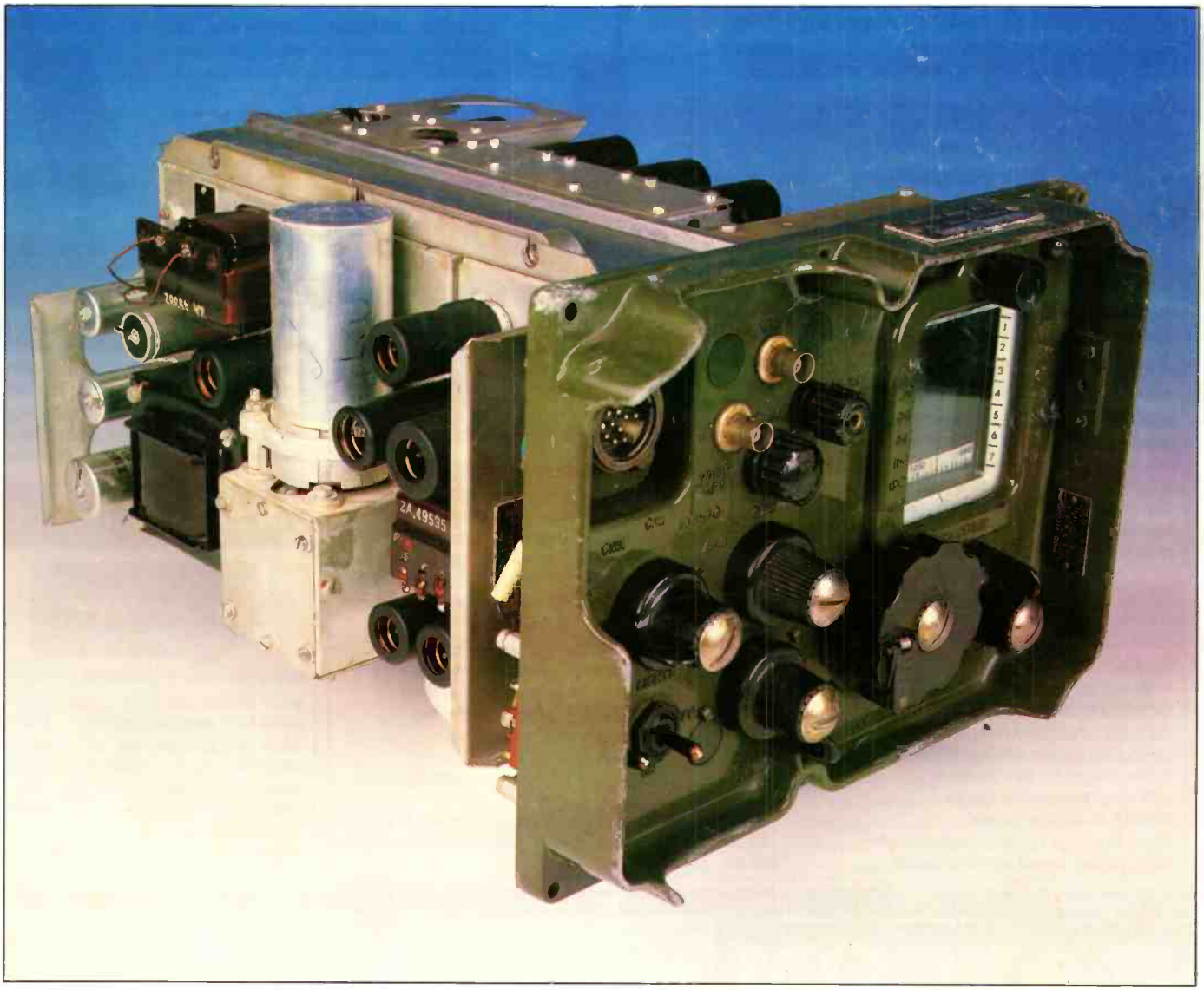
Short Wave Magazine

SWM SWM SWM SWM SWM SWM

£1.60

JANUARY 1990

MODIFYING THE R210 EX - MOD RECEIVER



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PLUS

REGULAR FEATURES FOR SCANNING AIRBAND & BROADCAST ENTHUSIASTS

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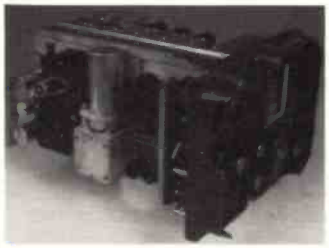
VOL. 48 ISSUE 1 JANUARY 1990

ON SALE DECEMBER 21st

FEBRUARY ISSUE ON SALE JANUARY 25th

|10| **Converting the R210 Receiver**



Cover The R210 ex-MOD receiver can be easily converted to provide a low-cost, but excellent, receiver ideal for the beginner's station. The R210 on the front cover was kindly provided by J. Birkett of Lincoln.

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Short Wave Magazine

GOOD LISTENING

FIRST WORD

What do you plan to do for your holiday in 1991? How about DXing on the equator, or on the slopes of Cotopaxi? Some of you may remember that we had planned a holiday to Ecuador with HCJB a couple of years ago but, unfortunately due to circumstances beyond our control, this never got off the ground.

However, the idea of an *SWM* DXpedition has not died. We are now planning one for May 1991 and, as well as having radio activities aimed at both the listener and licensed amateur, the holiday will be planned to appeal to other members of your family as well. Sightseeing, shopping, and visits to HCJB's various installations are planned for the two-week long holiday. It is anticipated that costs will be around £1100 at today's prices including return airfare London to Quito, dinner, bed and breakfast in hotels and transport for the various organised activities. If you are interested please write to me at the Poole offices to put your name on the list. Further details will be published as soon as they are known.

You will also be interested in the latest service which we are offering to our readers. By dialling an '0898' telephone number - *calls charged at 38p per minute, etc., etc.* - you will be able to get up-to-date information on radio-related subjects. Among the ideas we have for the information on the service are changes of broadcasting schedules and frequencies, rallies and special club meetings, news from DX Clubs, Special Event Stations, propagation, etc. If you have any other ideas please let me know. The service, to be called '**RadioLine**', will start on 1 January 1990 and will be updated each Friday. The number to remember is **0898 654 676.**

This issue sees the start of an article on modifying the R210, ex-MOD, receiver. This should encourage you to try your hand at the straightforward task of taking a low-cost, but high-quality, set and modifying it to suit your own requirements. At current prices the basic, unmodified receiver will cost you the princely sum of £58. The parts needed to carry out the modifications for mains operation should cost around £10, giving you an excellent short wave receiver for £70 plus a few hours interesting and instructive work with basic tools. I acquired one from John Birkett of Lincoln at his stall at a rally and will be using it as a model to illustrate the article. I must admit that it is a beautiful piece of work and reminds me of my early days as an apprentice when all our equipment was made like this.

Talking of early days reminds me - have you placed your subscription for *Vintage Radio* yet? If the answer is yes - well done. If not, why not? The form is on page 29 of this issue.

Also starting in this issue is a regular competition. Why not try your hand - you might be the lucky one to win one of the prizes.

DICK GANDERTON

A WORD IN EDGEWAYS

IF YOU HAVE ANY POINTS OF VIEW THAT YOU WANT TO AIR PLEASE WRITE TO THE EDITOR. IF YOUR LETTER IS USED YOU WILL RECEIVE A £5 VOUCHER TO SPEND ON ANY SWM SERVICE.

The Editor reserves the right to shorten any letters for publication but will try not to alter their sense. Letters must be original and not have been submitted to other magazines.

Sir

In all walks of life, there are always a few people, who by their actions, get the majority a bad name.

Most of use have met, at sometime or other, the big-headed, arrogant twit, who thinks that he is better than anyone else, just because he has something that others do not.

It was most unfortunate that the first radio amateur that Mr Semmens met was one of these, but to accuse the whole of the amateur radio fraternity of being snobs, because of this chance encounter, is very unfair.

I may be wrong, but I have always understood that amateur radio clubs were just what they say they are, amateur or 'ham' radio clubs. Most are run by radio 'hams' for radio 'hams'.

A club is where both old and new 'hams' can meet to exchange ideas, discuss any problems they may have, or just natter about 'ham' radio in general, and newcomers can gain much useful information from the 'Old Timers'.

Some of these clubs were never intended to be for anyone else, and to say that they are snobs, because they do not cater for the average short wave listener, is rather like saying that the AA and RAC are snobs, because they do not cater for cyclists and pedestrians.

There are other clubs, that do welcome short wave listeners, and they are generaly known as Radio and/or DX clubs.

As for 'Hams' being snobbish, I can only say that I have known many over the past years and have had telephone conversations with some that I have never met. I bought a Racal RA17 for DXing (I had never seen one of these sets before) and it was a 'ham' who was the first to put the set on test, when it arrived. He also provided a Racal Service Manual. May I say at this point that I am NOT a 'radio ham'.

That does not mean that I am not interested in amateur radio. I have spent many interesting hours in 'ham' radio shacks. However, it does help if one has some basic theoretical knowledge of radio and can understand what both you and the 'ham' are talking about.

GEORGE MILLMORE
WOOTTON
ISLE OF WIGHT

Sir

The letter from Ron Pearce in the November issue of Short Wave Magazine *evoked memories of my youth, including listening to Australia on an 0-V-1 receiver using IN5 and IC5 valves. The same IN5 was used in the m.w. portable using only 9V h.t. and it would pick up about 12 stations with good selectivity!*

I wonder whether Ron could be persuaded to let us have the circuit and constructional details of his 955 one-valver - I feel like a return to home construction.

DAVID BIGMORE
BENFLEET
ESSEX

You see Ron, there is a demand for you to put pen to paper! ED.

A WORD IN EDGEWAYS

Sir

I've been an s.w.l. for some forty years and of late have become particularly interested in the Airbands.

Current receivers are a Signal R-535 and the new Jupiter MVT-6000, the main antenna being a Sandpiper 'nest of dipoles' for the v.h.f and u.h.f. aircraft bands.

Although airfield reception should be restricted to line-of-sight, I regularly receive signals from Lyneham, Wattisham, Honington, Wyton, Cranfield and Bedford, amonst others, up to distances of about eighty miles. Airfields south of my QTH are difficult because the North Downs are in the way and Gatwick and Redhill, only six to ten kilometres away are relatively weak. My QTH is about 100m a.s.l. and the antenna is in the loft.

It would be interesting to hear from other readers about DX reception of base stations.

I've been a subscriber to SWM since it began in the new format and really get quite excited when I see the latest issue on my doormat!
PETER GILLMAN
CARSHALTON BEECHES
SURREY

Sir

Regarding the recent correspondence about Milnes h.t. units, I have managed to 'dig out' what I always knew as 'Milnes h.t. units' from the loft and find that they differ from those mentioned in various letters recently to SWM.

These consist of 12 glass jars each of 5.2V cells, all connected in series and in a wooden crate 403 x 162 x 140mm high with leather carrying handles.

The glass jars are marked 'Elite' and were drained of the electrolyte when impounded by the Post Office in 1939 and have been idle ever since.

Amongst my old records I felt sure that I had some technical information on them, but in spite of going back to 1868 or so in old books I have, it has not been possible to find anything yet!

I seem to remember these units being charged with an 120V motor generator which I am not sure if I still have buried somewhere!
R. A. LORD
EAST GRINSTEAD
WEST SUSSEX

Sir

It is often said that amateur radio is on the decline and that youngsters are not interested. This must also be said about short wave listening.

A few weeks ago I purchased a receiver, a Matsui MR4099. I demonstrated it to my cousin, showing him the various stations on l.f., m.f. and h.f. including BBC, VOA, Moscow, Beijing, various stations on m.w. including a French station on top of a local (7km away) IBA station and the new Atlantic 252 beating with Tirana. We also looked in the amateur bands. Then I let him have a go. He tuned straight to f.m. and listened to local stations, not interested in DX or a.m.
It goes to show that the youth of today want stereo and hi-fi, not the pleasures of long distance. Am I, at 25,the last of the s.w.l/amateurs?
PAUL O'CONNOR
BILLESLEY
BIRMINGHAM

WHAT'S NEW

Liniplex Loop

There are few designs for active loop antennas on the market, due to fundamental dificulties of excessive loop inductance. However, in the Liniplex design, loop inductance has been very much reduced by a novel multi-loop structure - patent pending. In this way optimum coupling is obtained with the current amplifier for improved sensitivity throught the frequency range. There is a switchable high pass filter for receiver protection of 12-19dB below 1.6MHz.

This loop antennna is only 1 metre wide and covers 50kHz to 30MHz and will cost in the region of £350. For all the details on the full specification write to:

Phase Track Ltd., 16 Britten Road, Reading RG2 0AU.

RAF Award

The Worked RAF Waddington Club Members Award is designed to promote the club and encourage on the air activity between club members and all other radio amateurs.

The award will be available to all licensed amateurs and s.w.l.s who have made simplex contacts or heard 25 club members on or after 6 November 1989.

To claim the award, log extracts including callsign, date, time, frequency, mode and club membership number of the station worked, should be submitted to the club secretary. Submissions must be verified by two licensed amateurs but this requirement is waived for club members.

The cost of the award will be £1 (or 50p to club members). A list of club members callsigns is available from the club secretary on receipt of an s.a.e.

Dave Bloomfield G0KUC, 8 Sunningdale Drive, Boston, Lincs.

Mid Winter Sports

The G-QRP club will be holding the annual mid winter sports during the period December 26 to January 1 inclusive. An opportunity to work many countries on many bands. Not a contest as such, but is ideal for the Christmas period. Details from **George Dobbs G3RJV. Tel: (0706) 31812.**

Special Event Stations

GB6RB: To celebrate the birthday of Robert Burns, this station will be operated by Ayrshire RAYNET from the Land O'Burns Centre in Alloway on Saturday January 27. The station will be active on 145MHz f.m., 3.5/7MHz 'phone and 14MHz RTTY, AMTOR and 'phone.

There is a commemorative A4 size certificate for all contacts and s.w.l. reports. UK stations need to send a second class stamp with their QSL card or s.w.l. report, EEC countries send one IRC and other countries 2 IRCs. Send to PO Box 36, Prestwick, Scotland KA9 1AL.

For more information on this station, contact:

GM4SUC. Tel: (0292) 43127.

WHAT'S NEW

Where is that Satellite?

Swift Television Publications are offering a more unusual satellite service for installers. They will produce a print-out for any location listing the azimuth and elevation (for fixed satellite systems) for the 30 satellites which beam signals across Europe. For motorised polar mount dishes, modified polar and apex elevation angles are given.

The cost of each print-out is £3.00. If you would like further details, contact:

Swift Television Publications. 17 Pittsfield, Cricklade, Swindon, Wilts SN6 6AN. Tel: (0793) 750620.

Fairmate HP-100E

The Fairmate HP-100E has 1000 channels of memory (yes, that's right - I haven't typed it wrong!) with a frequency coverage of 25 - 550MHz and 850 - 1300MHz. The modes available are a.m., n.b.f.m. and w.b.f.m. with search steps of anything you care to program up to 999kHz. It comes complete with batteries, carrying case, d.c. adaptor, two antennas, ear piece and carrying strap, all for £299 including VAT.

For those who haven't heard of Fairmate before, they are a major Japanese company who for many years have produced models for the famous brands such as AOR and Regency. The HP100E will be the first product released into Europe carrying their own name.

Nevada should have the Fairmate HP-100 in their showroom the week this magazine goes on sale.

Circuit Tester

A new range of electrical circuit testers is now available in the UK from Longs Ltd of Surrey. The digital volt mters made by SOAR are both compact and easy to use.

The virtually drop-proof circuit testers measure about the same size as a pocket calculator, weighing in at just 100g. They can be operated by one hand to show accurate readings of a.c. or d.c volts and ohms test on large digital displays.

Top of the range is the all new, high speed, ME3060 which has a bar graph display for fast, accurate readings.

It has a battery life of over 250 hours and an automatic shut-off safety function.

The ME3060 costs £35.08 including cariage and VAT.

The ME3020 is fully protected up to 450V r.m.s. and costs £23.58 including carriage and VAT.

Snippets from Sweden

China: The Voice of free China in Taiwan was heard in Spanish on 15.165MHz at 2300-2400 to South America.

Libya: Libyan Jamahiriya Broadcasting was noted on the new frequency of 15.435MHz in Arabic at 1900 with 15.415MHz in parallel.

USSR: Radio Kiev broadcasts in German at 1700-1800 on 5.905, 6.010, 6.090, 6.155 and 7.115MHz. Radio Minsk can be heard in German on Wednesdays, Saturdays and Sundays 1830-1900 on 5.945, 6.010, 6.055, 6.090, 6.165, 7.115, 7.160, 7.160 and 7.420MHz. German from Radio Station Peace and Progress is at 1530-1600 on 1.323, 1.386, 6.030, 6.145, 7.230, 7.360 and 12.040MHz; 2100-2200 on 263kHz, 6.145, 7.230 and 7.360MHz; and 2200-2300 on 4.795, 7.205, 7.360MHz.

The BATC

The British Amateur Television Club (BATC) has recently published the latest issue of its magazine CQ-TV. It includes a variety of interesting articles, ranging from Using Oscilloscopes by Mike Wooding G6IQM to Camera Tubes Explained by Peter Delaney G8KZG. There is a review of the Camtech 24cm f.m. amateur television transmitter as well as news, contest details and the like.

