collided with OSCAR-10 when it was jetting off spare fuel for this very reason. Unfortunately, it would now appear that stages that went up long before the discovery and the resultant agreement can still pose a threat, and potentially jeopardise all satellites, manned missions, etc.

## Satellite Round-up

RS-11 is still the transponder activated, with Mode "KA" (21MHz plus 145MHz to 29MHz) on during the week, and 145MHz to 29MHz (Mode "K") on only at weekends. Mode "T" (21MHz to 29 plus 145MHz will return if the associate COSMOS 150MHz transmitter is activated, as it blocks the 145MHz RX uplink receiver. Sub-horizon access, brought about by intense "E" layer ionisation and Sporadic E, has been much in evidence, with access possible often 12–14 minutes before AOS and after LOS.

A number of users have asked for the operating schedule for RS-10/11. At this time, a long range transponder employment is not given, but the expected restrictions on operating are only that low power (not greater than 10W e.i.r.p.) should be used on Mondays Moscow time, e.g. 2100 Sundays to 2100UTC Mondays, and that Wednesdays (2100 Tuesdays to 2100 Wednesdays) is for use only for special pre-co-ordinated scientific experiments, education, or other special purpose other than run-of-the-mill QSOs.

OSCAR-10 is in excellent working order, and shows every reason for continuing to perform well on the proviso that users keep to low power within the strict transponder use schedule. It was sad to listen to two loud stations operating through the

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## Yaesu

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|---|---|---|---|
| FT767 | HF Transceiver | 1550.00 | (—) |
| FEX767(2) | 2m Module (767) | 169.00 | (3.00) |
| FEX767(70) | 70cm Module (767) | 215.00 | (3.00) |
| FEX767(6) | 6m Module (767) | 169.00 | (3.00) |
| SP767 | Speaker | 69.95 | (2.50) |
| FT290 | Mkll New Super 290 | 429.00 | (—) |
| FT690 | Mkll 6m M/Mode 2.5W | 399.00 | (2.00) |
| MMB11 | Mobile Bracket | SPECIAL PRICE | (2.00) |
| NC11C | Charger | 10.50 | (2.00) |
| CSC1A | Carrying Case | 6.50 | (2.00) |
| YHA15 | 2m Helical | 7.50 | (2.00) |
| YHA44D | 70cm 1/2wave | 12.50 | (2.00) |
| YM49 | Speaker Mike | 23.00 | (2.00) |
| MMB15 | Mobile Bracket | 14.55 | (2.00) |
| FT23R | 2m Mini H/H | 223.50 | (3.00) |
| FT73R | 70cm Mini H/H | 243.50 | (3.00) |
| FNB9 | Nicad Battery Pack (23/73) | 27.60 | (2.00) |
| FNB10 | Nicad Battery Pack (23/73) | 32.60 | (2.00) |
| FNB11 | Nicad Battery Pack (23/73) | 50.60 | (2.00) |
| NC18C | Charger (23/73) | 12.35 | (2.00) |
| SMC28 | Charger (23/73) 13A Plug | 15.40 | (2.00) |
| NC28 | Charger (23/73) | 17.71 | (2.00) |
| NC29 | Base Charger (23/73) | 57.50 | (3.00) |
| PA6 | Car Adap/Charger (23/73) | 18.40 | (2.00) |
| MH12A2B | Speaker Mic | 29.75 | (2.00) |
| MH18A2B | Speaker Mic Miniature (23/73/727) | 27.00 | (2.00) |
| FT727R | 2m/70cm H/H | 425.00 | (3.00) |
| FNB3 | Spare Battery Pack | 41.00 | (2.00) |
| FNB4 | Spare Battery Pack | 46.00 | (2.00) |
| FNB5 | Empty Cell Case | 10.00 | (2.00) |
| FRG9600M | 60-950MHz Scanning RX | 509.00 | (—) |
| PA4C | Power Supply for 9600 | 21.00 | (2.00) |
| MMB10 | Mobile Bracket | 10.00 | (2.00) |
| NC9C | Charger | 11.50 | (2.00) |
| PA3 | Car Adaptor/Charger | 21.85 | (2.00) |
| YM24A | Speaker Mike | 21.05 | (2.00) |
| FRG8800 | HF Receiver | 639.00 | (—) |
| FRV8800 | Converter 118-175 for above | 100.00 | (2.50) |
| FRT7700 | RX ATU | 59.00 | (2.50) |
| MH1B8 | Hand 600 8pin mic | 21.00 | (2.00) |
| MD1B8 | Desk 600 8pin mic | 79.00 | (2.00) |
| MF1A3B | Boom mobile mic | 25.00 | (2.00) |
| YH77 | Lightweight phones | 19.99 | (2.00) |
| YH55 | Padded phones | 19.99 | (2.00) |
| YH1 | Lweight Mobile H/set-Boom mic | 19.99 | (2.00) |
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| SB2 | PTT Switch Box 290/790 | 22.00 | (2.00) |
| SB10 | PTT Switch Box 270/2700 | 22.00 | (2.00) |
| FT736 **NEW** | 2/70cm 25W Base Stn. | 1,450.00 | (—) |
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| FT231R | 23cm FM Transceiver | 475.50 | (—) |
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| FT212RH | New 2m 45W FM Mobile | 349.00 | (—) |

### *Datong Products*

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|---|---|---|---|
| PC1 | Gen. Cov. Con. | 137.40 | (2.50) |
| VLF | Very low frequency conv. | 34.90 | (2.50) |
| FL2 | Multi-mode audio filter | 89.70 | (2.50) |
| FL3 | Audio filter for receivers | 129.00 | (2.50) |
| ASP/B | r.f. speech clipper for Trio | 82.80 | (2.50) |
| ASP/A | r.f. speech clipper for Yaesu | 82.80 | (2.50) |
| ASP | As above with 8 pin conn | 89.70 | (2.50) |
| D75 | Manual RF speech clipper | 56.35 | (2.50) |
| D70 | Morse Tutor | 56.35 | (2.50) |
| RFA | RF switched pre-amp | 36.00 | (2.50) |
| AD270-MPU | Active dipole with mains p.s.u. | 51.75 | (2.50) |
| AD370-MPU | Active dipole with mains p.s.u. | 69.00 | (2.50) |
| DC144/28 | 2m converter | 39.67 | (2.50) |
| ANF | Automatic notch filter | 67.85 | (2.50) |
| SRB2 | Auto Woodpecker blanker | 86.25 | (2.50) |
| RFA | RF switched pre-amp | 36.00 | (2.50) |

## ICOM

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|---|---|---|---|
| IC761 | New Super HF Transceiver | P.O.A. | (—) |
| IC751A | HF Transceiver | 1465.00 | (—) |
| IC735 | New HF Transceiver | 945.00 | (—) |
| AT100 | 100W ATU (751/745) | 365.00 | (3.50) |
| AT150 | 150W ATA (735) | 315.00 | (3.50) |
| PS55 | Ext PSU (735) | 185.00 | (3.00) |
| IC505 | 50MHz multi-mode portable | 499.00 | (—) |
| IC290D | 2m 25W M/Mode | 542.00 | (—) |
| IC28E | 25W FM | 359.00 | (—) |
| IC28H | 2m 45W FM | 399.00 | (3.00) |
| IC Micro | 2E New Mini H/H | 239.00 | (3.00) |
| IC2E | 2m The Original H/H | 225.00 | (3.00) |
| IC02E | 2m H/H | 269.00 | (3.00) |
| IC275E | New 2m 25W Base Stn | 1039.00 | (—) |
| IC4E | 70cm H/H | 285.00 | (3.00) |
| IC04E | 70cm H/H | 299.00 | (3.00) |
| IC48E | 70cm 25W FM Mobile | 449.00 | (3.00) |
| IC490 | 70cm 10W M/Mode | 617.00 | (—) |
| IC3200 | 2m/70 Dual Band FM Mobile | 556.00 | (—) |
| IC12E | 23cm H/H | 428.00 | (3.00) |
| IC R71 | Gen Cov RX | 825.00 | (—) |
| IC7000 | VHF/UHF Scanner | 957.00 | (—) |
| AH7000 | 25-1300MHz Discone | 82.00 | (3.00) |
| SP3 | Ext Speaker | 61.00 | (2.50) |
| CK70 | DC Cable (R70/R71) | 7.00 | (2.50) |
| EX257 | FM Board (R70/R71) | 41.00 | (2.00) |
| GC5 | World Clock | 43.00 | (2.50) |
| AQ2 | Waterproof Bag all Icom H/H | 14.38 | (2.00) |
| BC35 | Desk Charger | 70.15 | (2.50) |
| BP3 | Battery Pack 8.4V (2/4E/02/04E) | 29.90 | (2.00) |
| BP4 | Empty Battery Case (2/4E/02/04E) | 9.20 | (2.00) |
| BP5 | Battery Pack 10.8V | 60.95 | (2.50) |
| BP7 | Battery Pack 13.2V (02/04E only) | 74.75 | (2.50) |
| BP8 | Battery Pack 8.4V | 71.30 | (2.50) |
| CP1 | 12V Charge Lead BP3/7/8 | 6.90 | (2.00) |
| DC1 | DC/DC converter operate from 12V | 17.25 | (2.00) |
| FA2 | 2m Helical BNC | 9.20 | (2.00) |
| FA3 | 70cm Flexible 1/4 wave Antenna (BNC) | 9.20 | (2.00) |
| HM9 | Speaker/Mic | 21.85 | (2.50) |
| HS10 | Head set Boom Mike | 20.70 | (2.00) |
| HS10SA | Vox Unit HS10 (02/04E only) | 25.30 | (2.00) |
| HS10SB | PTT SW Box HS10 | 20.70 | (2.00) |
| LC1 | Leatherette Case 2E/4E + BP5 | 6.90 | (2.00) |
| LC3 | Leatherette Case 2E/4E + BP3 | 6.90 | (2.00) |
| LC11 | Leatherette Case 02E/04E + BP3 | 9.20 | (2.00) |
| LC14 | Leatherette Case 02E/04E + BP5/7/8 | 9.20 | (2.00) |
| SS1 | Shoulder Strap | 10.35 | (2.00) |
| SM6 | 600ohm 8P Base Mic | 46.00 | (2.50) |
| SM8 | 1.3kμ/600μ 8P Base Mic | 82.00 | (2.50) |
| SM10 | Comp/Graphic Mike | 116.00 | (3.00) |

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| Iambic Deluxe | | 78.09 | (3.00) |
| Vibrokeyer Standard | | 63.98 | (3.00) |
| Vibrokeyer Deluxe | | 78.09 | (3.00) |
| The Original Standard | | 73.54 | (3.00) |
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| BY2 | Squeeze Key, Chrome base | 76.97 | (3.00) |
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| Kenpro | Electronic Keyer Unit (No Paddle) | 54.70 | (3.00) |
| Kenpro | Electronic Memory Keyer (No Paddle) | 95.00 | (3.00) |

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| SP940 | Ext Speaker | 87.55 | (3.00) |
| TS930S | 9 Band TX General Cov RX | 1695.00 | (—) |
| AT930 | Auto/ATU | 206.03 | (3.00) |
| SP930 | Ext Speaker | 86.23 | (3.00) |
| TS440 | 9 Band TX General Cov RX | 1138.81 | (—) |
| AT440 | Auto/ATU | 144.82 | (3.00) |
| PS50 | H/Duty PSU | 222.49 | (3.00) |
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| SP230 | External Speaker Unit | 66.49 | (3.00) |
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| SP430 | Matching Speaker | 40.81 | (3.00) |
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| TH205 | 2M H/H | 215.26 | (3.00) |
| TH215 | 2M H/H Keyboard | 252.13 | (3.00) |
| TR751 | 2M 25W M/M Mobile | 599.00 | (—) |
| TS711 | 2M 25W Base Stn **(New Low Price)** | 898.00 | (—) |
| TS811 | 70cm 25W Base Stn **(New Low Price)** | 998.00 | (—) |
| R2000 | Gen Coverage HF/RX | 599.00 | (—) |
| VC10 | 118-174MHz Converter (R2000) | 161.94 | (2.50) |
| R5000 | General Coverage HF/RX | 875.00 | (—) |
| VC20 | 118-174MHz Converter (R5000) | 167.21 | (2.50) |
| BT2 | Empty Battery Case TH21/41 | 11.86 | (2.00) |
| DC21 | DC Power Supply TH21/41 | 25.00 | (2.00) |
| EB2 | Ext. Battery Case TH21/41 | 6.77 | (2.00) |
| HMC1 | Headset with Vox TH21/41 | 32.91 | (2.00) |
| PB21 | Nicad Pack TH21/41 | 24.36 | (2.00) |
| BC6 | Desk Charger TH21/41 | 99.00 | (2.50) |
| SC8 | Soft Case TH21/41 | 11.86 | (2.00) |
| SMC30 | Speaker/Mic TH21/4/2600 | 28.31 | (2.00) |
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| MC60A | 8P Desk Mic | 88.22 | (3.00) |
| MC80 | Electric Desk Mic | 53.98 | (3.00) |
| MC85 | Desk Mic Audio Level Comp | 99.00 | (3.00) |
| MC43 | 8P Fist Mic | 22.22 | (2.00) |
| MC35 | 4P Fist Mic | 21.72 | (2.00) |
| MC55 | Mobile Mic (6p.o. 8p) | 52.67 | (3.00) |
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| SP425 | 140-525MHz PWR/SWR/PEP | 119.95 | (3.00) |
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| SMCS 2N | 2 way 'n' Skts Switch | 23.50 | (2.50) |
| Kenpro KP21N | 2 way Switch 'n' Socket Deluxe | 27.00 | (2.50) |
| T30 | 30W Dummy Load | 10.29 | (2.50) |
| T100 | 100W Dummy load | 45.00 | (3.00) |
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| DAF70 | 1.75 | ECC88 | 1.10 | EH90 | 0.85 | GZ33 | 4.20 | PL519 | 5.85 | UM80 | 1.80 |
| DAF96 | 0.90 | ECC189 | 1.20 | EL32 | 0.85 | GZ34 | 2.45 | PL802SE | 3.45 | UM80* | 2.30 |
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| DF96 | 1.15 | ECF82 | 1.15 | EL82 | 0.70 | PY88 | 3.95 | PY83 | 0.75 | UY85 | 0.85 |
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| DY86/87 | 0.65 | ECH81 | 1.25 | EL90 | 1.75 | ML4 | 3.20 | QQV03-10 | 5.95 | X61M | 1.70 |
| DY802 | 0.70 | ECL80 | 0.65 | EL91 | 6.50 | ML6 | 3.20 | QQV03-10* | 7.50 | X66 | 4.95 |
| E92CC | 2.80 | ECL82 | 0.75 | EL95 | 1.80 | MX120/01 | 29.50 | QQV03-20A | 27.50 | Z749 | 0.75 |
| E180CC | 11.50 | ECL85 | 0.75 | EL504 | 2.70 | N78 | 9.90 | QQV06-40A | 28.50 | Z759 | 19.90 |
| E1148 | 0.75 | ECL86 | 1.10 | EL509 | 5.85 | OB2 | 1.80 | QQV06-40A* | 54.10 | Z800U | 3.45 |
| EA76 | 1.60 | EF9 | 3.50 | EL519 | 7.70 | OD3/12 | 5.75 | QV03/12 | 5.75 | Z801U | 3.75 |
| EB34 | 1.15 | EF22 | 3.90 | EL821 | 8.05 | PCL82 | 0.95 | SP61 | 2.50 | Z803U | 21.15 |
| EB91 | 0.60 | EF37A | 2.15 | EL822 | 9.95 | PCL84 | 0.85 | T121 | 45.00 | Z900T | 4.30 |
| EBC33 | 2.20 | EF80 | 0.65 | ELL80SE | 4.50 | PCL86 | 0.80 | TT22 | 45.00 | 1A3 | 3.80 |
| EBC90 | 0.90 | EF83 | 3.90 | EM80 | 1.35 | PCL805/85 | 0.95 | UABC80 | 0.75 | 1L4 | 0.65 |
| EBC91 | 0.90 | EF85 | 0.90 | EM87 | 3.00 | PD500/510 | 4.30 | UBF80 | 0.70 | 1R5 | 1.00 |
| EBF80 | 0.95 | EF86 | 1.45 | EY51 | 0.90 | PFL200 | 1.10 | UBF89 | 0.70 | 1S4 | 1.00 |