The subscription rate for 1990 and 1991 (two years) is £15. This includes eight issues of CQ-TV as well as discounts of components, equipment and p.c.b.s. For membership details, send an s.a.e. to:

Mr D. Lawton, 'Grenehurst', Pinewood Road, High Wycombe, Bucks HP12 4DD.

Catalogues

A wide variety of catalogues have arrived this month, all different shapes and sizes. At one end there are the Electromail and Maplin catalogues and at the other there are price lists and information sheets from Jandek.

The Electromail catalogue weighs some 1.87kg! Some of the new products included in the November to February edition are Sharp calculators, advanced graphic i.c.s, microprocessor crystals, infra-red emitters and detectors, weather resistant Tywraps and satellite cable - to mention only a few. You can order from the Electromail catalogue, using your credit card, 24 hours a day. Mail order transactions must be accompanied by a cheque or postal order. **Electromail, PO Box 33, Corby, Northants NN17 9EL. Tel: (0536) 204555.**

The Maplin catalogue is some 575 pages in length. With this issue comes an offer of a handy continuity tester with all orders over £10. Recognising the increased interest in communications, this section has been increased by one third and includes a range of new mobile transceivers. The similarly expanded computer section features a 3-button serial mouse together with a 3-button track-ball, ideal for creating graphics. You can place credit cards orders day or night with Maplin too. Alternatively you can visit one of their twelve shops, all the addresses are given at the front of the new catalogue. The telephone number for your mail order is **(0702) 554161**.

The new colour catalogue from Henry's is available by post or from their shops. The cost is £1.00 for callers and an s.a.e. with a £2.00 stamp for mail order. The catalogue does contains purchase vouchers totalling £90.00. Supplements are regularly issued and there are three available now, test instruments, electronic components and security equipment. **Henry's Audio-Electronics, 404-406 Edgware Road, London W2 1ED. Tel: 01-723 1009 for components and 01-724 0323 for communications.**

Jandek have a range of kits now available, details of which can be obtained from their price list/information sheet. **Jandek, 6 Fellows Avenue, Kingswinford, West Midlands DY6 9ET. Tel: (0384) 288900.**

TRADING POST

FOR SALE Icom ICR-7000 scanner £550. Perfect working order, reason for sale recent divorce. **Will Swap** for AOR AR-2002 + £150. I. Spiers, 67 Skellery St, Butt Lane, Stoke-on-Trent ST7 1NW. Tel: Stoke-on-Trent 776409.

WANTED Details of frequencies used by bus and rail operators in the UK. Information required for personal interest only. All information will be acknowledged and postage refunded. J. Allpress, 9 Phoenix Way, Southwick, Brighton BN42 4HQ.

FOR SALE Realistic PRO-2021, 200 channel scanner, £130. Sangean ATS-830A s.w. RX, £70. Chris Rolfe. Tel: Folkestone 52479 evenings and weekends.

FOR SALE Telereader 660 RTTY/CW/TOR/AMTOR/ASCII multi-mode decoder, £199. Digital flight scan 108-136MHz, l.e.d. display, 16 memory, priority, lockout, etc. Cost new £250, boxed with manual, bargain at £95. Airband glass fibre collinear, new, £20. A. Bailey. Tel: Mottram 872614 evenings, Manchester area.

FOR SALE AR-900 hand-held scanner still under guarantee, boxed with instructions, charger, v.h.f./u.h.f. antennas, £175. Dick. Tel: 04203 4962.

FOR SALE Complete receiving station, comprising Yaesu FRG7 receiver, 500kHz-30MHz. Dee-Comm a.t.v and a half size G5RV dipole. All in excellent condition, £160 complete. Write to Mr K. Jewison, 7 Nelson Street, Scarborough, N. Yorkshire YO12 7SZ.

FOR SALE WRAASE s.s.t.v. tranceiver also receives FAX never been used to transmit, £500. J. Ferguson. Tel: Medway 828952.

FOR SALE Grundig Satellit 400, very good condition, £125. P. Walker. Tel: 061-445 0458.

FOR SALE Nems-Clarke R1421 w.h.y. R1302 handbook, £15. 40ft lattice tower base mounted, £100. Various lengths of Heliax type coaxial cable with connectors. Allan G6EII. Tel: Penketh, Cheshire 727160.

WANTED Drake M54 or M57 loudspeaker, parts for Eddystone 1590 receiver, 455kHz u.s.b. and l.s.b. filter. Manuals on Collins, Nems-Clarke, CEI, DEI, ASTO LABS, Stoddart, Sineer, equipment. Allan G6EII. Tel: Penketh, Cheshire 727160.

WANTED Signal 532 or 535 airband set. Write to David Jones, 18 Lowndes Grove, Milton Keynes MK5 6EF.

FOR SALE Sony Air-7 a.m./f.m./air/p.s.b. scanner, mint condition plus BP-23 NiCad pack and Sony suede case, £155. Christopher J. North. Tel: Derby 510056.

FOR SALE Panasonic RF840 portable receiver f.m., l.w., m.w., s.w., 27 station memory, mint condition. L. Lidster. Tel: 01-950 3425 after 6pm and weekends.

WANTED Service manual or any data for National Panasonic comms receiver DR48, must have, money waiting. R. Rigg, 61 Conisborough, Rochdale OL11 4JS. Tel: Rochdale 358943.

FOR SALE Trio R2000 pristine condition plus Trio headphones, antenna and various publications for listening. Boxed and can deliver to 50 miles, £340. B. Tennyson. Tel: Largs, Ayrshire 675656.

FOR SALE CD660 communication decoder RTTY/c.w., c.w. key in - out can be used for c.w. practice, £200. Printer star DP515 dot matrix, interface centronic, £100. Dave. Tel: Herne Bay 368803.

FOR SALE Sony Air-7, £150, mint. SEM h.f converter unused, £40. RX4 receiver program (Spectrum), £10. GAREX v.h.f./u.h.f. pre-amp, £25. Densi desk microphone, £60 new, £25. Icon 27-180MHz receiver, £15. J. Parker. Tel: Burton-on-Trent 68439.

FOR SALE Icom IC-7000 scanner 12/240 volts, £725 or **exchange** NRD-515/525, Trio 5000 or complete RTTY, c.w. station or w.h.y. Peter Hall. Tel: Rotherham 700775.

FOR SALE Owing to ill health. Lowe 125 (with Key Pad), Datong FL2 filter, Casio World clock, 5x5 4ohm speaker. All mint condition, boxed with manuals, £360 o.n.o. B. Blanchard. Tel: 091-526 7902.

FOR SALE Black Jaguar MkIII scanner, boxed with mobile charger and 12V supply, £130. Peter Reeves. Tel: Guildford 503211 after 6pm.

FOR SALE Realistic PRO-2005 programmable scanner, 25-520MHz, 760-1300MHz, 400 memories, 10 search bands, latest model, boxed, mint condition, bargain at £260. Mr Horton. Tel: Hednesford (Staffs) 877995.

WANTED Drake R4245, DSR2, RR3 or R7A receiver, any condition. Pat McAlister G3YFK. Tel: Shrewsbury 884858.

FOR SALE Yaesu FRG-9600/RWC scanner, modified, 0.1-950MHz, no gaps, all modes, with p.s.u. and discone. Unused, still boxed with manuals. Offers, must sell. Mr R. Eno. Tel: Torquay 64139.

FOR SALE Challenger (BJ200) H/H scanner, boxed, as new, £150. ERA Mkl Microreader/Tutor, as new with freq lists, £95. Signal R5375 H/H airband receiver, boxed with extras, £55. Mr J. Garnett. Tel: Truro 40105 evenings.

FOR SALE AOR-2001 scanner v.h.f./u.h.f. 25-550MHz, £250. Sony Air-7 hand-held scanner with mains lead, covers air/marine bands and p.m.r etc, £160. John Cruttenden. Tel: Hastings 754927.

FOR SALE Sony ICF-2001D portable receiver, mint, £250. 90-450MHz wavemeter, £30. Standard C500 v.h.f./u.h.f. dual bander hand-held, extended Rx range, £240. Mizuho h.f. sky coupler KXZ, £20. **Wanted** Military radios and radar. Neil Wedgbury G6CUQ. Tel: Astwood Bank 892282.

WANTED Memory unit for Yaesu 7700 receiver. R. Greaves. Tel: Holmfirth 684122 after 5pm.

FOR SALE National Panasonic DR-48 communcations receiver, digital frequency display, 7s.w., m.w., f.m., l.w. bands, v.g.c., £250. H. Hanshaw, 302 Courtney Lodge, Barkingside, Essex. Tel: 01-437 8482 day and 01-551 1065 evening.

FOR SALE Racal RA17L receiver, 500kHz to 30MHz, lovely front panel, £150. Sony ICF-2001D receiver, £195. SX200 scanner, £130. Steve Westell. Tel: Whalley 823305.

FOR SALE National high frequency receiver type HRO-MX, general coverage and bandspread coils covering 50kHz to 30MHz included. Good condition, open to sensible offers. H. Venning. Tel: Saffron Walden, Essex 23558 after 6pm.

FOR SALE AOR AR-2002 scanner in mint condition, boxed, the acknowledged professional quality, v.h.f./u.h.f. leader with a superb specification, £365. G. McMurray. Tel: Edinburgh 031-441 6193.

FOR SALE Realistic PRO-34, 200 channel hand-held scanner, 66-88, 108-174, 380-512, 806-960MHz, manual and boxed, £170. R. Rankin. Tel: Merseyside 051-334 5501.

FOR SALE AOR AR-900 hand-held scanner, as new (four months old) plus frequency guides and other relevant books, total value £270, will sell for £185. C. Wynne-Hughes. Tel: Swansea 897563.

FOR SALE Weather satellite receiver, fully cased, 137MHz amplifier, Meteosat down-converter and pre-amp, channel switching unit, cost over £220. Offers invited. R. Lemin. Tel: Thornbury 417533.

FOR SALE Kenwood R-2000 with VC10 converter, boxed, excellent condition, little used, with free Revco wideband antenna pre-amplifier, mains, £485. Also ex-Navy signal generator CT433A (15Hz/50kHz). Any reasonable offer accepted. J. Peckett, 30a Finchley Rd, Westcliff-On-Sea, Essex SS0 8AF. Tel: Southend-On-Sea 332667.

FOR SALE Realistic PRO-32, 200 channel hand-held scanner with a/c charger, mains adaptor and rechargable batteries. Revcone discone antenna with 9m low loss cable, £160. Will split. Mr P Thompson. Tel: Sunderland 5674048.

SWAP Audioline model 440, new in box, 18 memory. **For** Airband set scanner or others. Was £149.99. J. Clark. Tel: Luton 28488.

FOR SALE Signal R528 airband Xtal scanner, as new with manual and case and seven spare crystals, £70. Mr J. Short, 4 Audley Rise, Newton Abbot, Devon TQ12. Tel: Newton Abbot 60328.

FOR SALE JRC-525 Receiver, mint condition, seven months old, perfect working order, boxed, manual, £720. JRC NVA-88 matching speaker, £45. Icom GC5 world clock, £25. Carriage extra. K. Ferry. Tel: 01-570 5603 evenings.

FOR SALE Eddystone Pacific h.f. receiver, £300. JIL SX-400 u.h.f. receiver (no breaks) scanner, £300. Yaesu FRG h.f. receiver, £100. All good working order. M. Davidson. Tel: Liskeard 20969.

Write out your advertisement in BLOCK CAPITALS - up to a maximum of 30 words plus 12 words for your address - and send it, together with your payment of £2.30, to Trading Post, Short Wave Magazine, Enefco House, The Quay, Poole, Dorset BH15 1PP. Advertisements will be published in the earliest available issue and *SWM* reserves the right to exclude any advertisement not complying with the rules. You must send the flash from this page, or your subscription number as proof of purchase of the magazine.

Advertisements from traders, apparent traders or for equipment which it is illegal to possess, use or which cannot be licensed in the UK will not be accepted.

SWM JAN 90 TP

BANDSCAN

Peter Laughton

Welcome to our annual survey of developments in broadcasting as we enter a new decade. What will it hold for the short wave listener?

At the start of the new decade it is interesting to note the changes within the field of international broadcasting. Ten years ago we were looking forward to the first radio with digital readout (at a consumer price). It was in August 1980 that Sony launched their Sony ICF-2001. The original model used so much power the batteries got warm! Now we see a trend towards spectrum displays on very expensive amateur radio and professional monitoring receivers. All the indications are that this technology will reach the consumer level within a few years.

It also appears that the EBU is working on a short wave version of the Radio Data System (RDS) currently being promoted in several European countries for f.m. RDS is a sort of radio version of TV Teletext, allowing specially equipped radios to display which station they are tuned to without having to wait for a station ID. At the moment we are facing a chicken and egg situation in the UK, with only a limited launch of RDS facilities. We rang several new Independent Local Radio Stations to ask when RDS would be implemented, only to find it was very low on the engineering priority list.

The RDS specifications are designed for high-speed data transmissions. Of course there is no reason why the same idea should be adopted for medium or short wave, if the speed is reduced. In the case of short wave, a station ID and possibly the current broadcast schedule, would be sufficient. This might be what the a.m. part of the dial has been waiting for; f.m. can boast higher fidelity, but a.m. is much easier for people on the move, and it is perfectly adequate for 'talk radio'. Although many advertising campaigns indicated that f.m. is the way forward (e.g. Radio One FM), most countries are very reluctant to tamper with medium wave allocations and there is currently a huge investment in short wave going on - order books are full.

Pacific Update

The Christian Science Monitor Station in Saipan has been reactivated, and a second transmitter is now heard. The callsign of KYOI has been dropped in favour of new KHBI. On Tuesdays at around 1500UTC listeners in Asia hear them on 15.385 and 9.530MHz. Later at 2000 they're on 9.455 and 17.770, and at 2200 they were noted on 15.275 and 15.405MHz. So it looks as if they are back in action.

Meanwhile, the High Adventure Ministries based in California continue to hire airtime from short wave station KSDA on Guam. They announced a few weeks ago their plans for a station with the callsign KHBN also on Guam, so we rang Paul Hunter, who's technical manager for the station, to find out whether construction has, in fact, started. He told us that a problem over the land rights had arisen but that he was hoping that it would be resolved very shortly. Construction of the station shouldn't take more than around four months, once the green light is given. In the meantime the relay via KSDA runs from 0400 to 0800 on 15.225MHz. Currently the last two hours are in English. Meanwhile in Europe there has been a noticeable change in the output of Radio Berlin International. On Saturday the rallies in Berlin were carried live on both the domestic and external service, and on Monday English transmissions had a lot more detail than you would normally expect.

Publication Survey

Over the last few weeks we've been looking into publications for the international radio listener, comparing the situation with a similar survey we did two years ago. There appears to have been a 30 per cent increase in these type of books on the world market. There's a huge growth area in the field of radio nostalgia and vintage radio collecting, and at the same time a decline in the technical 'how it works' type of books. With a few notable exceptions, the overall cost of these sort of publications has risen some 20 per cent over the last two years. There are more books published by small publishing houses, and overall the quality of writing has gone up, probably due to competition. And those are just the books in English. Quite a lot of relevant books have also appeared in Spanish, Italian and German too.

Last year around this time we mentioned a special publication produced by the Fine Tuning group in the US designed for the more experienced DXer. Now FT Special publications have done even better with their latest publication called *Proceedings 89*. There are 27 articles, tightly edited and spirally bound together to preserve the reference work for the future. Even the best magazine articles can only touch the surface of many subjects, but in order to keep the interest of those who know the short wave bands but want to explore further, Fine Tuning has found some real specials, both within their own organisation, and by getting assistance from the Ontario DX Association and the North American SW Association.

However, whilst the articles go into a lot of depth on subjects like auroral propagation, the better short wave receivers like the Collins 51-J4 or the NRD-525, Editor John Bryant, says the market is broader this time round. The book is also critical, reviewing eleven pieces of equipment and is not afraid to point out where it thinks manufacturers have made major design flaws.

Personally, I think the highlight of this work are the feature articles at the back. John Fisher uses maps and a very readable dialogue to explain broadcasting in Brazil. And Hans Johnson, who has a masters in Arab studies, has written an excellent guide to broadcasting in the Arab world. The language barrier is probably the reason why these two areas of the world are not reported as often in English language periodicals, yet once you dig beneath the surface the result is fascinating. *Proceedings 89* can tackle topics in this way because it is non-profit making.

The charge of $19.50 does not include postage. That is an extra $3.00 surface mail outside that continent, or $15.00 dollars extra if you want it sent airmail. The book is over 25mm thick so that's why the airmail postage costs are so high. More information from Fine Tuning Special Publications, Rural Route 5, Box 14, Stillwater, Oklahoma, 74074 USA.

WRTH Awards

The *World Radio TV Handbook* have just announced the results of their awards for the past year. Here are the winners:

Best Communications Receiver 1989: ICOM IC-R9000. This set is expensive, but you buy a lot of new technology for the price.

Best Portable Receiver 1989: Lowe HF-225. Although only just in the portable class (it is really transportable), this is clearly the best budget receiver on the market for the serious s.w.l.

Most Innovative Software 1989; IBM MS DOS: Datacom 4. This is not just one program, but a series of solutions to match all types of computers to a huge variety of receivers and transceivers. The judges say they were very impressed at the level of knowledge displayed by this Florida based company. They have evidently well researched most of the incompatability problems, they know what can be solved and how.

Most Innovative Software 1989; Apple Macintosh: Radio Runner. This program combines the clever use of maps and database material with direct control of a wide range of receivers in the Icom and Kenwood family.

The program is extremely 'user friendly' and has obviously taken time and trouble to compile. The company is

based in San Francisco, California.

At the same time the *World Radio TV Handbook* announced a change in its editorial address. They're moving to the southern part of Amsterdam. The address now is *WRTH*, PO Box 9027, 1006 AA, Amsterdam, Holland.

ILG Update

We've carried several reports about Bernd Friedewald's *International Listening Guides* (see *SWM* December 1989), and problems that this West German company has faced in delivering goods on time and refunding customers' money if they don't want to wait. The company changed its name a while back to Peacewood Publications, which is a translation of the publisher's German name into English. In mid-November the *International Listening Guide* for the period September 1989 to March 1990 appeared in our mailbox (since we have a subscription). The 32-page, A4 publication is in two parts. It consists of the English language external and home services listed in time order, and an extensive, frequency-order, database of short wave broadcast stations, irrespective of language. It is clearly up-to-date, but then you could argue that, having waited five weeks after the start of the new season before it arrives, the list probably should be. Several *SWM* readers sent us clippings from the Italian radio magazine *Play DX* in which Peacewood Publications claimed their *1989 Broadcasting Handbook* was published earlier this year but that due to a computer error some people on the mailing list may not have received their copies. If that's the case then it seems strange that no magazine or broadcast station has yet reviewed the handbook.

Radio Netherlands has come out with a new *Booklist* designed to help short wave listeners find publication information. We're pleased to note that *Short Wave Magazine's* Book Service is listed. In all, Edition 12 is 48 pages of useful tips. What is more - it's free. Drop a line to Media Network, Radio Netherlands, PO Box 222, 1200 JG, Hilversum, Holland.

Canada: No Closure

In the middle of 1989 we reported that Radio Canada International in Montreal was facing possible elimination as a result of severe budget cuts throughout the Canadian Broadcasting Corporation. In the last couple of weeks it has emerged that RCI will face a financial cut next year, but only around 12 per cent of what was originally feared. As a result, RCI Director Andrew Simon, says it should be possible to maintain the service at its present level. They have submitted a proposal to the CBC Board of Directors which was later approved.

Indeed, there are plans to improve the audibility of the service in Asia and the Middle East. Andrew Simon visited South Korea about two weeks back to discuss the possibilities of a daily two-hour live programme exchange between Radio Korea's Overseas service and RCI. The negotiations were successful, although one final technical point needs to be ironed out, and the agreement has yet to be approved by the South Korean government. If successful, RCI would get transmission time *via* Seoul for its recently inaugurated Mandarin Chinese service towards Mainland China, and Radio Korea would use RCI's Sackville transmitter site for English and Korean programmes to North America. This would start around the end of March 1990. The transmission schedule has already been registered with the ITU as follows:

6.150MHz 1300-1330 to China
6.095MHz 1330 -1400 to Japan
9.700MHz 1330-1400 to Japan
9.700MHz 1430-1500 to China

RCI is also in negotiation with broadcasters in the Mediterranean and Western Europe to set up exchanges in time for the launch of an Arabic service in the middle of this year. It seems the majority of listeners in the Middle East prefer medium wave reception to short wave, which explains large audiences to Voice of America and BBC's Arabic services, both of which have a medium wave outlet in the region.

Although Radio Canada International's Sackville transmitter site is now approaching maxiumum output capacity, there are still gaps in the schedule when some transmitters are idle. Andrew Simon says they're now planning to rent out the airtime to anyone who wants it, subject to some restrictions. They're also investigating whether carrying advertisements between programmes might be a way forward. Currently, several international broadcasters accept advertisements. Radio Moscow is one example. Some programmes carried on the Voice of America Europe satellite service include commercials which are part of a music programme package that VOA buys from US independent programme producers.

Danish Green Light

The Danish government and the opposition have now agreed to fund the External Service for 1990, permitting Radio Denmark to hire airtime from Radio Norway International and thus close its short wave transmitter site just outside Copenhagen. Although the approval has been given, Radio Denmark expects the paperwork to take a few more weeks. Radio Denmark will therefore probably start the agreement mid-January. As yet, no fixed date can be given.

Radio Plays

In Holland it seems people still like listening to radio plays. At least the Dutch broadcasting corporation NOS feels that £275000 should be set aside next year to finance plays on the wireless. Various organisations interested in preserving Dutch cultural heritage have welcomed the decision. Earlier there had been talks of a much smaller budget being set aside.

Clarin Returns

Radio Clarin in the Dominician Republic, usually on 11.700MHz, has been absent for many months. Now a new crystal has been purchased in Miami and the station has reappeared on the new channel of 9.950MHz between 0100-0200UTC daily. The programme is in Spanish and runs under the title of *The Voice of the Foundation*. The foundation turns out to be a large group of Cuban Americans who have a rather critical view of the political situation in Fidel Castro's Cuba. They have hired time from Radio Clarin. This organisation is not as agressive as La Voz del CID, another Miami based Cuban exile organisation. La Voz del CID has its own facilities in Guatemala, so no longer needs to hire airtime.

We note that the Radio Clarin transmitter is currently running some 40kW after repairs to its transmission feeder line. The transmitter is often switched on earlier than 0100UTC and Radio Clarin's domestic network is then relayed on short wave.

TV Marti

Radio Marti has been on the air for years *via* medium and short wave beaming the US government position on various topics towards Cuba. Some experiments are currently underway to see whether TV is possible. Since TV signals only normally travel as far as the horizon, the US clearly needs to put up a very high antenna if its going to get a signal into Havana. The solution involves flying a special type of tethered balloon containing a transmitter and the antenna. Those tests are still underway in the Florida Keys. The transmission facility has to be hauled down in high winds (such as hurricanes). Meanwhile, the US congress has decided that, providing the tests are successful, TV Marti will be part of the Voice of America, thus creating a television division within the organisation. Radio Havana in Cuba says that if the transmissions start 'they have an immediate answer'. At the moment they are not saying what that is. □

When you are ready to graduate to real listening Look to Lowe

The New HF-225 Receiver

I am delighted that the HF-225 has been a raging success world wide, and I will just quote a letter received from one of our American customers:—

"I received my Lowe HF-225 about a week ago. Since then I have enjoyed many pleasant hours listening to it. As a past owner of receivers such as the Sony ICF2010 and Grundig Satellit 650 and 500, I must say that none compare to your Lowe HF-225. Without question, for hour after hour listening, nothing compares. I especially like the Genie key pad. Why more receivers do not incorporate such intelligent rergonomics is beyond me. I also thought both the instruction manual and the short wave book were well written, with the shortwave guide particularly enjoyable."

The letter comes from Chris Williams in Massachusets, but is typical of many letters we are receiving from all over the world about the HF-225.

Technically, the HF-225 distinguishes itself by having a low phase noise synthesiser, which gives a reciprocal mixing performance not far off that of "professional" receivers costing up to ten times the price, and that's not just advertising talk, it is really true. The synthesiser actually tunes in steps of 8Hz, which betters most other receivers and gives a smooth "VFO" feel when tuning. As one user has already commented "If you tuned the HF-225 with your eyes closed, you would believe you had a £5,000 receiver on the table".

The HF-225 has a range of low cost options which extend its appeal; such as a keypad for direct frequency entry, which simply plugs into a rear panel jack; an active whip aerial; a rechargeable battery pack for portable use; and an attractive carrying case which protects the receiver whilst allowing full operational use. The new D-225 detector option is really something special, because it gives true synchronous AM detection for dragging sensible programme quality out of a signal being affected by selective fading distortion. The same option also gives narrow band (communications) FM demodulation.

Every listener these days appreciates a receiver which offers facilities for memorising favourite or regularly used frequencies, and the HF-225 offers 30 memory channels for this purpose. Using the memories has been made particularly versatile, because the operator can review the contents of the memories whilst still listening to the frequency he is using, or alternatively in the "Channel" mode, can tune through the memory channels using the main tuning knob, listening to each frequency as it appears on the display. Just like having a bank of single channel receivers under your control. Terrific for checking HF airband channels for activity.

Unlike most HF receivers on the market, the HF-225 comes complete with all filters fitted for every mode:— 2.2kHz, 4kHz, 7kHz, and 10kHz. There is also a 200Hz audio filter for CW, and if the D-225 detector is fitted, a 12kHz filter for FM. The correct filter for each mode is automatically selected by the receiver mode switch, but further selection can be made by the user from the front panel and the receiver remembers which filter was last used. True versatility and all built in at no extra cost. When selecting filters in use, the filter bandwidth is shown on the main display.

The display itself is a high contrast liquid crystal type, and shows frequency, filter bandwidth, detector lock (when D-225 is fitted), and whether the receiver is in memory mode. Automatic placing of the decimal point takes place as the receiver is tuned, so there can be no ambiguity in reading.

At the end of the day, what does the HF-225 offer you as a user? I can do no better than quote what was said by Rainer Lichte about the earlier HF-125:—"The HF-125 is a serious piece of equipment; don't be deceived by the unassuming front panel and the lack of spectacular features. The HF-125 will outperform most competitors. If you like an honest approach to receiver design, this is it. British understatement at its best".

The HF-225 is even better.

HF-225 £395 John Wilson

FREE

Send four first class stamps to cover the postage and we will send you, by return of post, you FREE copy of "THE LISTENERS GUIDE" (2nd edition), a commonsense look at radio listening on the LF, MF and HF bands. Its unique style will, I am sure, result in a "good read" but underneath the humour lies a wealth of experience and expertise. You will also receive detailed leaflets on our range of receivers and a copy of our current price list.

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25 YEARS IN SHORTWAVE

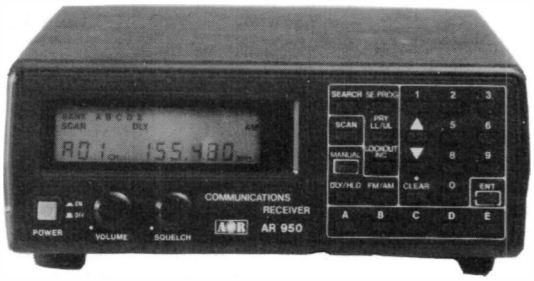
When it comes to scanners Look to Lowe

AR-3000
Continuous all-mode (including SSB) from 100kHz to 2036MHz makes the AR-3000 the most amazing receiver ever to be made. Trouble is, they can't make enough of them to meet the world wide demand, so there is a lengthy waiting list. Well worth patiently waiting for, the AR-300 has stunned the market by its specification and sheer performance.

AR-3000 £765

AR-2002
The best known, most respected scanner, in the world. The AR-2002 offers continuous coverage from 25-550MHz and 800 – 1300MHz, and all mode (AM, FM(W), FM(N)). This scanner has consistently been the leader in the field, and has yet to be equalled. Scanning, searching, just enjoying listening; it's all there with the AR-2002.

AR-2002 £487



AR-950UK
A new addition to the AOR range is this base station/mobile scanning receiver, with all the features and performance we have come to expect from AOR. Frequency ranges 60-88, 108-136, 137-174, 220-290, 291-380, 406-470,and 830-950MHz. AM or FM available on any frequency. 100 memories. Everything in fact that you need in a scanner, and from the best maker in the world. The AR-950UK comes complete with mains power supply and two aerials for top performance.

AR-950UK £249

AR-900UK
What a scanner; The AR-900UK covers all the bands you ever needed, in AM or FM modes (on any frequency); has 100 memories built in, enables you to monitor so much of interest — and all in a tiny hand held package. No wonder thousands are already in use. Designed for the UK listener, the AR-900UK offers every facility at a reasonable cost. Frequency ranges 108-136, 137-174, 220-280, 300-380, 406-470, and 830-950MHz. Send for details now.

AR-900UK ~~£235~~ NOW £199

AR-800E
The baby of the family, but what a baby. Covers 75-105, 118-174, 406-495, and 839-950MHz in AM and FM modes. Comes complete with rechargeable battery pack, charger, and flexy aerial. As with all AOR models, every channel spacing in current use can be programmed, so you needn't miss a transmission. All you ever wanted in a low cost scanner.

AR-800E ~~£199~~ NOW £165

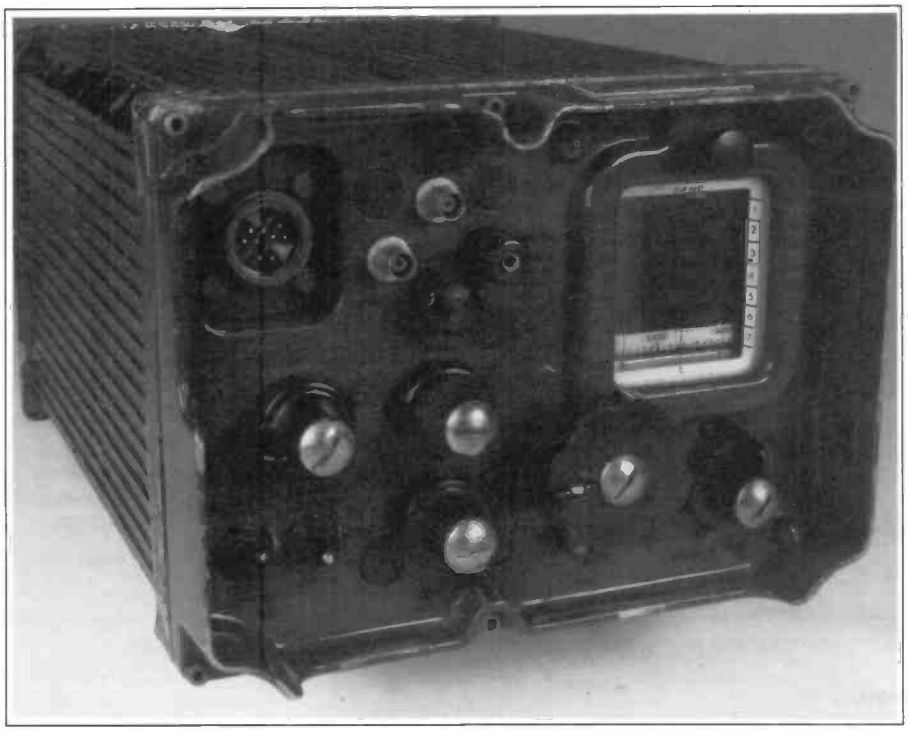
For the past 25 years Lowe Electronics have specialised in seeking out the best in radio and bringing it to our customers. Those customers will also tell you that we have another speciality — looking after them. Whatever is best in radio, we sell. Whatever we sell, we back with really expert advice and service. We are pleased to represent the best companies in the receiver world, and in addition to the AOR range shown here, we also distribute receivers from Signal Communications and WIN, two of the top names in Airband radio. For full information and a copy of our Airband Guide, simply send us four first class stamps and mention that you saw our ad. in Short Wave Magazine". Happy listening.

Shops in **GLASGOW** Telephone 041-945 2626, **DARLINGTON** Telephone 0325 486121, **CAMBRIDGE** Telephone 0223 311230, **BARRY** Telephone 0446 721304, **LONDON** Telephone 01-429 3256, **BOURNEMOUTH** Telephone 0202 577760
All branches are closed all day Monday.

CONVERTING THE R210 RECEIVER

Tom Harrison GM3NHQ
Part 1

It is not essential to use the very latest, high technology, receiver to get pleasure from short wave listening. You can enjoy yourself by modifying a cheap ex-MOD receiver and save money into the bargain.



The R210 receiver as purchased for £58 from J. Birkett of Lincoln.

I recently celebrated the thirtieth anniversary of becoming a licensed radio amateur and, in a short trip down memory lane, spent a pleasant couple of hours leafing through my old logbooks and boxes of QSL cards, remembering that first QSO - pre-arranged with GM6TF; the triumph of the first transatlantic contact with 15W, a dipole and R1155; the fun of Field Days when something usually went wrong; and lots more.

Ah, happy days! Subsequent operation on 28MHz with the FT-757 battering out 100W to all parts of the world seemed to have lost a bit of magic and a decision was taken to lay aside the modern, all-singing, all-dancing rig and re-create a 1960s style station, hopefully to enjoy again some of the old thrills of long-distance, short wave communication using equipment with a bit of 'soul' in it.

Fun

A glance through the magazines revealed a lack of ex-MOD equipment that might form the basis of a beginner's station.

However, the R210 appeared to be the latest of the cheap surplus releases offering the possibility of conversion, with the prospect of some fun in the process.

The other sets on offer - the R209, Eddystone 730 and the RA17 - were all rejected as being 'ready to use' and lacking the necessary 'fun factor'.

A handbook for the R210 was purchased and it soon revealed itself to be full of promise, offering a few pleasant hours with the soldering iron and reasonable performance at the end of it.

So, one was bought for conversion.

General Description

The R210, as obtained unmodified, is in a diecast aluminium box 356mm deep with a front panel 250 x 190mm and weighing 16kg. It was obviously designed to withstand being dropped from an aircraft or run over by a tank! Perhaps of more importance, it is designed to be run in conjunction with a companion transmitter, the C11, from which it usually derives its power supplies and to which it is connected by a cable and Plessey MkIV, multi-pin connector, which is not easily obtained in 'civvy-street'.