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satellite for a week before use was permitted, but, despite the low battery and switching probability so caused, the transponder did not appear to be permanently further damaged.

FO-12 continues, when on, to function well. **Heinz Hildebrand DL1CF,** reports that on Mode "JD" he has now exchanged some 300 different files with many stations. "I estimate that there are some 50 to 60 different digital mode operators now on from Japan, and some 25 different stations in Europe", he states. "As for DX, I have had QSO's with stations in VK2, 3, 4, 6 and 8, and in ZL too." On Mode "JA", **Dave Rowan G4CUO,** reports that the use is still very low, with the upper half of the downlink passband often devoid of all signals.

OSCAR-9 and 11 continue to perform well, and the use of the DIGITALKER for the Polar Bridge communications of position worked well, with over 3000 schools around our earth taking part in the tracking. A few copy problems are evident now, as Sporadic-E often attenuates, Faraday rotates and almost extinguishes the downlink signal at times during daylight passes.

The USSR PHOBOS Martian moon explorer is due for launch between 7 and 12 July. At this time frequencies are unknown.

**The next three deadline dates are: July 27, August 31 & September 21**

The "BURAN" (UA for "Snowstorm") space shuttle, earlier thought to first orbit in May, seems now to be an unmanned flight due in July, placed in orbit by the massive ENERGIA re-useable launch vehicle from Baikonur.

## Keplerian Elements

Again this month they have been furnished by **Birger Lindholm** of Dalsbruck, Finland, after his collating and checking. Birger points out that the Nodal Period and Increment given have been calculated as that of the Epoch Day stated. "METEOR 1-30 is back on 136.995MHz" he tells us "and COSMOS 1602 is active once again."

| Satellite Name | OSCAR 9 | OSCAR 10 | OSCAR 11 | FO12 | MIR | RS5 | RS7 | RS10/11 |
|---|---|---|---|---|---|---|---|---|
| Bulletin No. | 207 | 337 | 311 | 91 | 193 | 498 | 383 | 372 |
| Internat Design | 81-100B | 83-058B | 84-021B | 86-61B | 86-017A | 81-120C | 81-120E | 87-054A |
| Object Number | 12888 | 14129 | 14781 | 16909 | 16609 | 12999 | 13001 | 18129 |
| Epoch Year | 1988 | 1988 | 1988 | 1988 | 1988 | 1988 | 1988 | 1988 |
| Epoch Day | 130.24273983 | 115.94105397 | 122.10823373 | 104.26260007 | 130.80902547 | 129.30830428 | 121.29895428 | 129.99211414 |
| Inclination | 97.6186 | 27.3714 | 98.0570 | 50.0148 | 51.6199 | 82.9502 | 82.9531 | 82.9265 |
| RAAN | 162.0021 | 327.0087 | 186.0015 | 179.8548 | 264.5680 | 91.1267 | 86.4524 | 176.6970 |
| Eccentricity | 0.0003330 | 0.6026648 | 0.0012957 | 0.0011415 | 0.0021967 | 0.0009609 | 0.0023024 | 0.0013921 |
| Arg of Perigee | 134.6173 | 299.0558 | 170.9199 | 332.1841 | 309.1932 | 51.3929 | 354.9896 | 89.8437 |
| Mean Anomaly | 225.5441 | 13.8883 | 189.2231 | 27.8318 | 50.5357 | 308.7982 | 5.0932 | 269.8430 |
| Mean Motion | 15.32714689 | 2.05875480 | 14.62291026 | 12.44394839 | 15.75046158 | 12.05066609 | 12.08705652 | 13.71931792 |
| Decay Rate | $8.694e^{-05}$ | $7.8e^{-07}$ | $4.20e^{-06}$ | $-2.5e^{-7}$ | $4.3239e^{-04}$ | $1.2e^{-07}$ | $1.3e^{-07}$ | $1.2525e^{-03}$?? |
| Orbit No. | 36677 | 3660 | 22230 | 7587 | 12778 | 28111 | 28099 | 4397 |
| Nodal Period | 94.011321 | 699.2059 | 98.534368 | 115.653162 | 91.363946 | 119.551958 | 119.192254 | 105.023441 |
| Long Increm | 23.499932 | 175.3565 | 24.634266 | 29.239330 | 23.230111 | 30.014998 | 29.924990 | 26.381602 |
| Beacon Frequency | 21.002MHz<br>145.825MHz<br>435.025MHz<br>2.401GHz | 145.810MHz<br>145.987MHz | 145.826MHz<br>435.025MHz<br>2.4015GHz | 435.797MHz<br>435.913MHz | 143.625=voice<br>166.125=data<br>(a.m.) | 29.330MHz<br>29.452MHz | 29.340MHz<br>29.501MHz | 29.357MHz<br>29.403MHz<br>145.857MHz<br>145.903MHz<br>29.407MHz<br>29.453MHz<br>145.907MHz<br>145.953MHz |
| Ref EQX | 14 May 1988 | 11 May 1988 | 14 May 1988 | 11 May 1988 | 12 May 1988 | 14 May 1988 | 13 May 1988 | 13 May 1988 |
| Orbit No. | 36750 | 3694 | 22419 | 7933 | 12813 | 28180 | 28253 | 4452 |
| Time (HHMM.MM) | 0012.19 | 1053.73 | 0058.81 | 0114.20 | 0042.59 | 0053.04 | 0106.07 | 0002.86 |
| Long W | 68.10 | 68.47 | 48.08 | 153.18 | 347.52 | 157.24 | 168.06 | 57.95 |

| Satellite Name | NOAA9 | NOAA10 | METEOR 1-30 | METEOR 2-14 | METEOR 2-15 | METEOR 2-16 | METEOR 2-17 | COSMOS 1602 |
|---|---|---|---|---|---|---|---|---|
| Bulletin No. | 257 | 142 | 532 | 233 | 165 | 104 | 31 | 875 |
| Internat Design | 84-123A | 86-073A | 80-051A | 86-039A | 87-001A | 87-068A | 88-005A | 84-105A |
| Object Number | 15427 | 16969 | 11848 | 16735 | 17290 | 18312 | 18820 | 15331 |
| Epoch Year | 1988 | 1988 | 1988 | 1988 | 1988 | 1988 | 1988 | 1988 |
| Epoch Day | 123.77948212 | 118.52149707 | 129.77613240 | 128.67569917 | 129.05430136 | 129.09388196 | 128.76577311 | 122.09212771 |
| Inclination | 99.0972 | 98.6805 | 97.7089 | 82.5398 | 82.4637 | 82.5572 | 82.5408 | 82.5414 |
| RAAN | 97.9177 | 150.0494 | 219.3314 | 208.7427 | 118.6987 | 180.4624 | 242.6660 | 358.1303 |
| Eccentricity | 0.0016382 | 0.0014489 | 0.0041716 | 0.0016284 | 0.0012730 | 0.0010790 | 0.0016502 | 0.0025133 |
| Arg of Perigee | 28.2866 | 19.8210 | 148.3947 | 70.6709 | 323.5521 | 250.8427 | 332.4239 | 348.5683 |
| Mean Anomaly | 331.9191 | 340.3528 | 211.9795 | 289.6215 | 36.4775 | 109.1572 | 27.6044 | 11.4952 |
| Mean Motion | 14.11581242 | 14.22566485 | 14.99224806 | 13.83781302 | 13.83588064 | 13.83345258 | 13.84023452 | 14.73834705 |
| Decay Rate | $1.4e^{-06}$ | $1.82e^{-06}$ | $3.39e^{-05}$ | $8.4e^{-07}$ | $5.5e^{-07}$ | $1.8e^{-07}$ | $6.3e^{-07}$ | $4.63e^{-06}$ |
| Orbit No. | 17454 | 8357 | 43102 | 9837 | 6759 | 3650 | 1360 | 19349 |
| Nodal Period | 102.069604 | 101.275710 | 96.109432 | 104.121266 | 104.135687 | 104.154086 | 104.103064 | 97.764134 |
| Long Increm | 25.515405 | 25.318935 | 24.027076 | 26.159055 | 26.163242 | 26.167125 | 26.154498 | 24.570448 |
| Beacon Frequency | 137.620=APT<br>137.770=DSB | 137.500=APT<br>136.770=DSB | 136.995 | 137.850MHz | 137.850=APT | 137.400=APT | 137.300=APT | 137.330=APT |
| Ref EQX | 11 May 1988 | 11 May 1988 | 14 May 1988 | 11 May 1988 | 11 May 1988 | 11 May 1988 | 11 May 1988 | 11 May 1988 |
| Orbit No. | 17570 | 8549 | 43181 | 9883 | 6800 | 3691 | 1405 | 19540 |
| Time (HHMM.MM) | 0002.50 | 0037.18 | 0110.22 | 0002.58 | 0027.75 | 0125.51 | 0027.35 | 0125.50 |
| Long W | 123.37 | 74.97 | 25.01 | 23.54 | 119.63 | 72.32 | 355.77 | 267.19 |

# Propagation

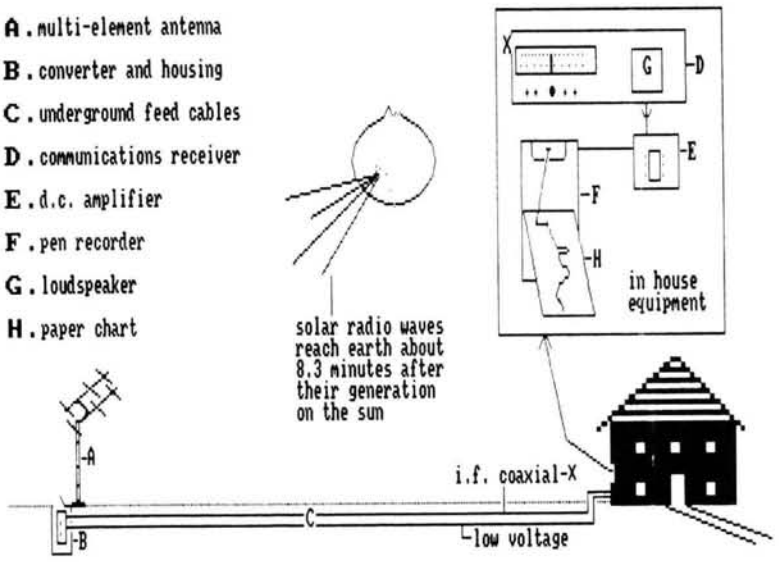
*Reports to Ron Ham*
*Faraday, Greyfriars, Storrington, West Sussex R20 4HE.*

Last month I described the special antenna I built for solar observation and its installation. Although this site is over 30m away from my house, the advantages that it offered far outweighed my horror of lengthy feeder cables between the antenna and receiver.

## The Receiver

Briefly, the receiver used in this radio telescope was a "spreadout" superheterodyne with an added means of recording the incoming signal on a paper chart, Fig. 1. Basically, a superheterodyne receiver can be divided into 3 sections, 1: the r.f. amplifier, local oscillator and mixer, 2: the intermediate frequency amplifier and detector and 3: the audio output stage.