Once the receiver has been withdrawn from its case - after unscrewing the six socket-headed screws around the front panel - you will see that it is a thing of beauty. The construction is based on a series of sub-assemblies which are bolted to a central, T-shaped, diecast frame. The top of the 'T' forms the front panel, with all the controls and connection sockets, and the leg of the 'T' forms the support to which the sub-assemblies are bolted and to which they are hinged for ease of access for maintenance.

Electrically the receiver is as shown in the block diagram, Fig. 1.1. Note the r.f. stage, separate local oscillator, three i.f. stages, b.f.o., noise limiter and calibrator. It covers a range from 2 to 16MHz in seven bands approximately 2MHz wide and has a 'film strip' dial. Valves are used throughout and a 24V d.c. supply is required at around 2A. The audio output is intended to drive low-impedance headphones and either long wire or dipole antennas can be used.

The 'works' are distributed between sub-chassis for p.s.u., i.f. strip, r.f./mixer and a.f. output/calibrator. There are coaxial output sockets for i.f. output to drive an RTTY decoder in service applications and, in my example, local oscillator output, for reasons unknown. The calibrator gives markers at 10 and 100kHz intervals and there is a narrow bandwidth, audio filter for c.w. reception.

The receiver will form the basis of an effective station for the 3.5, 7, 10 and 14MHz amateur bands as it stands and

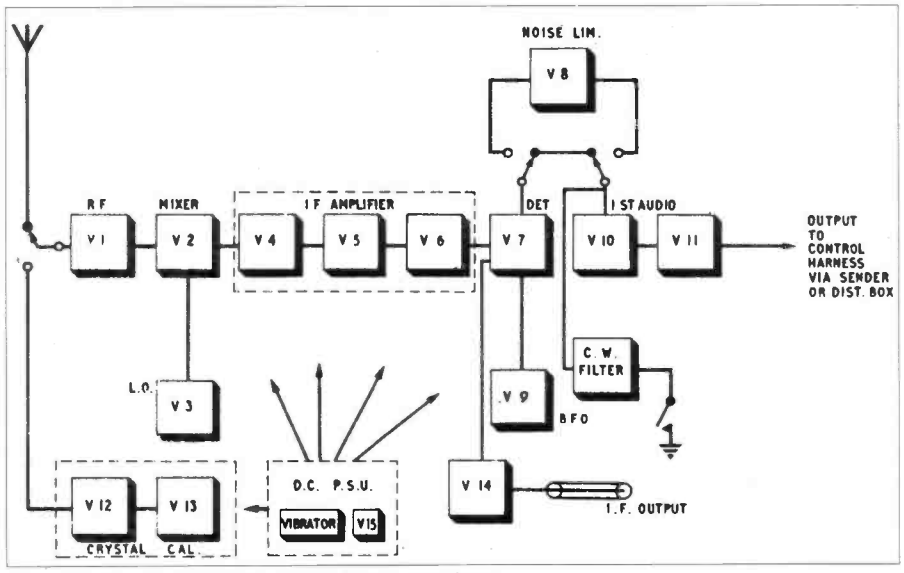


Fig. 1.1: Block diagram of the R210 receiver.

CONVERTING THE R210 RECEIVER

Table 1.1: Initial Test Set Up

Tag	Function	Mods
E1	6.3V a.c. heaters	Link to F8
E2	h.t.+ from p.s.u.	Link to E7
E5	+24V d.c. input	
E6	24V supply sense	Link to E5
G3	Headphones	to Phone jack tip
G4	Headphones	to Phone jack body

will give a good account of itself on other bands when used with converters. It is stable, has good resettability, bandspread and selectivity on c.w. and it receives s.s.b. and a.m as well.

Beginners

The R210 makes a good starter receiver for beginners, requiring very little work to 'de-mob', as this article will show. Newcomers should not be put off by the use of valves - integrated circuits and microprocessors are not obligatory for amateur communications!

Familiarisation

Before starting the 'de-mobilisation', it is well worth spending a few hours with the handbook, familiarising yourself with he wonders of the machine.

Undo all the screws holding the sub-units in place and swing them out. Check the various interconnecting tag-strips and generally admire the workmanship of the job. Fig. 1.2 shows the location of the tag-strips. Then get it going in the 'as found' condition.

Initial Testing

The first job is to get power into the set. The interlinks to the companion C11 transmitter must be bypassed by making the links and modifications shown in Table 1.1. Connect 24V d.c. with the positive lead to tag E5 and the negative lead to the chassis.

With a metre or so of wire on to the ROD AERIAL terminal, you are ready for business. Switch on and listen for the sound of the vibrator humming, followed a few seconds later by the headphones springing into life. If nothing happens, you've got a trouble-shooting session ahead. It may be just the 2A fuse that's gone. If it's the vibrator that's US, don't worry as you won't need it if you are going to convert the set to mains operation. Assuming the set is OK at this stage we can set about civilianising it.

Before getting to work with the wire cutters and soldering iron, spend a few minutes thinking about how far you want to go with the conversion.

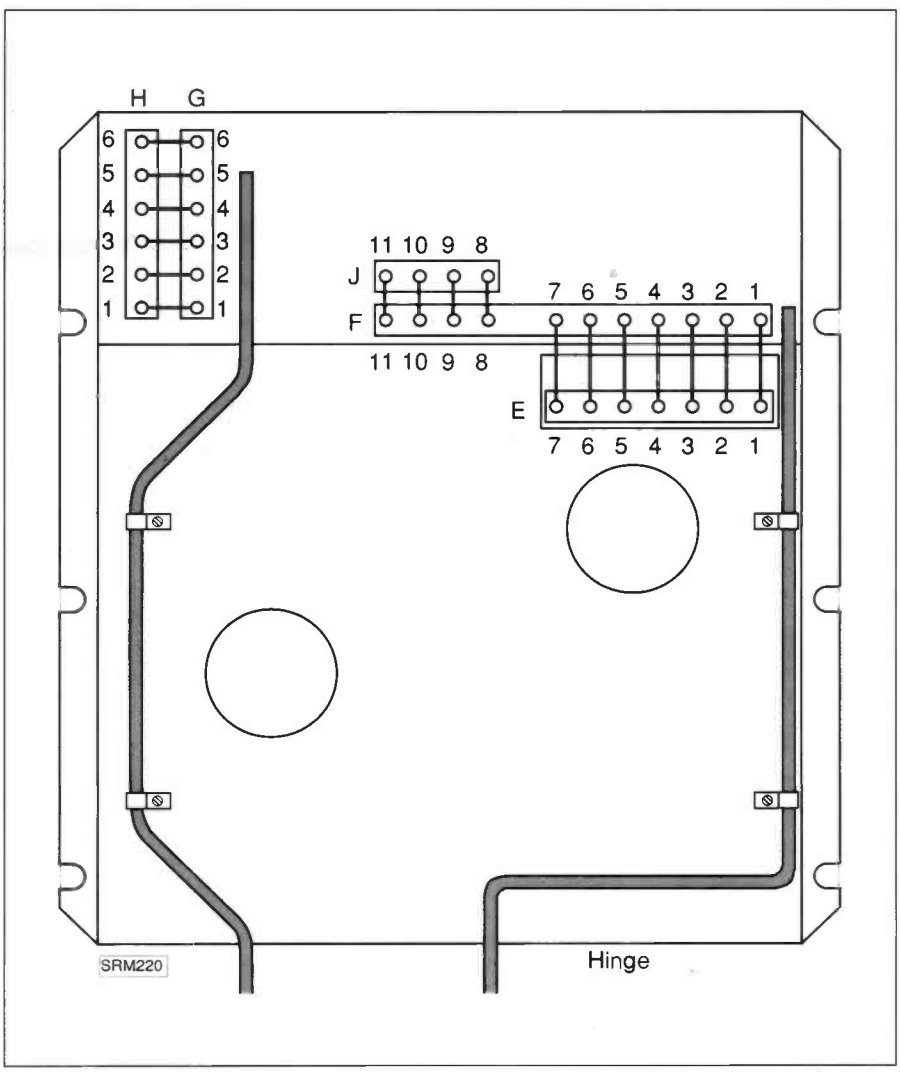


Fig. 1.2: The positions of the various tag-strips on the swing-out p.s.u. chassis.

Table 1.2: Options.

Power supply	24V d.c. as supplied **or** 24V a.c. external transformer **or** 48V a.c. external transformer **or** 240V mains built-in transformer.
Speaker o/p	New o/p transformer.
TX/RX switch	Mods to bias circuit required.
SSB filter	New p.s.u. chassis to create space.

Options

For instance, you might want loudspeaker output as well as headphones. Or you might want to operate in conjunction with a transmitter, so you will want to incorporate a muting system, and so on.

I have listed a few options in Table 1.2 and what **you** want determines what **you** need to do!

However, as this article has been

Abbreviations	
A	amperes
a.c.	alternating current
a.f.	audio frequency
a.m.	amplitude modulation
b.f.o.	beat frequency oscillator
c.w.	continuous wave (Morse)
d.c.	direct current
i.f.	intermediate frequency
kg	kilograms
kHz	kilohertz
MHz	megahertz
mm	millimeters
MOD	Ministry of Defence
p.s.u.	power supply unit
QSL	verification card
QSO	radio contact
r.f.	radio frequency
RTTY	Radio TeleTYpe
RX	receiver
s.s.b.	single sideband
TX	transmitter
US	unservicable
V	volt
W	watt

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SCANNING

Alan Gardener

As the end of the year approaches and a new decade starts Alan takes a look at what the New Year may bring.

This issue of *SWM* not only marks the beginning of a new year but also the start of a new decade. Short wave listening has of course been around for many years but it is really only during the 1980s that the v.h.f./u.h.f. listening side of the hobby has taken off. This is mainly due to the availability of cheap microprocessor chips, development of r.f. synthesiser design and modern construction techniques making suitable receivers readily available. Most current scanning receivers simply could not have been built in the early 1980s as many of the main components common in modern designs simply did not exist. Indeed technology is increasing at such a rapid pace it is difficult to look more than a few years into the future as far as receiver design is concerned.

Looking back over the past year several trends start to become apparent. For example, several manufacturers are now producing top-of-the-range models featuring very wide frequency coverage from a few tens of kHz right up to the microwave bands in the low GHz region of the r.f. spectrum. With one receiver it becomes possible to monitor transmissions from all corners of the globe - and beyond!

If you don't find the thought of this being available in a compact desktop unit exciting, how about Icom's announcement of the IC-R1 which will have almost as large a frequency coverage, but in hand-held form.

Surface-mount technology makes the construction of such designs possible at economical prices without sacrificing performance. For this reason I believe that the majority of scanners sold over the next few years will be hand-held models. Designs such as the Jupiter II are already setting the trend and are beginning to make some designs look very dated.

Computer Control

One aspect of the hobby which seems slow to take off is computer control. This does surprise me as a scanner operating with a computer controlled search routine is a very effective way of finding new frequencies. There seems to be two main reasons for its current lack of popularity.

The first of these is the difficulty of operating a computer and receiver in close proximity to each other without the computer generated hash masking wanted signals. The second is the difficulty in intercommunication between the receiver and the computer. Many receivers only allow the control of certain functions remotely and do not give any indication back when a signal is received. This seems a little pointless to me as it is often easier to turn a knob on the front panel of the receiver than it is to type in a command on a keyboard.

The first problem may be solved by tighter controls on unwanted radio emissions from electronic equipment. New European specifications are currently being drafted which may help to improve this situation in the long term.

The second problem is made a lot easier with receivers such as the AOR AR-3000. This has a standard RS232 port built-in and uses a simple series of ASCII commands to exchange data.

The advantage of this is that less computing power is required in order to communicate with the receiver, making it possible to use some of the cheap lap-top or pocket computers now available.

Data Transmission

A computer may form another important function for the listener in the future as many existing radio users change over to data transmission rather than direct speech for passing messages.

Many companies are currently experimenting with such systems, as they offer several advantages when used on busy radio channels.

One example of this is a taxi company operating in London in which cab drivers 'bid' for jobs by pressing a button, the details of which are then printed out on a small dashboard-mounted unit. This saves airtime, gives a printed ticket with the job details, avoids distracting the cabbie whilst driving and gives an instant update of taxi deployment back at the control centre.

Digital Speech

Other trends in the field of communications include the further development of digital methods of speech transmissions, starting in the early part of the year with the launch of the CT2 range of cordless telephones by several manufacturers. This system uses a digital transmission to rapidly switch between transmit and receive, permitting normal telephone type conversations on only one radio channel. One other advantage of this technique is that it offers security against casual eavesdropping. CT2 is only the first development in a whole series of projects leading up to a world-wide personal communications system. The next stages include the introduction of a Pan-European, digital, cellular telephone system and the the next generation of cordless telephones. After CT2 - PCN the Personal Communications Network?

As the sales of sophisticated receiving equipment increase many users of radio-communications equipment are becoming increasingly aware of the problem of casual eavesdropping.

Until now providing protection against unauthorised listeners has been difficult. Equipment has generally been very large and expensive to produce making it only suitable for users such as the Military or Government departments.

Modern components such as large scale integrated circuits and surface mounted semiconductors have now made scrambling equipment small enough to be mounted inside hand-held tranceivers and cheap enough to be purchased by private users.

I would expect to see such systems being introduced initially for 'sensitive' communications in the fairly near future.

One other aspect of security that may experience growth during the new year is that of r.f. listening devices or 'bugs'. These have always been available to the public by mail order from advertisers in magazines, but during a recent walk down Tottenham Court Road in London many of the electronics shops had several different models on open display. Although most of them were relatively unsophisticated using w.b.f.m. in the 110-120MHz region, one or two were crystal-controlled, offered high sensitivity and a reasonable transmission range. The sales person I spoke to said that sales had been good and that they were now offering a new range of 'bug' detectors. Again, surface mount components are responsible for this new 'consumer' product.

Spectrum Allocation

Frequency allocations are also likely to change during the next few years as we move closer towards a common European market. Spectrum has already been set aside at around 1GHz for Personal Communication Networks but bands at lower frequencies will have to be found for other services such as Paging systems.

Looking at the use of frequencies, one of the biggest changes to UK allocations is now nearly complete with the Police and Fire services moving out of the middle of the v.h.f. f.m. broadcast band. This is in order to make way for the next tier of national radio stations. Towards 1995 the top end of the band around 105-108MHz will also be cleared of its existing users making way for more low-power community stations.

Looking at two other bands previously used for TV broadcasting I predict that greater use will be made of the old Band

I TV allocation for low power devices such as short range data links and cheap radio-operated consumer goods. In line with current policies these devices do not need to be licenced providing that they carry a type approval label. An allocation at 47.4MHz has already been set aside for radio car alarms and several five channel 'Hands free' walkie-talkies, operating around 49MHz, are now being advertised. In Band III the DTI has just released an additional 50 channels in the lower sub-band (176.5-183.5MHz & 184.5-191.5MHz) to trunked system operators. This is a bit of a surprise in the industry as this portion of the band was being held in reserve for use by systems utilising more spectrum efficient methods of transmission, the general feeling being that the current allocation was more than adequate for the present number of users.

One other major change just announced is the closing down of the BT System 4 radio telephone service. This will leave a valuable chunk of spectrum free at 163MHz, the future use of which is still a mystery. Watch this space!

Scanners (3rd Edition)

Those of you who already have a copy will not need an introduction to Peter Rouse's book *Scanners* which is a good guide to the use of scanning receivers and the principles behind their operation. First published in 1986, the book has gone through several stages of revision and has just been further updated in what is now its third edition.

The book covers just about every aspect of the hobby and my well thumbed second edition finds pride of place on the bookshelf. The contents form an invaluable guide for the newcomer to the hobby, with many of the more complicated aspects of radio communications explained in concise and easy-to-understand terms.

I usually recommend the book to listeners who write to me with questions relating to the use of scanning receivers, as I find its contents quickly help the reader to obtain a wider understanding of the hobby's many different facets.

Major changes in this edition include an additional 45 pages of information, updating of the chapters devoted to current equipment and accessories and completely revised sections relating to UK frequency allocations and spot frequencies.

The inclusion of a frequency allocation list makes the book very good value for money, especially when one considers that the actual content of the list is as great as that found in many of the currently available frequency guides.

Highly recommended and available from the *SWM* Book Service!

Jupiter II Modification

In line with many requests here is a method of removing the irritating keyboard confirmation 'bleep' present in the Jupiter II hand-held scanner.

As with all modifications beware of the conditions of guarantee and be sure you know your own limitations before you start on any work. The nice part about this modification is that it does not involve any soldering and can easily be reversed - should you need to.

The first step is to open the battery compartment and take out the batteries. Remove the two small cross-headed screws located on either side of the battery compartment and the two small black cross-headed screws located either side of the case next to the carrying strap lugs.

Very carefully separate the two halves of the case. Take a good look at how the carrying strap lugs and the flexible plastic battery separator are held in place so that you can replace them later. Do not pull the two case halves too far apart as a small capacitor is soldered between the main circuit boards attached to each half.

Looking at the p.c.b. mounted in the rear half of the case, locate the two white, multi-way connectors just next to the case cut-out for the battery compartment, see Fig. 1. Carefully unplug the larger of the two connectors labelled KP7. Note the connector orientation so that you can replace it later.

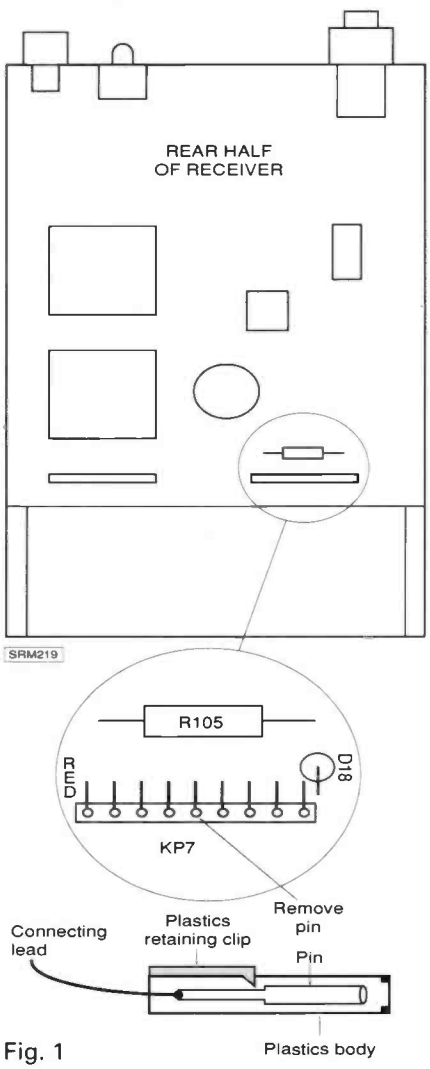

Fig. 1

Looking at the loose connector locate pin 5 (count along from the red cable). If you examine the connector you will see that each pin is held in by a plastic retaining clip. Carefully lift the clip with a small jeweller's screwdriver and pull out the pin with the connecting wire.

Refit the connector and insulate the pin you have just removed with some tape. Tuck the unused lead neatly back into the case and carefully reassemble the receiver, not forgetting the carrying strap lugs and battery separator. Finally replace the batteries. You should now have a 'beep-free' hand-held. If you wish to restore the 'beep' at any time simply refit the pin in the connector.

My thanks to **Bob Munns** for allowing me to try this modification on his receiver.

What Can I Hear? Part 10

This months examination of the radio spectrum begins at 470MHz and the start of u.h.f. TV Bands IV & V.

TV transmissions in this band are arranged in 8MHz wide channels starting at channel 21 (471.25MHz vision carrier frequency) and ending at channel 68 (847.25MHz Vision carrier frequency). The TV signal consists of several different components starting off with the amplitude modulated vision signal. This is very complex and consists of several different frequency components. When you tune to a vision signal with your scanner the most noticeable sound you will hear is the low frequency 'buzz' of the 50Hz field synchronisation pulses. These are transmitted to ensure that the TV receiver starts each complete scan of the TV screen at the same point for each picture. As well as this information 15kHz line synchronisation pulses are also transmitted to ensure that each line of the picture starts in the same position.

If you listen to the vision 'buzz' for a few seconds you will find that the 'tone' alters as the picture information changes. If you tune higher in frequency across the vision signal you will find that the level of vision 'buzz' gradually decreases. At around 4.5MHz above the vision carrier frequency as well as the 'buzz' you may be able to detect traces of the colour information which is audible as a slight 'swishing' noise.

At 6MHz above the vision carrier frequency you will find the sound signal - this is transmitted using w.b.f.m. and provides good music quality. However, the next generation of TV receivers will offer very high quality stereo sound which

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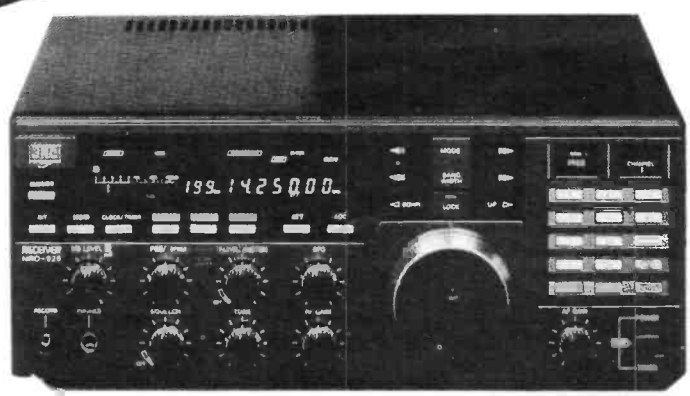

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SCANNING

Frequency Allocations 470 - 868MHz

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	UHF TV Band IV
582.000	
	Aeronautical Radio-navigation (Ground radar until 1995)
590.000	
	Aeronautical Radio-navigation (Ground radar)
598.000	
	Aeronautical Radio-navigation (Ground radar until 1995)
606.000	
	Radio Astronomy
614.000	
	UHF TV Band V
854.000	
	Government/TV & Radio OB links UHF TV (Possible extension to Band V)
864.000	
	CT2 Digital Cordless Telephones
868.000	

is already being transmitted on an experimental basis by several TV stations around the country. The stereo information is carried in digital form at around 6.552MHz above the vision carrier frequency. Exact frequencies are published in pocket guides available from both the BBC and IBA free of charge. Alternatively, the *Maplin Catalogue* has a very useful list of TV and Radio stations printed in the section relating to antennas.

There is a gap of four channels (35-38) in the middle of the TV bands, this has until recently been used for aeronautical radio-navigation purposes. Some of the main air traffic control radar stations dotted around the country being the main users. However, it now looks as if the proposed channel five TV service will make make use of some of these channels plus perhaps one new channel at 855.25MHz. This is also putting pressure on the radio astronomy alllocation at 606 - 614MHz.

Moving a little higher in frequency the segment 854-864MHz is generally allocated to government users. These tend to be high power troposcatter links between the UK and the rest of Europe, although there is some sharing of frequencies between 854-862MHz with use by TV and Radio companies for short range outside broadcast links.

Allocated to the new CT2 digital cordless telephone service is 864-868MHz. I would expect that use of this small band will rapidly increase over the next few months as the four companies competing against each other to provide the service hurry to get their base stations operational.

More next time as we take a look at what is likely to become one of the busiest portions of the spectrum during the next decade.

As usual all letters to PO Box 1000, Eastleigh, Hants SO5 5HB. Until next month - Good Listening and have a Very Happy New Year. □

Abbreviations	
f.m.	frequency modulation
kHz	kilohertz
MHz	megahertz
OB	outside broadcast
r.f.	radio frequency
u.h.f.	ultra high frequency
v.h.f.	very high frequency
w.b.f.m.	wide band frequency modulation

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Semiconductors
Diodes
1N4004 4 D1, 2, 3, 4

Miscellaneous
Transformer Kit (Maplin YJ62S or Electromail 207-554); Enamelled copper wire 0.2mm dia (36 s.w.g.), 0.71mm dia (22 s.w.g.); Mains socket (Maplin HL15R or Electromail 481-191); Insulating cover for mains socket (Maplin JK66 or Electromail 544-112).

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J. Birkett, 25 The Strait, Lincoln LN3 1JF. Tel: (0522) 2076
Electromail, PO Box 33, Corby, Northants NN17 9EL, Tel: (0536) 204555.
Maplin Electronics, PO Box 3, Rayleigh, Essex SS6 8LR. Tel: (0702) 554161.
Sitek, 20 The Broadway, Swindon, Wilts. Tel: (0666) 89307.

Table 1.3: Connections to PLA for External 24V d.c. Operation

Pin	Connections
A	+24V d.c.
B	Ground (0V)
C	Link to D
D	
E	Link to F
F	
G	Link to B & L
H	
J	
K	Headphones (50Ω)
L	Headphones

written primarily with the beginner in mind, I'll give details of the conversion to mains operation with loudspeaker and phone output only in mind - refinements such as s.s.b. filters and TX/RX switching can be added later.

Part 2

In the second part of this article we will start attacking the receiver in earnest. Why not get an R210 and have some fun in the New Year? □

AIRBAND

Godfrey Manning G4GLM

That old problem of co-channel offset relay stations appears in the Civil Aviation Authority (CAA) *Aeronautical Information Circular* 106/1989.

When two stations are on the same nominal channel, they are in fact offset respectively by +5kHz and -5kHz. With three stations, two are offset by ±7.5kHz (the third being on channel centre). Four stations are offset by ±7.5kHz and ±2.5kHz. Unfortunately, when two such stations are simultaneously in reception range, the carriers mix in the receiver to produce a heterodyne or beat note of, say, 5kHz. Being just above the audio passband, this can be misinterpreted by the squelch as noise and the receiver mutes instead of allowing the perfectly good signal to be heard. Some airborne receivers allow for this problem by opening the squelch if a carrier is nevertheless present; but it has been found that up to 20μV is needed for this to happen in certain cases. To ensure reliable squelch opening when carrier is present, the receiver should be set to respond to a carrier level as low as 12μV potential difference.

Frequency & Operational News

The *General Aviation Safety Information Leaflet* 10/89 from the CAA informs us that at Aberdeen (Dyce) the 17/35 runway has changed to 16/34.

Another CAA publication, *Aeronautical Information Circular* 93/1989, warns of a problem that has appeared in this column before: the extension of v.h.f. band II broadcasting to 108MHz (the previous top limit was 100MHz). This removes the guard band between broadcasting and the 108-117.95MHz aeronautical navigation band. New installations must be resistant to any consequential intermodulation or desensitisation as from January 1995; all installations must meet this standard by 1998.

Mark Graham (18 Sheffield Street, Leicester LE3 0GX) reports 121.025MHz to now be in use as a London Air Traffic Control Centre relay in the Midlands area. Mark welcomes direct correspondence on airband topics, should any other readers be interested.

To confirm the n.d.b. change mentioned in December 89, **Jeremy Cottingham** (Gainsborough, Lincolnshire) writes that HMS (365kHz) is the Humberside beacon that has been re-coded KIM (remember that Humberside was once called Kirmington).

Information Sources

The CAA do two interesting video cassettes (standard VHS-PAL), which each last around quarter of an hour. They are Safety Sense 1: *Fuel Management* and 2: *VFR Navigation*. They're not expensive at £14.22 for the pair (VAT and postage included) from: CAA Printing and Publication Services, Greville House, 37 Gratton Road, Cheltenham, Gloucestershire GL50 2BN. Note the changed telephone number: (0242) 235151. While you're at it, ask for a free *Publications List*. Tape 2 is the more interesting from the airband point of view; as well as explaining what not to do, it includes examples of the radio procedure to use when calling for help.

It's Christmas Quiz time again and Godfrey has made the questions harder than last year, but you have twice the opportunity to win!

Airport Timetables UK runs to a winter edition for the first time. It's £8.60 including post from The Midland Counties Aviation Society, 27 Highwood Croft, Kings Norton, Birmingham B38 8ET, but of course members get it at discount, so why not join? Society members receive one of the most informative monthly bulletins of any aeronautical enthusiasts' club.

John Buying (Hitchin, Hertfordshire) recommends a frequency list: *The Complete VHF & UHF Airband Guide* by Ron King.

Agony Column

A problem from **P. Barham** (Ashton-under-Lyne, Lancashire): to answer your point, I know of no aeronautical channels where split frequencies are used. The aircraft and controller always use the same frequency so as to prevent problems such as confusion, two stations transmitting at once, two receivers being tied up in the cockpit, etc. Some receivers may not be selective enough and could hence give a misleading impression of received frequency especially if strong signals are present. Can you send me any more information?

To **Neil A. Oakley** (Whitstable, Kent) who asks if I can recommend a receiver, the answer is regrettably 'No!' This may seem disappointing - but my choice would not necessarily suit you.

Let me answer a slightly more general question: how would I go about choosing a receiver? First, list the facilities required: top of the list comes frequency coverage, next comes any need for portability (handheld?) and after that you can add whatever special features you are looking for. Next, size up the market: reviews and adverts in this magazine can be useful here. Draw up a two-way table with required features down the side and receiver models along the top. Tick off the cells in the table as appropriate. Shortlist those sets offering the maximum number of essential features within your price range.

Lastly, the hardest, but most essential bit: visit some shops (more than one if you can!) and get a demonstration. Is the set sensitive enough? Is it selective (tune to an adjacent frequency and ensure that transmissions don't break through). Lastly, remember that the antenna is an essential part of the system too.

As a general help, let me remind readers that the v.h.f. civil aircraft band has navigation aids (including a.t.i.s. transmissions) on 108-117.95MHz 50kHz spacing; and communications 118-136.975MHz 25kHz spacing, all a.m. VOLMET and relay transmissions can be co-channel offset by up to 7.5kHz.

To **J.P. Robins** (Ealing): I cannot say why your Bearcat 100XLT won't behave since I can't see it in operation. Don't forget the antenna; distance at v.h.f. is limited to a little beyond line-of-sight in the case of ground stations, but a well-sited external antenna can improve things. Look at the lengths some of our s.w.l. readers go to when trying to receive the 144MHz band! It is a disappointment, though, that the dealer can't help. If you have had satisfaction from other makes of receiver, you might consider the manufacturer's very fair 'money back' offer if all else fails. Again, more information would help.

Another problem receiver was **Alec Pacey's** AR-900 which would slightly alter certain frequencies as entered. **John Coulter** (Winchester) found that his set converted 121.020 into 121.018MHz; very curious. The correct frequency should have been 121.025MHz.

Jeremy Cottingham wants to know if the Anglia Radar u.h.f. channel can also in some way relay traffic on the same facility's v.h.f. allocation. Any ideas?

Sorry I can't reply direct to enquiries - but all answers appear in this column.

Follow-Ups

In the November 89 issue I suggested that some aeronautical terms might have ambiguous meanings. **Dave Taskis** (Romford, Essex) sends some more examples and here is a selection of them:

USB: Type of modulation designed to render h.f. oceanic voice transmissions incomprehensible.

Flow management: Method of preventing passengers from reaching their destinations on time.

West Drayton: Proposed site for the National Computer Museum (open 24hrs).

VMC: Not applicable in the Manchester control zone.

Radio navigation: A system of beacons used by navigators to confirm that they are lost.

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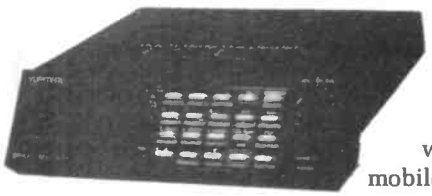

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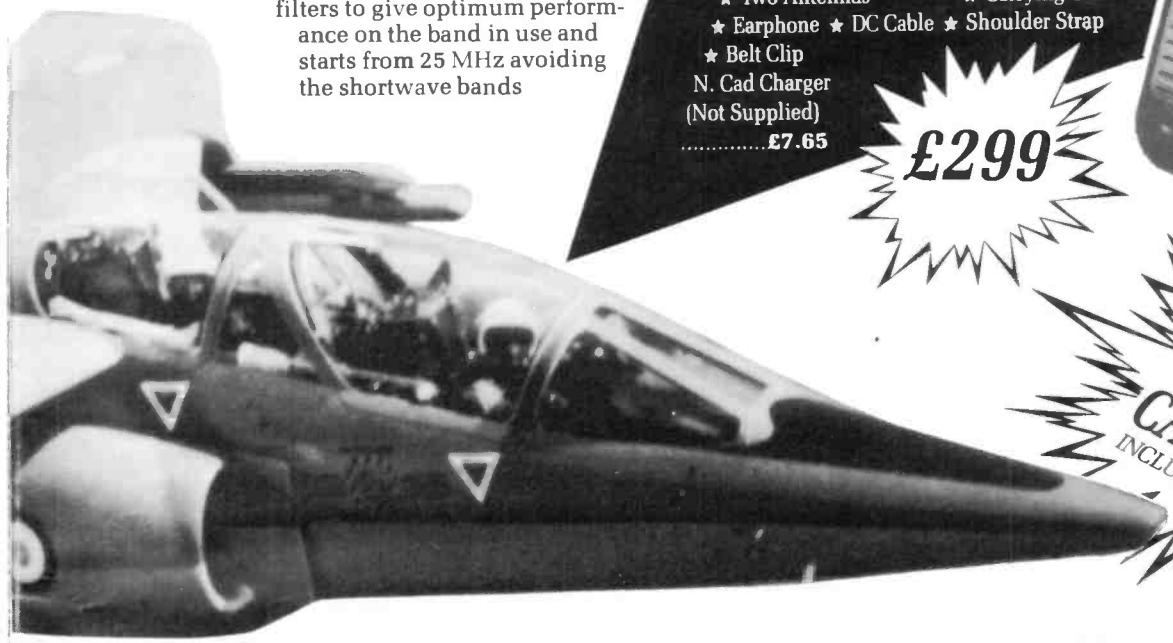

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Callsigns were summarised in December 89, where **Tom Hunter** (Largs, Ayrshire) will find EXPRESS to be Federal Express and Starjet to be Novair. I can't place EAGLE or JETSTAR - I'm sure someone else out there can, though. Tom recommends the **Bill Laver** *VHF/UHF Airband Frequency Guide* and the **T.T. Williams** *Flight Routings* (both from the *SWM* Book Service) when looking up callsigns. Thanks also to **Allan Wyllie** (Ayr) and **N.J. O'Hion** (Grays, Essex) for filling in the details after December's listing went to press but before they would have seen it appear in print.