I installed section 1, a crystal controlled converter, in a waterproof container near the antenna, thus allowing for a short coaxial feeder at the observational frequency of 136MHz, Fig. 1. My first converter, inside container "B", was home-brewed using an r.f. stage to amplify the incoming signal at 136MHz, a crystal oscillator chain giving an output of 110MHz and a mixer which produced an intermediate frequency of 26MHz (136 – 110 = 26MHz). This conversion enabled any solar noise, at 136MHz, to reach the rest of the receiver in the house via a coaxial cable at 26MHz. Some u.h.f. television antenna cable proved to be an ideal feeder because it offered very low loss at 26MHz and by laying it underground, "C", it was out of sight and the covering earth provided extra screening to reduce the possibility of unwanted signals appearing at 26MHz. For added protection, this cable was placed inside a hose-pipe and a twin plastics




**Solar Radio Telescope** **Fig. 1**

**Fig. 2**

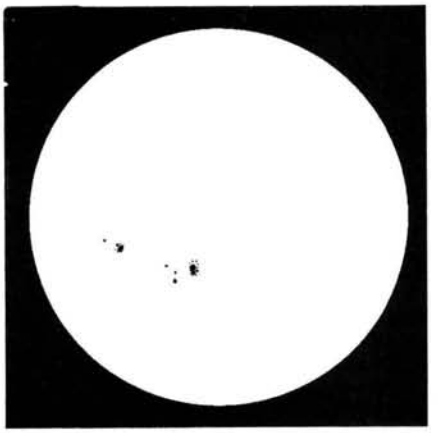


**Fig. 3**

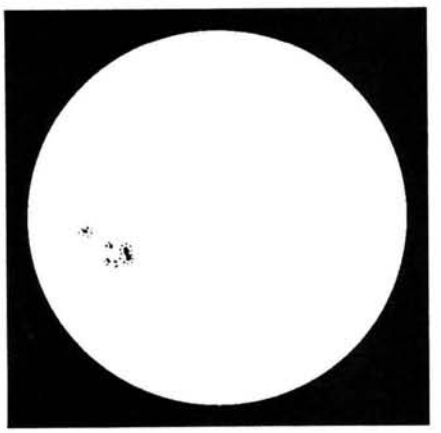


**Fig. 4**

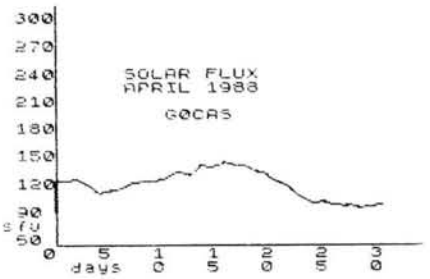



**Fig. 5 ▼**

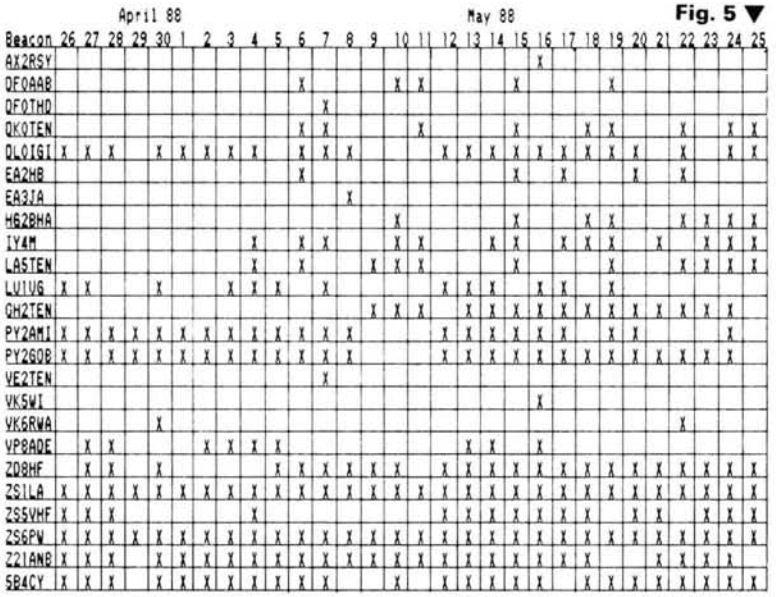



**Fig. 6 ▼**

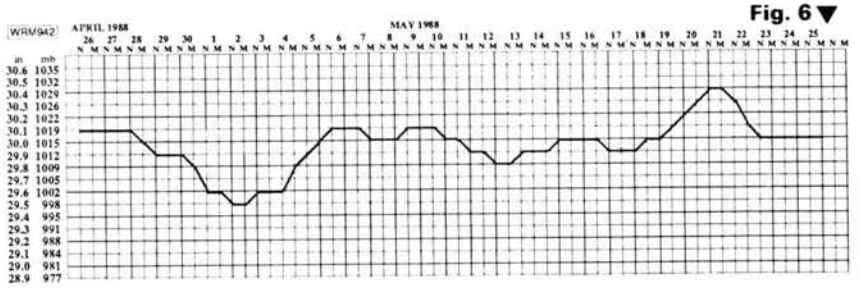
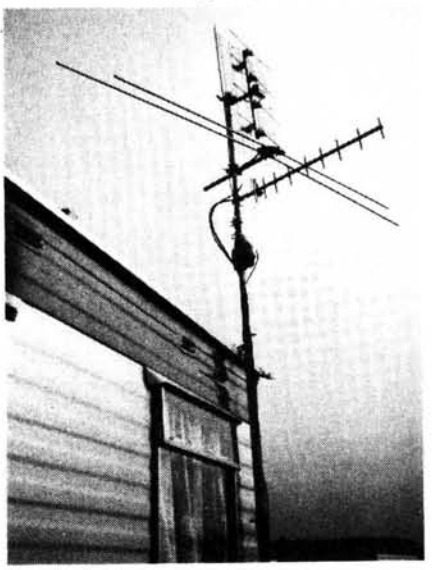



**Fig. 7 ▼**



covered flex was laid alongside to carry the low-voltage d.c. required to power the converter.

By connecting this coaxial cable to the antenna socket of a communications receiver, sections 2 (the i.f. amplifier and detector) and 3 (the audio ouput) were complete in one internally powered box. If the communications receiver is now tuned to the 26MHz signal carried by the i.f. cable and the receiver is switched to a.m. and its r.f. gain control is set reasonably low, any solar noise, at 136MHz, should be heard through the loudspeaker, "G", like a variable hissing, similar to, but distinct from the receiver's background noise.

This system can be tested by tuning between 136 and 137MHz (now converted to 26–27MHz on the dial of "D") to find a signal from an orbiting satellite.

The receiver first used in position "D" was an ex-military AR88. This was ideal because, apart from its good performance, it was fitted with a "diversity" terminal fed from its detector and a convenient place to connect the movement of a pen recorder, "F".

Although the energy at this point was insufficient to move the pen, the addition of a d.c. amplifier, using a 741 i.c., made this possible. There are many published circuits using a 741 operational amplifier to drive a meter movement, but some experimentation is required to get the right component values to make the pen move to full scale with a low input voltage. It was essential to fit a zero control to the 741 which can be adjusted in conjunction with

the receiver's r.f. gain control. Finally, I zeroed the pen and then increased the r.f. gain until the receiver's noise line was being drawn about 10mm in from the edge of the paper chart.