Clear Take-Off

In the October 89 issue we eavesdropped on the crew of a medium-sized, twin-jet airliner as they started the engines. In the meantime (well, you do get some delays!) they have taxied to the holding point under instructions from Ground Movements Control. It is an important principle that the runway is under the control of one person - the Tower - both for the incoming and departing aircraft that use it. So it is now that Ground Movements Control tells the pilot to switch to the tower for clearance to enter the runway. The Captain will handle the take-off from the left-hand seat so the First Officer is doing the talking. The airways clearance has already been given and I won't dwell on this now; we're about to take-off.

Ground: Short wave One Zero Eight Niner, call Tower One One Eight Decimal Seven.

FO: Tower 118.7, good day. (Changes frequency on No. 1 v.h.f. COM set, leaving the first airways frequency on No. 2). Manchester Tower, good morning, Short wave 1089 at holding point Alpha.

Tower: Short wave 1089, clear take-off Runway 24, the surface wind Two Eight Zero degrees at One Two knots.

FO: Clear take-off, 1089.

The aircraft advances to the threshold directly beyond the holding point. In view of the slight crosswind from the right, a little right aileron bias might be needed on the trimmer to prevent the right wing from being lifted by gusts. Also, some left rudder will be necessary to prevent weathercock behaviour, where the fin is caught by the wind.

Full power is not needed on this long runway; the Captain opens the throttles, and asks for take-off power whilst steering with the small nosewheel tiller on his left. The First Officer holds the control column still as required. The Captain releases the parking brake, by firm pressure on both toe-brakes.

Captain: Brake release. Set take-off power.

As the engines spool up - that is, reach the revolutions required for take-off power - the First Officer adjusts the throttles to the precise setting needed. To ensure correct functioning of the engines he also watches their other instruments: jet pipe temperature, oil pressure, temperature, fuel flow and perhaps vibration.

First Officer: Engines stable. Take-off power set. Speed building - through 80 knots.

The Captain transfers his left hand to the control column as the rudder is now fully effective for steering at this speed.

Captain: I have control.

The First Officer releases the controls to the Captain, and calls the speeds. Eventually he calls V_1 and at this point the take-off must continue whatever happens as there is now insufficient runway left in which to stop. At V_R the First Officer calls 'Rotate' and the aircraft lifts off. Once the vertical speed indicator is showing climb, the First Officer calls 'Positive Climb' and the Captain requests 'Gear Up.'

Very quickly, V_2 is reached - the optimum climb speed in case of one engine failure. And there we must leave them, flying away into the distance on a standard instrument departure.

The next three deadlines (for topical information) are January 5, February 2 and March 2. □

Godfrey's Christmas Quiz

Once again, here's a little aeronautical distraction to ensure that the Christmas turkey isn't the only thing with wings to think about over the festive season. This time I've made the questions more difficult, but you've got twice the chance to spot the correct answer.

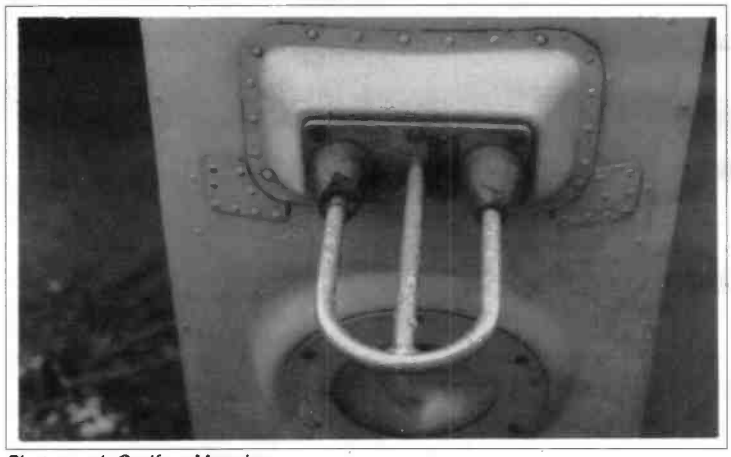
Photo A (the top one) is a close-up of a piece of aeronautical radio equipment attached to an aircraft

Photo B (the lower picture) shows an aircraft in its entirety - with Yours Truly alongside for scale. You must choose **one** of the photos and correctly name the type of aircraft depicted. But, you may **not** hedge your bets by attempting to answer both questions - this will lead to disqualification and your next flight being diverted to Gatwick!

All correct answers - regardless of which photo is attempted - will be placed in the same hat and a draw made. Answers to reach the Editorial Office not later than the last working day in January, please.

There is an aeronautical prize - my decision is final. That should give you something to do till next month.

Abbreviations	
a.m.	amplitude modulation
a.t.i.s.	automatic terminal information service
h.f.	high frequency
kHz	kilohertz
MHz	megahertz
n.d.b.	non-directional beacon
s.w.l.	short wave listener
t.m.a.s.	terminal manoeuvering areas
u.h.f	ultra high frequency
µV	microvolt



Photograph Godfrey Manning

Photograph Chris Mlynek

AOR AR3000 SCANNING RECEIVER

John Wrightson

Can such a small box cover such a wide frequency range with all-mode reception? Add a built-in computer interface, a tuning knob as well as buttons and you have the AR3000, the scanner enthusiast's dream. John Wrightson was one of the fortunate few to try one of the very first in the UK.

The AR3000 covers the entire 100kHz to 2036MHz frequency range with no gaps. It might take you a long time but you can tune or scan continuously from one end of this wide spectrum to the other! The AR3000 can be switched to receive narrow or wide band f.m., a.m., u.s.b., l.s.b., or c.w. As such it can be used for a multiplicity of functions, from listening to amateurs on your local 2m, 70cm or even 23cm repeater, tuning in to world-wide coverage broadcast stations on short wave, weather satellites on both 136 and 1699MHz and, of course, a wide variety of h.f. and v.h.f. data signals such as RTTY, packet and facsimile when coupled to a suitable terminal unit.

The set is quite small considering its wide coverage. Measuring 138 x 80 x 200mm it can easily fit under a car dashboard as well as on a table top. It operates from a standard 13.8V d.c. supply, a 240V mains adaptor being supplied for home use as well as a 13.8V d.c. power lead, and a small speaker is fitted at the bottom front of the case. Round the back, two BNC antenna sockets are used, one for the h.f. range (100kHz - 30MHz) and the other for 30MHz to 2.036GHz, and to get you on air quickly, the set comes supplied with a telescopic whip and a short wire antenna, both terminated in BNC plugs.

Tuning

To enter a frequency, all you need do after pressing the DIAL button is to key in the required digits followed by a press of the ENTER key. It's as simple as that. To change the reception mode, you press the MODE key and then use either the main tuning dial or the up/down buttons to step through the modes of a.m./n.b.f.m./w.b.f.m./c.w./l.s.b./u.s.b. until you reach the required one, then press the ENTER key. After this, either the main tuning knob or the UP/DOWN buttons can be used to tune around in any step size between 50Hz and 100kHz, the step size being variable in 50Hz increments.

This means you can tune the medium wave in the usual 9kHz steps, then change this to 12.5 or 25kHz for listening on v.h.f. and u.h.f., then right down to 50Hz for accurate tuning of s.s.b. on the h.f. bands. Pulling the spring-loaded tuning knob out once increases the tuning rate by a factor of ten to let you get from one part of the band to the other quickly, pulling it again sets the tuning rate back to normal. Alternatively, keeping either the UP or DOWN buttons pressed for around a second sets the receiver automatically searching in the relevant direction at 20 steps per second, pressing the DIAL button stops it again.

A 'Shift' facility can be programmed to help when you're monitoring duplex frequencies such as repeaters. Here a frequency shift and direction can be programmed, for example +1.6MHz for when you're listening to a 70cm amateur repeater, a press of the SHIFT button then switches you to the repeater input frequency. To combat the effects of strong signals overloading the receiver, an attenuator can be switched in and out of circuit from the keypad.

Memories

The 400 memory channels are arranged into four banks of 100 channels, each storing the reception frequency, mode, and r.f. attenuator in/out status. Dial information can be entered into any memory channel by pressing the ENTER button followed by the memory channel number, then the ENTER button again. In memory mode, the main tuning dial acts as a memory channel selector stepping through each stored channel in turn, alternatively channels may be recalled directly from the set's keypad.

Searching and Scanning

All stored channels in the selected memory bank 1-4 can be scanned for activity by pressing the UP or DOWN key in memory mode for around a second, the set then halting as soon as the squelch raises. The first channel of each bank can also be used as a priority channel, to allow the set to briefly check this every few seconds, locking onto it when activity is present. In memory scan mode, any number of channels can be 'locked out' by using the MEMORY PASS second function on the set, to prevent you continually listening to your local VOLMET transmission or whatever when you're trying to look around for other activity.

As well as the memory scan, each memory bank can store a pre-programmed frequency range which you can automatically search in the required frequency steps, the set again halting when the squelch raises.

A very useful facility is that of a 'Frequency Pass', where up to 48 unwanted frequencies can be programmed in to stop the search halting on these, whether these are constant transmissions or unwanted spurii, these frequencies being stored in memory channels 00 to 47.

Another scan facility comes by the name of 'Free Scan', operating in both memory scan and band search mode. Here the set halts only for 5 seconds on active channels before resuming, to give you a taste of what's going on throughout all the channels.

Controls and Connectors

Rotary volume and squelch controls are provided together with an on/OFF switch, a headphone socket being provided for private listening. All the other facilities are commanded by the multi-function keypad. Rather than an analogue meter or a string of l.e.d.s being used as an S-meter, the main liquid crystal display gives a rising bar-graph display of the received signal strength as well as showing the tuned frequency, memory channel and the like. Adjacent l.e.d.s show you which memory bank you're using as well as the timer status.

To let you listen to signals when you're not around, a cassette interface is provided which can be used to switch the tape motor on and off in line with the receiver squelch raising, so you only record activity rather than long periods of silence. A built-in timer can also be programmed to switch the set on at any pre-arranged time, with an 'on' period from 1 to 120 minutes. As well as allowing you to use the set as a clock radio, to wake you up to the rousing tunes of your local radio station or the early morning 80m net, this may be used for recording short wave programmes for you to listen to at more convenient times. If you really want, the set can also show you the current time on its display in place of the frequency. For night-time use, an l.c.d. backlight can be switched in from the keypad, and finally a keypad 'beep' on/off facility is also fitted to give a short 'pip' each time a key is pressed.

AOR AR3000 SCANNING RECEIVER

Computer Control

The AR3000 has a built-in RS232 computer control interface, allowing two-way communication with a personal computer or terminal using the standard RS232 protocol with settings of 4800 baud, two stop bits and no parity. The rear panel of the receiver sports a 25-way RS232 connector, of which 6 lines are used, pin 1 (Ground), pin 2 (TX data), pin 3 (RX data), pin 4 (RTS), pin 5 (CTS) and pin 7 (Remote on/off), a manual switch wired between pins 1 and 7 lets you switch between keyboard and remote control. Short commands, which are detailed in the manual, allow you to set the frequency, mode, attenuator in/out, frequency step, and memory functions remotely, and the AR3000 gives an output every 25ms of the received signal strength and squelch state. Hence if you're a dab hand at simple programming, unlimited memory channels coupled with activity and signal strength logging can be yours. Even a 'bar chart' of activity over a given band can be realised, as was shown on the AOR stand at Friedricshafen.

On The Air

The AR3000 was connected up in my shack, the h.f. antenna socket linked to a multi-band, h.f. dipole and the v.h.f./u.h.f. socket via an antenna switch to a loft-mounted, 25-1300MHz discone, a roof-mounted, rotatable, log-periodic Yagi, and an outdoor, v.h.f./u.h.f. vertical. Having 'played' with v.h.f./u.h.f. scanners before, my first listening activities took place on h.f. - certainly a novelty bearing in mind the size of the receiver. Setting the step size to 5kHz and tuning the h.f. broadcast bands in search of alternative entertainment was fun, in fact the set remained on the 41m h.f. broadcast band for a while, during which I had a thorough read of the set's instruction manual.

I busied myself filling some of the memory channels with my favourite v.h.f. and u.h.f. frequencies, arranging these into the memory backs so I could select whether to scan amateur frequencies, the local and not-so-local airband frequencies, and so on. Living close to both an international airport and a major shipping port certainly made for interesting listening, but even so I didn't even approach filling up all the 400 memory channels available. Armed with a copy of the *Complete VHF/UHF Frequency Guide* I began experimenting a little to find new and exciting things to listen to, although the region above 1300MHz was, at the time of writing at least, rather devoid of activity! When I switched in the log-periodic Yagi, I found I could copy wideband f.m. TV sound from several ITV regions apart from my local one, likewise with broadcast Band II radio signals which again provided a degree of 'alternative' listening.

Searching

Using the set in 'Search' mode was a very pleasant change from that of other scanners, the reason being the facility of frequency lockout. Here, whenever the set stopped on a blank carrier I simply pressed the relevant buttons and this frequency was entered into memory. Then on the next 'sweep', this frequency was automatically skipped, hence I wasn't continuously pressing the SCAN button when searching around for activity.

Although I could receive many surrounding 2m and 70cm amateur repeaters, the local 23cm f.m. repeater which is fully quieting on my 23cm amateur transceiver was only just distinguishable on the AR3000. Switching in an external preamp was necessary to bring this up to a copyable strength. Likewise at 1699MHz a purpose-designed converter gave better results, which to be fair would not be unexpected.

Using the 'shift' facility was also a novel and quite useful experience, here I could quickly switch between the duplex frequencies to listen to both base and mobile ends of each transmission. I did, however, find it a bit of a chore when changing modes. Here I had to press the relevant button, twist the tuning knob, and then press another button. Likewise when I wanted to change the tuning step size from, say 12.5 to 25kHz, but I suppose this is the price one pays for a front panel that isn't full of rotary controls.

I sometimes found I had to be careful when using the keyboard, occasionally I pressed the keys too fast which caused the set to occasionally miss an input, but I soon got used to this. As an alternative, I connected my computer to the serial port, operating the unit as a 'dumb terminal'. This really did make mode changing far quicker, together with frequency entry and step change, but again I found I had to be careful as the set had a habit of missing the first digit of entry. I understand, however, that this could have been a one-off problem with the early sample tested.

Having said all that, on v.h.f. and u.h.f. the set was tremendously versatile, more so than probably any other scanner of its kind currently on the market despite the number of button-pushing operations needed to use all the facilities!

HF Reception

Pulling myself away from v.h.f./u.h.f. and feeling a little more adventurous, I set the step size to 50Hz, the frequency to 14.200MHz and the mode to u.s.b. A tune of the 20m amateur band that afternoon showed many signals from both sides of the Atlantic to be present. Connecting my KAM, all-mode, data terminal unit allowed reception of quite a few packet and RTTY stations as well as many 'utility' transmissions and I found I could usually achieve 'spot-on' tuning even with the 50Hz steps.

Switching to 40m that evening gave differing results, with quite a bit of noise around until I switched the attenuator in, the combination of very strong signals combined with the large antenna used sometimes being a bit too much for the scanner!

The performance, quite understandably, wasn't up to that of a high cost dedicated h.f. receiver, with a degree of noise from the synthesiser apparent on s.s.b. The off-channel rejection on a.m. also seemed a bit of a compromise for the crowded h.f. bands as the ±7.5kHz filter is used, but even so it was very nice to have virtually everything in one small box!

Technical Aspects

The technically minded readers amongst us might like to know that the AR3000 uses a network of 15 switched bandpass filters following the switched attenuators in the front end, to provide good out of band rejection. These are followed by a pre-amp (bipolar on h.f., GaAs-f.e.t. on v.h.f./u.h.f.) and a double-balanced mixer fed from the set's main voltage controlled oscillator, this tuning across 736.33 to 1299.77MHz in 5kHz steps to provide a first i.f. of 736, 352.23, or 198.63MHz depending on the tuned frequency.

A second local oscillator signal then mixes this to a further i.f. of 45.0275MHz, where a crystal filter for a.m./narrow f.m., and a ceramic filter for wide f.m. are fitted to give roofing selectivity. A dedicated f.m. mixer/amplifier/detector follows where the signal is mixed down to 455kHz, with further filters of 2kHz (s.s.b./c.w.), 7.5kHz (n.b.f.m./a.m.) and 70kHz (w.b.f.m.) being switched in to give close-in selectivity.

This third mixer uses a digital to analogue converter to provide a tuning voltage feeding a Varicap across the mixer crystal, to allow tuning interpolation in 50Hz steps across a 5kHz range. The mixed signal is also fed to an external i.f. amplifier and detector, this stage providing a.m. detection, s.s.b./c.w. demodulation and a.g.c. output.

A single 12.8MHz oscillator coupled to a multi-loop synthesiser provides all the oscillator frequencies required in the receiver itself, this is controlled by a c.p.u. with separate RAM and RS232 interface, a 4.19MHz system clock oscillator together with a 32kHz timer clock oscillator are used here.

AOR AR3000 SCANNING RECEIVER

A quick check in the lab showed the sensitivity of the set to be very good up to 1GHz, and the r.f. intermod again to be good for a scanner at -55dBm for 12dB SINAD, giving an i.m.d. ratio of 63dB and an intercept point of -20dBm.

Above 1GHz, however, the sensitivity went down and, strangely, the s.s.b. modes were inverted, with the lower sideband being received in the USB switch position, but again this could have been a one-off effect due to the early sample tested.

Conclusions

My lasting impression of the set is still that it is 'the scanner enthusiast's dream'. It's incredible how AOR have managed to fit so much into such a small case.

The price of £765 reflects the set's coverage and capabilities, but add everything together and you could find it's quite good value as a 'do-everything' receiver. As for myself, I liked the AR3000 so much that I had to have my arm twisted before I gave it back!

My thanks to **Lowe Electronics Ltd, Chesterfield Road, Matlock, Derbyshire DE4 5LE. Tel: (0629) 580800,** for the loan of the review set. □

MANUFACTURER'S SPECIFICATIONS

Frequency Coverage:	100kHz - 2036MHz
Reception Modes:	u.s.b., l.s.b., c.w., a.m., n.b.f.m., w.b.f.m.
Circuitry:	Triple conversion superheterodyne (u.s.b./l.s.b./c.w./a.m./n.b.f.m.) and quadruple conversion superheterodyne (w.b.f.m.)
Memories:	400 (4 banks of 100 channels)
Scan Rate:	20 channels/second
Search Rate:	20 steps/second

Receiver Sensitivity:

	10dB S/N		12dB SINAD	
	s.s.b./c.w.	a.m.	n.b.f.m.	w.b.f.m.
100kHz - 2.5MHz	1.0mV	3.2mV	-	-
2.5MHz - 1.8GHz	0.25mV	1.0mV	0.35mV	1.0mV
1.8GHz - 2.0GHz	0.75mV	3.0mV	1.25mV	3.0mV

Receiver Selectivity:

l.s.b./u.s.b./c.w.:	-6dB	2.4kHz
	-60dB	4.5kHz
a.m./n.b.f.m.:	-6dB	12kHz
	-70dB	25kHz
w.b.f.m.:	-6dB	180kHz
	-50dB	800kHz

Antenna Connectors:	BNC
Audio Output:	1.2W into 4Ω ,0.7W into 8Ω at 10% distortion
Power Requirements:	13.8V d.c., at approx. 500mA
Dimensions:	138 x 80 x 200mm.
Weight:	1.2kg
Accessories Supplied:	Mains power supply; 13.8V d.c. lead; Telescopic antenna; 5m wire antenna; Operating manual.

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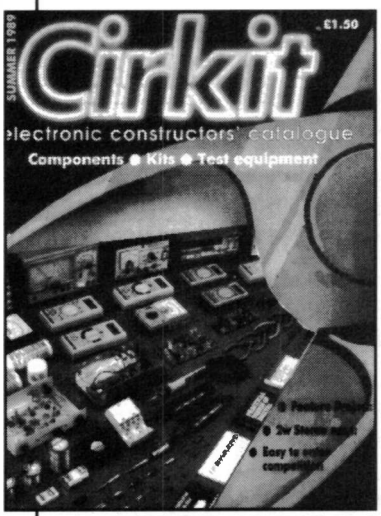

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AOR AR2515

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Frequency lists, Our UHF & VHF airband lists are produced and ammended regularly, enabling us to keep them as upto date as possible. Our VHF list includes LATCC transmitter sites/freq tie ups, squawk, codes, and the ICAO 3letter airline decode. Our UHF list is probably one of the most comprehensive available and is updated regularly to keep pace with the changes. — How many have the new Eastern frequencies?

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GRASSROOTS

Lorna Mower

Southgate ARC have a talk on Compact HF Antennas G3LMP G3LMP on January 11 and Club Videos of 1989 on the 25th. 2nd & 4th Thursdays, 7.45pm at Holy Trinity Church Hall (Upper), Winchmore Hill. Brian Shelton on 01-360 2453.

Biggin Hill ARC meet 3rd Tuesdays, 7.30pm at The Victory Social Club, Kechill Gdns, Hayes. January 16 is their AGM. Geoffrey Milne G3UMI on 01-462 2689.

Wimbledon & District ARS have a Night on the Air on January 26. 2nd & last Fridays, 7.30pm in St. Andrews Church Hall, Herbert Rd, Wimbledon. Steve Cook G8CYE on 01-541 1682.

Denby Dale & District ARS, details from Darren Chappell G0BWB, 221 Huddersfield Rd, Shelly, Huddersfield HD8 8LJ.

Mansfield ARS meet 1st & 3rd Thursdays, 7.30pm at The Polish Catholic Club, Windmill Lane, off Woodhouse Rd. December 21 is Grand Raffle and Open Night, January 4 is Video and the 18th is Test Gear. Keith Lawson G4AAH on Mansfield 642719.

Verulam ARC have an Activity Evening on January 9 and Avionics from DC to Light G0BZS on the 23rd. 2nd & 4th Tuesdays, 7.30pm at the RAF HQ, New Kent Rd, St. Albans. Andy Ince G0BZS at Cottage No. 1, Rounton, 28 Nascot Wood Rd, Watford WD1 3SD.

Halifax & District ARS have Mountain Rescue G6CNL on January 16. 1st & 3rd Tuesdays, 7.30pm at the Running Man Public House, Pellon Lane. 1st Tuesdays are Informals. David Moss G0DLM on Halifax 202306.

East Kent RS meet 1st & 3rd Thursdays, 7.30pm at The Canterbury High School, Knight Avenue. January 18 is a talk on the Weather and the Use of Satellites in Weather Forecasting by TVS Weatherman Ron Lobeck. Brian Tutt on Herne Bay 366232.

Hornsea ARC meet Wednesdays, 8pm at The Mill, Atwick Rd. December 27 is Christmas Social, Ferriby Club visit Hornsea, January 1 is Happy, Prosperous and Healthy New Year, the 3rd is Slide and Film Show G4IGY, the 10th is their Annual Dinner, the 17th is a Committe Meeting and the 24th is The Wonderful World of Wireless by G4IGY. Jeff G4IGY on (0964) 533331.

Plymouth RC meet Tuesdays, 7.30pm at Frederick St. Community Centre, just off King St. Bob Slater on (0752) 361842.

Yeovil ARC have Home Construction Techniques by G3PCJ on January 11, Using Homebrew Test Gear G3PCJ on the 18th and a Natter Night on the 25th. Thursdays, 7.30pm at The Recreation Centre, Chilton Grove. David Bailey G1MNM at 7 Thatchem Close, Yeovil BA21 3BS.

Trowbridge & District ARC have their 6th AGM on January 3. TA Clubroom, Bythesea Rd, 8.15pm. G0GRI on Bratton 830383.

Aylesbury Vale RS have their Christmas/New Year Club Dinner at The Plough, 8pm on January 10 and their AGM at Hardwick Village Hall, 8pm on the 24th. Geoff Groom on Buckingham 817496.

The Carlisle & District ARS meet in the Morton Community Centre, Wigton Rd, Mondays, 7.30pm except for Bank Holidays. Roy Brammeld G0HNQ on Wigton 44766.

Bromsgrove & District ARC have a lecture on Ceramics on January 12. 2nd Fridays at Avoncroft Art Centre. Trevor Harper G0KIN on Bromsgrove 33173.

Taunton & District ARC meet 1st & 3rd Fridays, 7.30pm at The Basement, County Hall, Taunton. W. A. Lindsay-Smith on Hemyock 680778.

Acton, Brentford & Chiswick ARC have their AGM on January 16. Chiswick Town Hall, High Rd, 7.30pm. W. G. Dyer G3GEH at 188 Gunnersbury Ave, Acton, London W3 8LB.

Mid-Somerset ARC have an Open Evening on January 5 and talk by Mr D. Jackson, District Manager of Radio Investigation Service, DTI on the 19th. Details of meeting place and time from Mrs Pam Ives-Whitaker at 17 Bedford Rd, Wells, Somerset BA5 3NH.

Banbury ARS meet 2nd & 4th Wednesdays in the Lounge Bar, Three Pigeons Public House, Castle St. Bryan Thornton G1IIO on Banbury 251774.

South Bristol ARC have a 2m Activity Evening on December 27, Photographic Equipment Evening G4RZY on January 3, HF Activity Evening on the 10th and Bristol Rally Planning Evening G4WUB on the 17th. Wednesdays at the Whitchurch Folkhouse Associaiton, Bridge Farm House, East Dundry Rd. Len Baker G4RZY on Whitchurch 832222.

Torbay ARS meet Fridays, 7.30pm at the ECC Social club, Highweek, Newton Abbot. They have Club Nights on December 22/ 29, January 5/12 and their monthly meeting followed by Construction Competition Judging on the 19th. Walt G3HTX on Paignton 526762.

Helensburgh ARC meet Thursdays, 7.30pm in the basement of the Cairndhu Nursing Home, Lower Rhu Rd. 1st & 3rd Thursdays are Business meetings followed by either a short talk given by one of the club member or a Natter Night. On the remaining Thursdays they have an Operating night. GM0KZX on Dumbarton 64401.

Coventry ARS have a Night on the Air and Morse Tuition/Social evening on December 22, Night on the Air and Morse Tuition on January 5/19 and The Computer Night - Bring Your Own If You Can! on the 12th. Fridays, 8pm at Baden Powell House, 121 St. Nicholas St, Radford. Jonathan Ward G4HHT on Coventry 610408.

Sutton & Cheam RS have a Committee Meeting at 153 Boundary Rd, Wallington on December 28, a Natter Night in the Downs Bar on January 1 and a 3.5MHz Fixed and AFS Team Contest on the 14th. 3rd Fridays, 7.30pm at Downs Lawn Tennis Club, Holland Ave, Cheam. 1st Mondays are Natter Nights in Downs Bar. John Puttock G0BWV at 53 Alexandra Ave, Sutton, Surrey SM1 2PA.

Chelmsford ARS have their Annual Film/Video Show on January 2. 1st Tuesdays, 7.30pm at Marconi College, Arbour Lane. Roy G3PMX on Chelmsford 353221 Ext. 3815 Office.

Midland ARS have a Junk Sale on January 16. Last Mondays are Computer Club, 1st Tuesdays are Committee and 4th Tuesdays are RAYNET. Wednesdays are Morse and Thursdays are Night on the Air/Natter Night. Paul O'Connor G1ZCY on 021-443 5157.

The Submarine ARC meet every other Thursday in HMS Dolphin, Gosport, Hants. Please send an SAE for more info to Mr K. Bricknell, 1 Walker Place, Gosport, Hants PO13 0LU.

Stourbridge & District ARS have an On Air and Natter Night on January 8 and a Forensic Scientist on the 22nd. 1st & 3rd Mondays, 7.45pm at the Robin Woods Centre, Scotts Rd. Clive Williamson G4IEB on Stourbridge 392006.

Horndean & District ARC have a Quiz G4UVP on January 4. 1st Thursdays, 7.30pm at Merchistoun Hall, London Rd. Stuart Swain G0FYX on Havant 472846.

The Amateur Radio Club of Nottingham meet Thursdays, 7.30pm at the Sherwood Community Centre, Mansfield Rd, Sherwood. Paul G1WBZ on Nottingham 733740.

Todmorden & District ARS have a Construction Competition on January 1. 1st & 3rd Mondays, 8pm at The Queen Hotel. Mrs E. Tyler G0AEC on Halifax 882038.

Mid-Warwickshire ARS meet 2nd & 4th Tuesdays, 8pm at 61 Emscote Rd (St. Johns Ambulance HQ). January 9 is Night on the Air at Warwick School and the 23rd is What Did Santa Bring Members? Mike Newell G1HGD on Kenilworth 513073.

Southdown ARS have their AGM on January 5. 1st Mondays, 7.30pm at the Chaseley Home for Disabled Ex-Servicemen, Southcliff, Bolsover Rd. Wednesdays and Fridays in the Clubroom, Hailsham Leisure Centre, Vicarage Rd. C. R. Evans G4VOS on Heathfield 3168.

Norfolk ARC have the Big Guns of Contesting G3VZT on January 3, 80m AFS on the 7th, Radio Astronomy, Ron McArthur, Norwich Astronomical Society on the 10th, Debate - Should Amateurs Homebrew? on the 17th and Test Gear Demonstration on the 24th. Wednesdays, 7.30pm at The Norfolk Dumpling, The Livestock Market, Harford, Norwich. Steve Sewell G4VCE on Mulbarton 78258.

ANTENNAS

F. C. Judd G2BCX

Part 11

This month it's the turn of the log-periodic dipole array and the skeleton slot antenna.

Last time we described the helical antenna which has a fairly wide bandwidth and circularly polarised radiation. However, there is another antenna, the log-periodic dipole array, which also operates over a wide frequency band but from which radiation is 'linearly' polarised. This antenna can be designed to provide substantial directivity gain with a reasonably low v.s.w.r. over its operational bandwidth.

The Log-Periodic Antenna

This antenna, often called an 'l.p.d.a.', is a system of driven elements, although they are not all active at any one particular frequency. The theory of design and operation is somewhat complex and in fact the l.p.d.a. can have more than one configuration. The basic log-periodic array consists of several dipole elements, each of a different length and with different spacing between each successive dipole, as in Fig.11.1. Both length and spacing increase from the feed point, permitting wide changes in operational frequency to be made without greatly affecting the electrical characteristics. Such antennas can be designed and constructed for h.f., v.h.f. or u.h.f. operation with a frequency ratio of 3 or 4:1.

Design details for l.p.d.a.s to operate with the bandwidths 21-55, 50-150, 140-450 and 420-1350MHz can be found in the RSGB publication *VHF-UHF Manual*. A commercially made l.p.d.a. is available with a claimed frequency bandwidth of 130-1300MHz and a forward directivity gain of 12-13dBi (9.5-11.5dBd).

Another version of this antenna, sometimes called a log-periodic bandpass antenna, will provide higher directivity

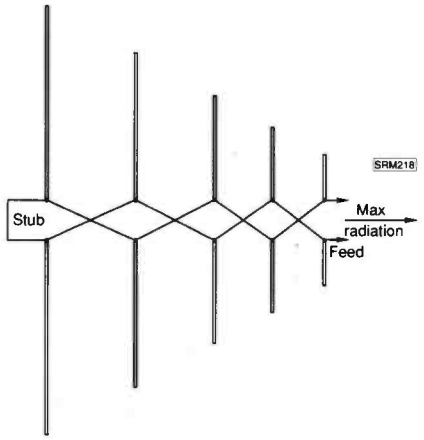


Fig.11.1: Basic configuration of the log-periodic dipole antenna; all elements are driven.

gain, but the overall length of the antenna is greater as parasitic directors and often a reflector are added. The arrangement is really a combination of an l.p.d.a. and a Yagi beam, as in Fig.11.2. The frequency response is virtually flat over a 2MHz bandwidth but then falls steeply at each end, as shown in Fig.11.3. The v.s.w.r. remains almost constant at about 1.5:1, or less, to the limits of the bandpass.

Effective Radiated Power

Having dealt with some of the more popular uni-directional beam antennas, it would seem appropriate at this stage to mention a performance parameter derived from directivity gain. This is usually referred to as "power gain", but is in fact the power ratio from which the gain factor in decibels is obtained in the first place. If the directivity gain in decibels (dBd) of an antenna is known, the power gain can be obtained from:

$Pg = 10^{xy}$, where xy = (gain in dB)/10. Example: if directivity gain = 12dBd, power gain = $10^{1.2}$ = 15.84.

The effective radiated power (e.r.p.) is obtained by multiplying the power in watts fed to the antenna by the power gain. For this example, if r.f. power fed to the antenna is 10W, and assuming no loss in feed cables or the antenna itself, the e.r.p. for maximum directivity will be 10 x 15.84 = 158.4W. However, side or rear lobes of fairly large magnitude will take some of the power from the main lobe so the real e.r.p. may be less than calculated.

Providing such lobes are better than -25dB down with respect to maximum radiation the percentage of power radiated by them is of little consequence. Note that if gain is given in dBi subtract 2.14 to obtain dBd.

Table 11.1 may be found useful for obtaining the e.r.p. related to various levels of r.f. power supplied to beams with directivity gain from 0 to 16dBd. It is rather surprising just how much power is radiated in the direction of maximum. As an example, take a forward gain of 13.5dBd and power supplied as 50 watts: the table gives 223.87W (for 10W supplied) which, multiplied by 5, shows that the e.r.p. is 1119.35W - well over a kilowatt! Even at -3dB from maximum the e.r.p. is more than half a kilowatt.

Other Types of Antenna

The 'Skeleton Slot'. This antenna could perhaps have been included with other Yagi types mentioned earlier in the series. It might be described as a self-contained pair of stacked Yagis and was developed by B. Sykes G2HCG of Jaybeam Ltd. The name 'skeleton slot' is derived from the nature of the primary driven element.

A slot antenna, as its name suggests, is a narrow slot approximately half a wavelength long cut in a large sheet of metal which, coupled to a source of r.f., radiates in the same way as a wire conductor except that the plane of polarisation is 90° opposed, i.e. a vertical slot radiates horizontally polarised waves and vice-versa. What is called a 6-over-6 stacked skeleton array is shown in Fig.11.4: it has a forward gain in the region of 11dBd and a half-power beamwidth of about 050°. For very high forward gain these double arrays can themselves be further stacked and bayed.