From the surplus market I purchased an Evershed & Vignoles recorder with a 1mA pen movement coil and a 240V chart motor which meant that observation times could be commanded by a time-switch. Gear wheels were obtained to give a chart speed of approximately 12mm per minute and I set the clock to switch on at 1130, as the sun entered the antenna's horizontal beamwidth, and off at 1430 when the sun was outside. These times are not too critical and must be adjusted to suit the location and antenna direction. Each daily observation produced about 2m of chart, which enabled increases of noise and/or individual bursts to be timed and clearly seen.

After many years, I replaced units "B" and "D" with a Microwave Modules converter and an FRG-7 communications receiver which also worked very well. Next month, I will show some of the observations from my archives, but now back to current reports.

## Solar

**Ron Livesey** (Edinburgh) located 4 sunspots on April 2, 4, 13 and 14; 6 on the 9th and 7 on days 10 and 15. At his observatory in Bristol, **Ted Waring** counted 20 sunspots on May 4 and 6, 9 and 5 on days 10, 16 and 22 respectively. The rotation of the sun and the apparent movement of a large sunspot group on the disc can be seen in Figs. 2 and 3, drawn by **Patrick Moore** (Selsey) at 0840 on April 30 and 1040 on May 1.

**Cmdr Henry Hatfield** (Sevenoaks), located 16 filaments plus one group of 11 sunspots and another containing many small spots, with his spectrohelioscope at 1405 on April 20. During May he observed 1 double spot and 13 filaments on the 17th and multiple spot groups and 10, 16, 9 and 16 filaments respectively on days 5, 6, 22 and 28. In addition, Henry recorded large individual bursts of solar radio noise at 136MHz on April 29 and May 3 and 29.

"The solar flux for April fell from 127 solar flux units on the 1st to 114 s.f.u. on the 5th, then rose sharply to peak at 147 s.f.u. on the 16th and fell back to 100 s.f.u. on the 28th," wrote **Neil Clarke GOCAS** from Ferrybridge. Neil said that the monthly mean was 123 s.f.u., the highest so far this cycle and his computer print-out can be seen in Fig. 4.

## Magnetic

"April was unsettled for the month with two periods of high activity," said Neil Clarke. He reports that the Ap index reached 103 on the 4th and 74 on the 22nd. "There were no quiet days (below 10) all month," added Neil.

The magnetometer used by **Karl Lewis** in Saltash was very unsettled on April 2, 5, 10 and 23 and indicating storm conditions on days 3, 4, 6, 22 and 23.

## Aurora

"Todd Lohvinenko reported 'all sky overhead' at Winnipeg, Canada, on three occasions, April 5/6, 6/7 and 27/28," wrote Ron Livesey, the auroral co-ordinator for the British Astronomical Association. "Note that the severest magnetic storm effects were detected in America and Todd's aurorae related the magnetic storm of the 6th and the build-up of activity on the 29th," said Ron. He also said that the NOAA Observatory, Boulder, Colorado, reported "severe storm" on April 6th and "storm" on the 22nd and 23rd. In addition, Ron received auroral sightings from observers in central Ireland described as "active storm" overnight on April 18/19, "glow" on 19/20, "active storm", "corona" and "glow" on 21/22 and "glow" on 22/23 and 23/24.

Around 1700 on May 6, **Dave Coggins** (Knutsford) received auroral reflected signals on the Band I television channels E2 (48.25MHz) and R1 (49.75MHz and from the 50MHz beacons in Anglesey (GB3SIX–50.020MHz), Potters Bar (GB3NHQ–50.050MHz) and Inverness (GB3RMK–50.060MHz).

## Sporadic-E

I counted up to 25 strong f.m. signals from eastern-European broadcast stations between 66 and 73MHz during the Sporadic-E openings on May 22, 23, 25, 26 and 27. As usual individual stations were exceptionally strong and, typical Sporadic-E, were frequently subject to deep fading. **Hil Snaden G4YNV** (Bristol) is interested in the apparent northward swing of signals at the end of a disturbance. I checked my archives and back in 1970, south-coast amateurs were among those responsible for installing a 2.5W beacon (TF3VHF on 70.275MHz) in Iceland. Many of us listened out for that tiny signal and then, late one June evening at the end of an extensive Sporadic-E, its signal suddenly appeared at 599, after a multitude of stations from the south-east had faded away.

## The 28MHz Band

In Bransgore, **John Levesley GOHJL** heard several stations from the USSR on April 23, South America on the 20th, 24th and May 1, 7, 14 and the Middle East and South Africa on days 20 and 24 and 1, 7, 14 and 22. With Sporadic-E about John logged signals from Austria, Czechoslovakia, England, Hungary, "lots of Is", Spain, Sweden, USSR and Yugoslavia on May 22 and Sweden on the 23rd. He also worked into the USSR on April 23 and contacted the Tino Island Expedition-I1W2/IP1 on May 22.

Hil Snaden logged c.w. signals from Argentina on April 25 and May 2, Brazil on the 30th, India, Indonesia, Turkey and Zaire on April 25, Saudi Arabia and Uruguay on the 26th, Jordan on May 11 and, on s.s.b., CQ6DTH, a special event station in Lisbon on May 6. "April 25 was quite a day, at one point VU2LO (India) and LU9CV (Argentina) were coming in simultaneously!," said Hil.

## Propagation Beacons

My thanks are due to **Chris van den Berg** (The Hague), Dave Coggins, **John Coulter** (Winchester), Henry Hatfield, **Don Hodgkinson GOEZL**, John Levesley, **Greg Lovelock G3III** (Shipston-on-Stour), **Ted Owen** (Maldon), **Fred Pallant G3RNM** (Storrington), Hil Snaden and Ted Waring, for their 28MHz logs which I have combined to produce the chart in Fig. 5. Dave Cogins also logged the PY2AMI beacon signals, almost daily at about S2, on 18.080MHz from 1900 to 2200 and between 1200 and 2100 on 24.900MHz. Don Hodgkinson first heard the new beacons EA2HB (28.247MHz) on May 6, HG2BHA (28.224MHz) on the 19th and ZD8HF (28.292MHz) from Ascension Is. on April 25. He also heard the Australian beacons AX2RSY and VK5WI on May 16.

Turning to v.h.f., Dave Coggins heard the 50MHz beacons GB3NHQ, RMK and SIX and the 144MHz beacons in Angus (GB3ANG-144.975MHz) and Wrotham (GB3VHF-144.925MHz) averaging between S1-3 on most days during the month prior to May 18. Dave uses a Yaesu FRV-7700 v.h.f. converter in front of his Icom R71 receiver and while the tropo was in progress, around 2100 on May 16, he was astounded to see the S-meter reading S9+10dB when tuned in the Wrotham beacon.

**The next three deadline dates are: July 27, August 31 & September 21**

## Tropospheric

The slightly rounded atmospheric pressure readings for this period, Fig. 6, were taken from the barograph at my home in Sussex. In Maldon, Ted Owen's barometer indicated peaks of 1025 (30.25in), 1027 (30.35in) and 1031mb (30.45in) on May 6, 20 and 21 respectively and lows of 1000mb (29.55in) on May 2 and 3.

## 934MHz

**Terry Wyatt UK-845** (Walton-on-Thames) said that good conditions and DX were enjoyed on May 16 from 2000hrs into the night, when contacts were made with stations in Cambridgeshire, Derbyshire, Leicestershire, Norfolk and Warwickshire at distances between 140 and 190km. As a member of the Hampton Court DX Group, Terry also uses the callsign HC-62 and during the opening on the 16th, he heard UK-934MHz Club members from Ashby-de-la-Zouch (UK-1155), Martisfield (355 and 417), Newhall (549), Nuneaton (1259), Redditch (704) and Wisbech (394).

While on holiday in Deal, **Les Jenkins GB-37** (Godalming) worked stations in Canvey Island (WD-432), Felixstowe (UK-717), Hadleigh (UK-968), Middlestoke (UK-1233), Sittingbourne (UK-938) and Southend (WW-01). Attached to his caravan in Deal, Les has a rotatable 10-element Yagi for 934MHz installed below his DXTV antennas, Fig. 7.

I had the pleasure of meeting Les and his wife at the Chalk Pits Museum (Amberley, Sussex) on May 30 when he told me how much he enjoyed operating on 934 during a lift and about his interest in computing, c.w. RTTY and scanning receivers.

From his home in Hampshire, John Levesley UK-627 made contacts of 161km with GY-186 in Guernsey on May 8 and 22 and JY-797/M in Jersey on the 22nd. John was in Guernsey himself on May 20 and worked RW-01 and 02/M on the mainland from the home of GY-186 and on the 21st, operating from St. Sampson (9m a.s.l.) and Fort George (100m a.s.l.), using 5W from a Delta 1 and collinear antenna he worked GB-3 in Dorset and MR-01 in Southampton.

# Broadcast Round-up

Peter Shore

There seems to have been a downturn in reception of long distant signals recently, with some ionospheric disturbances and severe fading problems. Clearly an improvement must be on the way as the sunspot count increases, but until then, we shall have to keep hoping for better conditions.

The changes to Moscow's schedules at the beginning of May resulted in an increase in broadcasting hours in the French, German and Arabic languages. The French Radio Moscow International service has brought together all the previously separate regional services and is on the air between 0400 and 0700, and from 1200 until 2200. German language programmes are heard 0430-0530, 0900-1000 and 1500-2030 whilst Arabic broadcasts for one hour at 0300 and between 1400 and 2030. Radio Moscow has announced a telephone number for listeners' comments and messages: Moscow 2336595. When this was tried, it rang, and rang, and rang . . .

Hungary may soon receive BBC External Service programmes in Hungarian and English via satellite for relay on cable systems in the country. At a recent Trade Fair in Budapest, there was tremendous interest in the BBC satellite reception demonstration, particularly as the Fair coincided with the political changes which occurred in Hungary then, with visitors crowding around to hear the news of events in their own country from London! It is reported that the authorities have no objection to relays being made available in this way.

In Hong Kong, the authorities are investigating the possibility of allocating a frequency to the BBC for twenty-four hour a day coverage with English and Chinese broadcasts from London. At present, BBC programmes are relayed on Radio Television Hong Kong (RTHK) Radio Three and Five during the evening, but a separate channel would benefit local and expatriate listeners.

A plan is being studied in London to change some of the output of BBC World Service. A *News Hour* programme will be established in the autumn which will be a rolling programme incorporating the regular newscasts, and analysis programmes such as *The World Today* and *Twenty-Four Hours*. *News Hour* will probably initially be broadcast twice daily. Also being studied is the possibility of a *World Service Two*, enabling news and current affairs to be carried on one Network, and features, drama, music and general programming on another. This would allow far more flexibility for general programmes, without the need to tailor programmes between newscasts. Full details will be carried in Broadcast Round-up as they become known.

If you have access to Sky Channel and a teletext decoder, you can now call up the external service schedules of Radio Netherlands and Radio Sweden, and this is to be followed shortly by extracts from *Sweden Calling DXers*, the station's weekly communications magazine. Page 496 currently carries Radio Sweden's schedule. Some other news for satellite users—Radio Moscow now delivers its programmes to North America daily at 0900 Eastern Standard Time (1300UTC) as well as 1900 EST (2300UTC) via the Satcom 1R Transponder 19, Channel 18-1.

## Europe

ORF Austria has English at 0030, 0430, 0730, 1130, 1305, 1630, 1730 and 2130, with programmes beamed to Europe 0400-2300 on 6.155MHz, 0700-1700 on 11.915MHz and 1700-2200 on 5.945MHz. The Austrian Shortwave Panorama is heard on Sundays 0100 and 0700, and Monday at 0400.

The BRT has changed a frequency for its 1000 broadcast in English to Africa, now broadcast on 21.810 and 17.595MHz. The European broadcast at 1730 remains on 1.512, 5.91 and 11.695MHz and the 2100 on 1.512, 5.91 and 9.925MHz.

Radio Sofia now uses 9.7 and 11.72MHz for English at 0630 and 17.825 and 15.31MHz for English at 1730.

Radio Denmark now uses 11.82MHz from 0900. The Voice of Greece is heard at 1500 on 15.63, 11.645 and 9.425MHz, with Thessaloniki at 1600 on 11.595, 9.935 and 9.425MHz.

The English language service from Radio Berlin International to Europe has a new schedule:
0500 on 5.965 and 6.115MHz
0745 on 6.115 (daily), 6.040, 7.185 and 9.73MHz (weekends only)
0945 on 6.115MHz
1100 on 6.115, 9.665 and 17.775MHz
1300 on 6.115MHz
1345 on 9.73MHz
1545 on 7.295MHz and 9.73MHz
1715 on 7.26, 7.295 and 9.73MHz
1945 on 6.115MHz
2145 on 5.965MHz

Programmes from the other side of Germany, on Deutschlandfunk, during the summer:

July 14. Alternative Holidays: find out about yak trekking or white water canoeing and other adventurous holidays in West Germany. Jazz in the Garden (also July 14) DLF visits Berlin as famous and less well known musicians perform in the garden of the National Gallery.

July 16 German Youth Hostel Movement: the first youth hostel, at Altena, is nearly 80 years old and has been visited by thousands of hostellers from all over the world.

July 21 Religion in West Germany: the continuing series, looking this time at the Jewish Community, Rosie Goldsmith reports. DLF programmes in English are heard at 1815 on 1.269MHz medium wave.

Iceland has moved in to the 13MHz band, with its 1220-1245 broadcast heard on 13.79MHz. Deutsche Welle's Sri Lankan relay at Trincomalee is to restart work during June, and at that time the relays via Radio Veritas Asia, which we have mentioned in this column, will cease.

Radio Norway International broadcasts to Europe:
0500 on 11.735MHz English on Monday
0600 on 9.59 and 15.165MHz
0700 on 9.59, 11.735 and 15.165MHz
1000 on 11.87 and 21.73MHz English on Sunday
1100 on 9.59MHz
1300 on 9.59MHz English on Sunday
1400 on 15.30MHz English on Sunday
1500 on 1.314MHz (Mon-Fri)
1600 on 15.18MHz English on Sunday
1700 on 9.655 and 15.22MHz English on Sunday
1800 on 9.655 and 15.22MHz
1900 on 9.59MHz English on Sunday
2000 on 9.59MHz English on Sunday
2100 on 15.265MHz
2200 on 15.18MHz English on Sunday
Programmes during the week are in Norwegian, with announcements in English.

Radio Bucharest from Romania broadcasts English during the afternoon and evening as:
1200 on 17.72MHz
1300 on 15.365, 15.27, 11.94 and 0.969MHz
1500 on 17.745, 17.72, 15.335, 15.25, 11.94 and 11.775MHz
1930 and 2100 on 11.94, 9.75, 9.69 and 7.145MHz
The station has announced a new address: PO Box 111, Bucharest.

The 1900 English transmission from REE Spain is now heard on 15.395, 11.79, 9.765 and 9.57MHz. REE will have a new relay station in Costa Rica which will start testing in 1990 and commence full operations in 1992. The s.s.b. transmissions from Sweden which were due to come to an end this summer have been granted a reprieve, and will continue until the year end, at least.

Reception of Radio Moscow's Great Britain and Ireland service continues to be poor at 1900. Frequencies used are 15.475, 11.95, 11.85, 9.775, 9.63, 7.37, 7.33 and 1.143MHz medium wave. R Moscow World Service continues to use several 13MHz channels during the day, including 13.650, 13.68 and 13.71MHz which tend to offer good reception on the whole.

## Africa

Radio Africa from Equatorial Guinea has been heard between 1700 and 2200 on 9.555MHz. Radio RSA is using 4.99MHz, replacing 5.98MHz between 1900 and 2000, in parallel with 9.61 and 7.27MHz. Reception is marred in the UK by co-channel interference on this new low frequency.

## Middle East

Iraq in English is heard at 0000 on 11.81 and 11.775 and at 2000 on 15.23 and 9.77MHz. Israel has moved from 15.095 for its domestic and external services as this channel is now occupied by Syria (in parallel with 12.085MHz). English broadcasts from Jerusalem are:
0400-0415 on 13.725, 12.077, 11.655, 11.605, 9.435 and 9.010MHz
1000-1030 on 21.675, 21.66, 17.685, 17.63, 17.575, 15.65, 15.64, 11.585 and 11.7MHz
1700-1715 on 13.75, 11.655 and 11.585MHz
1900-1930 on 17.685, 15.585, 15.485, 13.725, 13.625, 11.70, 11.605 and 9.01MHz
2130-2200 on 15.64, 15.592, 13.725, 13.625, 12.08 and 11.605MHz
2300-2330 on 12.077, 11.605 and 9.435MHz (and at 0000 and 0100)

Network B relays:
0300-0515 on 13.75, 11.585 and 9.385MHz
0515-1300 on 17.59 and 17.555MHz
0515-2000 on 15.615MHz
1100-1530 on 11.585MHz
1730-2215 on 13.75, 11.655 and 11.585MHz
2000-2215 on 9.385MHz

Turkey surprised band watchers at the start of May by going way out of band for programmes to Europe—14.88MHz was introduced running in parallel with 15.16 and 11.96MHz through the day from 0355 until around 1600. One wonders just how many average shortwave listeners are able to receive this channel on sets which don't have continuous coverage, as even one such as the recent Sony ICF-7600DA does not have this frequency in its coverage!

## Asia and the Pacific

Afghanistan has been heard on new frequencies:
English at 0900 on 17.655 and 15.255MHz
English at 1900 on 11.755 and 9.665MHz
Kabul's First programme is on the air on 4.74, 4.450 and 3.965MHz until 1930.

If you have to get up in the early hours of the morning, start your day with Radio Australia. Some of the 15MHz frequencies come in well at around 0400—try 15.395, 15.32, 15.24 and 15.16MHz. The 31 metre band frequency of 9.655 was performing very poorly at the beginning of June during the morning (0700 onwards), although 7.205MHz worked well during the early evening.

Bangladesh has English at 1230 on 15.25 and 17.87MHz, with the 0800 Voice of Islam on the same channels. The Soviet Union's relay of Laos in French at 1100 is now on 15.24 and 11.96MHz.

New Zealand was heard during May with good reception on 12.045MHz around 0700. This frequency operates with 15.15MHz between 0345 and 0730.

Radio Pyongyang in North Korea has an English language schedule:
0000 on 15.16 and 15.115MHz
0400 on 15.18, 15.16 and 15.115MHz
0600 on 15.18, 15.16, 13.65 and 9.53MHz
0800 on 15.18, 15.16, 11.83 and 9.53MHz
1100 on 11.735, 9.60 and 6.576MHz
1300 on 11.735, 9.60, 9.555, 9.345 and 9.325MHz
1500 on 11.74 and 9.325MHz (also at 1700)
2000 on 9.345 and 6.576MHz
2300 on 13.65 and 11.735MHz

KBS Seoul has English at 1450 on new 9.515MHz, with Russian starting at 1500 in parallel with 7.275 and 9.87MHz.

## The Americas

Surinam's International Service was off the air for some time during May, but returned at the end of the month using 17.875MHz at 1700 for its multi-lingual transmission.

Some gaps to complete the WCSN schedule in last month's column:
0200-0400 on 9.85MHz
1200-1400 on 5.98MHz
1400-1600 on 13.76MHz
1600-1800 on 21.64MHz
2000-2200 on 15.39MHz

KYOI can be heard at around 0700 on 17.78MHz with relays of WCSN programming.

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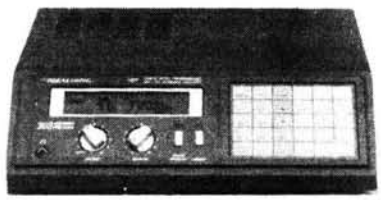

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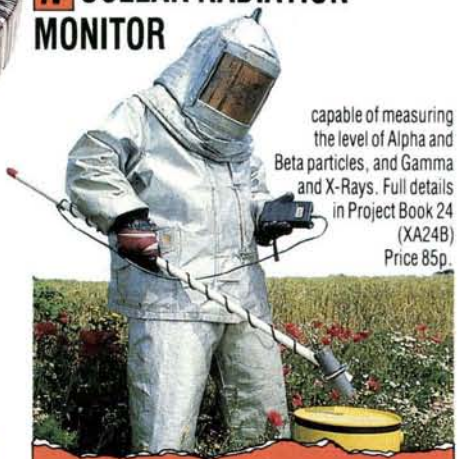

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