Formation of the open or skeleton slot, Fig. 11.4, could be regarded as

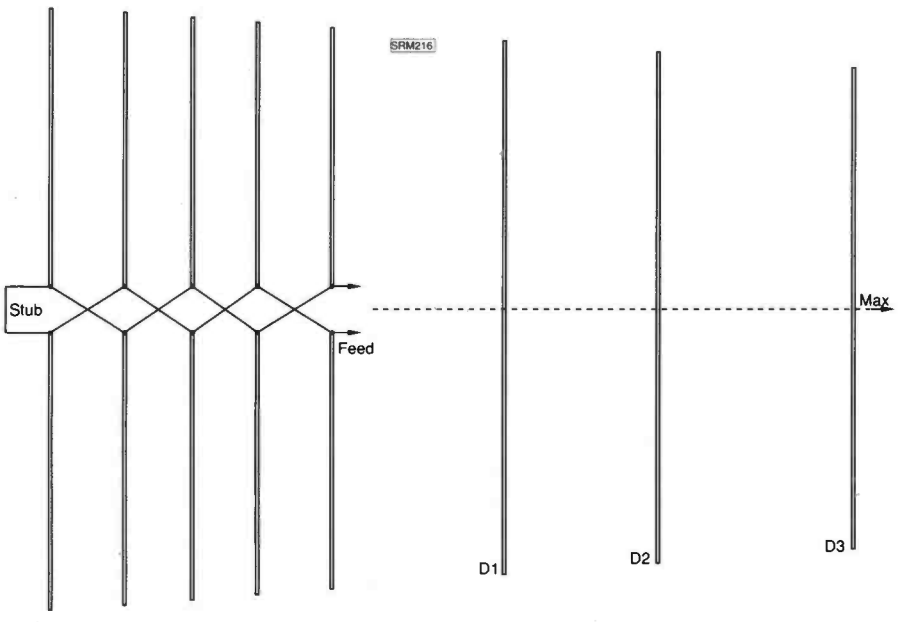


Fig.11.2: Arrangement of the log-periodic 'bandpass' antenna; D1, 2, 3 and 4 are passive elements (directors).

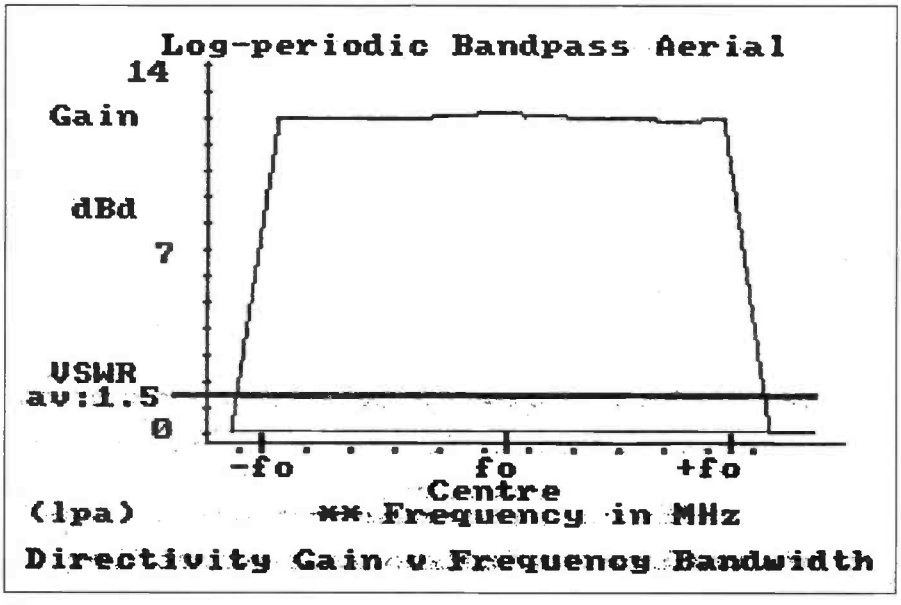


Fig.11.3: Directivity gain v. frequency response of the log-periodic bandpass antenna shown in Fig.11.2.

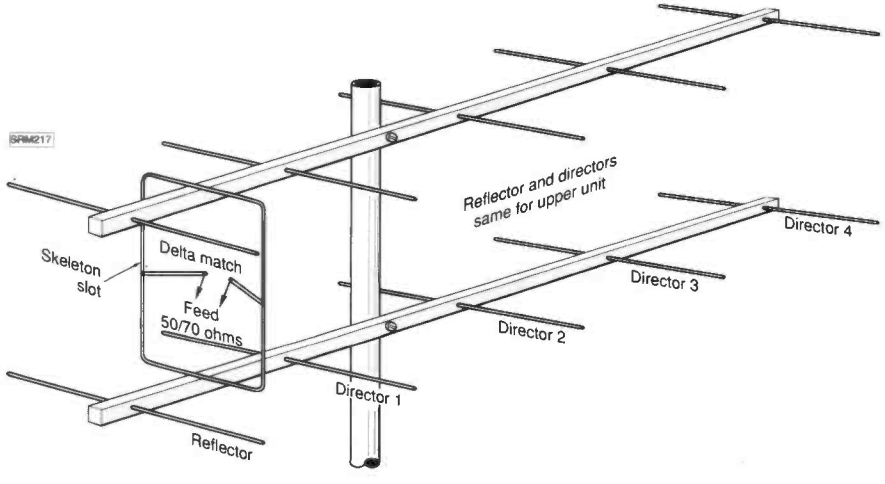


Fig.11.4: A 6-over-6 skeleton slot v.h.f. beam, see text.

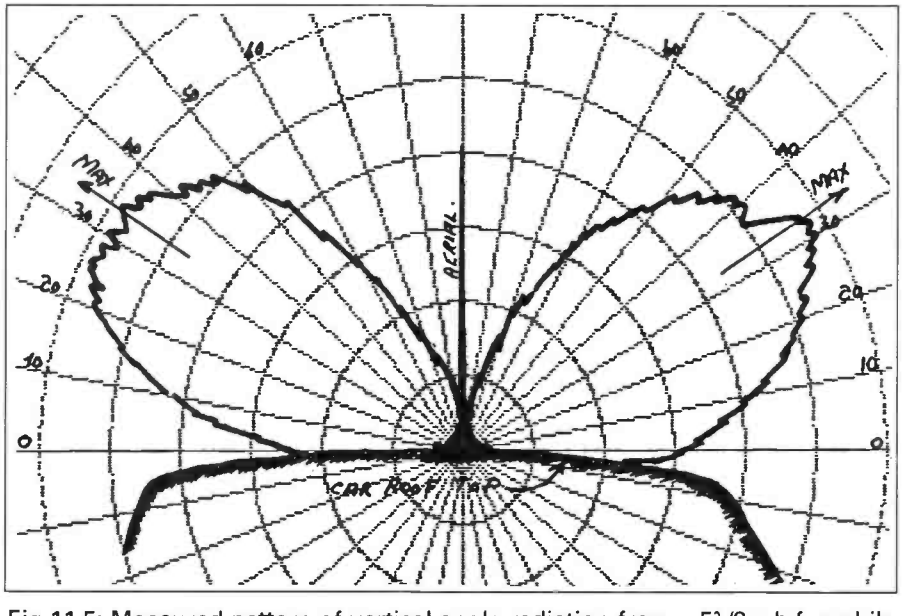


Fig.11.5: Measured pattern of vertical angle radiation from a 5λ/8 v.h.f. mobile antenna mounted on a car roof.

either two half-wave radiators folded down and joined to form the oblong loop, or a closed length of transmission line with an impedance Zo = 276 x log(D/d), where D is the width of the closed section and d is the diameter of the conductor used. In order to feed the antenna from a low impedance line (coaxial cable) a form of 'delta' matching is employed, connected each side at the centre of the loop.

Since the currents in the top and bottom halves of the loop are in phase and induced into the upper and lower parasitic arrays respectively, radiation from each array will also be in phase.

Antennas for Mobile Use

Virtually all antennas used for mobile operation are vertically polarised and, of course, omni-directional. Those for h.f. operation must be physically short for obvious reasons, and for the lower bands (1.8, 3.5 and 7MHz) this means incorporating a large amount of series inductance to 'electrically' obtain quarter-wave resonance.

Whilst such antennas will radiate, they are very inefficient for two reasons: first, a good deal of the r.f. power supplied is dissipated in the high resistance of the loading inductance and, secondly, the current-carrying portion of the relatively short length of open conductor, together with lack of direct ground connection, causes considerable attenuation of the radiated power.

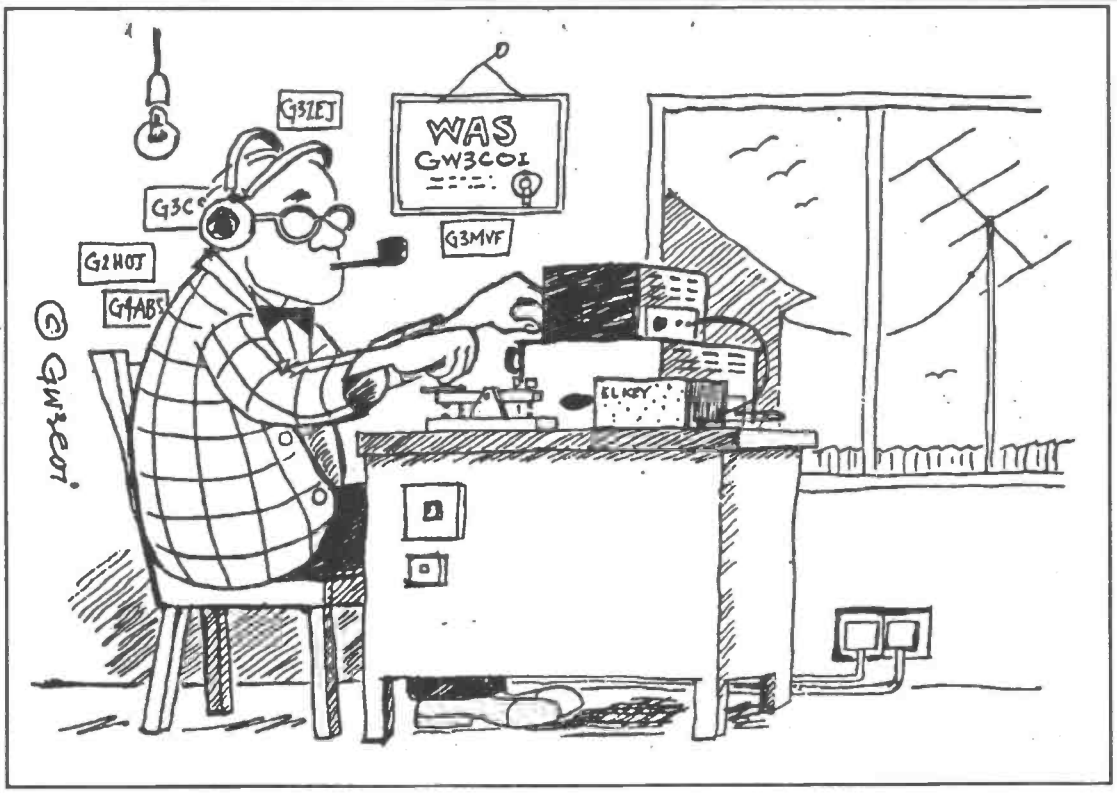
Mobile VHF/UHF Antennas

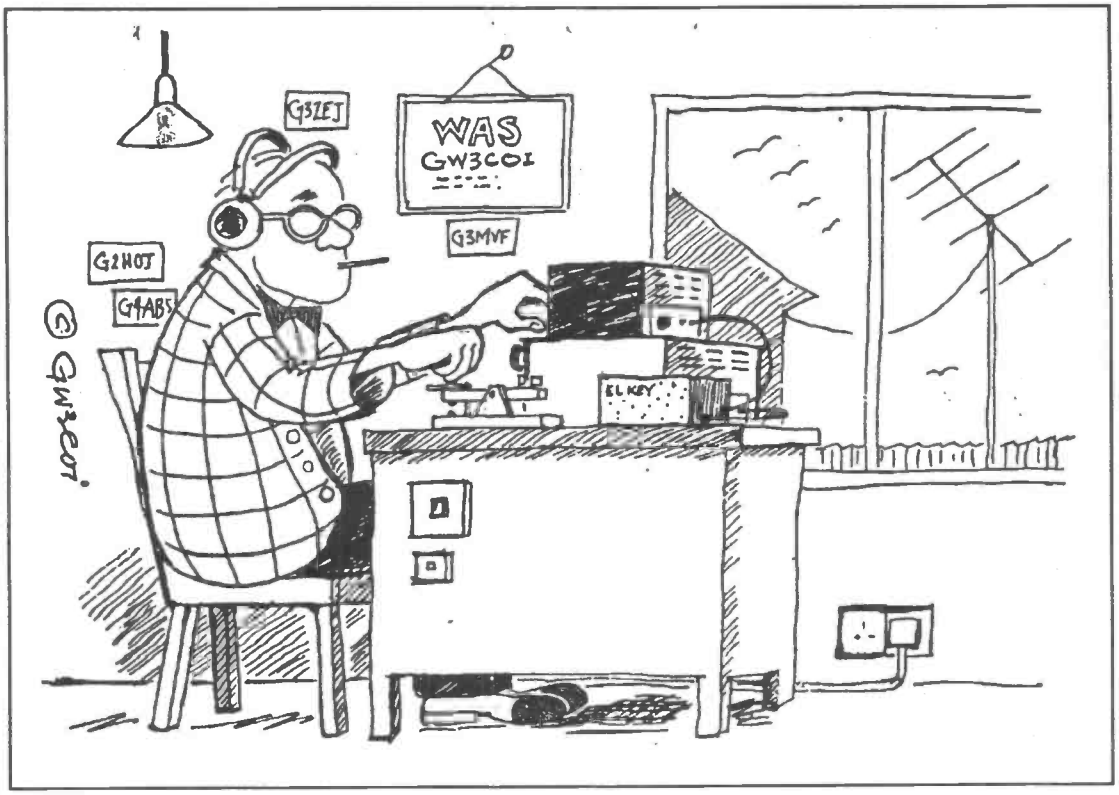
Antennas for mobile operation on v.h.f. and u.h.f. at least have the advantage of full 'electrical' length, e.g. λ/4, λ/2, 5λ/8, 3λ/4 and even 7λ/8 and are resonant without series inductance - except perhaps for a small amount at the base for matching purposes, or, in the case of u.h.f. collinears, for phasing the currents in the elements.

However, such antennas rely on the

Abbreviations	
dB	decibel
dBd	gain relative to a half-wave dipole
dBi	gain relative to an isotropic radiator
e.r.p.	effective radiated power
h.f.	high frequency
l.p.d.a.	log-periodic dipole antenna
MHz	megahertz
r.f.	radio frequency
u.h.f.	ultra-high frequency
v.h.f.	very high frequency
v.s.w.r.	voltage standing wave ratio
W	watts

SPOT THE DIFFERENCE





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RIGHT THE FIRST TIME

Part 4

Rev. George Dobbs G3RJV

So far, the audio output of the crystal receiver has been via a single crystal earpiece. There are several disadvantages in using such an earpiece, the crystal earpiece has a very high impedance and the diaphragm is very small. So the sound quality tends to emphasise the higher notes at the expense of the lower notes. Also these earpieces vary in quality and some of them are quite insensitive. They are also a rather specialist item.

It would be better to use a more conventional set of headphones. Probably the commonest form of headphones are the small stereo headphones designed for use with the personal stereo tape players.

A more conventional set of headphones will improve the audio quality of the output from the crystal set. In this part George Dobbs explains how to set about making the necessary changes to enable you to use the headphones from your personal stereo.

Transformer

Personal stereo headphones are low impedance: about 16Ω, whereas the output of the crystal set has an impedance of several thousand ohms. A method of converting the impedance has to be used and in this circuit we will use a **transformer**.

If a transformer is wound with a lot of turns of wire in the primary and relatively few turns in the secondary, an audio signal fed into the primary will emerge from the secondary at much lower impedance. The commonest impedance matching transformer available is the Eagle LT700.

The method of including the transformer in the circuit is shown in Fig. 4.1. The primary of the LT700 transformer is connected in the place of the crystal earpiece. The stereo headphones are connected to the secondary of the transformer.

The lead connection layout for the LT700 transformer is shown in Fig. 4.3. The transformer is an **audio output transformer** with a primary impedance of 1.2kΩ (centre tapped) and a secondary impedance of 3.2Ω. The connections are simple : the primary is the side with the three wires and the secondary the side with the two wires. The centre tap wire of the primary is ignored and can be bent upwards out of the way.

The output of the secondary requires the use of a suitable stereo jack socket. The usual plug for a personal stereo headphone set is a 3.5mm stereo plug.

Connecting the Headphones for Mono

The output of the crystal set is mono, not stereo so the 3.5mm socket has to be wired to drive both headphones from one signal. The preferred way to wire the two sides of the headphones is in series. This will add to the impedance. The impedance ratio of the transformer will be slighly increased by this method.

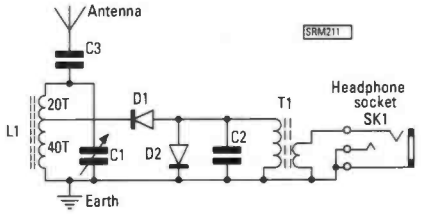


Fig. 4.1

How this can be done is shown in Fig. 4.4. Stereo headphones are wired to three sections on the plug barrel: the sleeve, the ring and the tip. The sleeve normally goes to the wire which joins one side of one phone to another side of the other phone. So if the sleeve connection is ignored and the output is taken to the tip and the ring connetions, the two sides are joined in series.

Most 3.5mm stereo sockets are of open construction and it is simple to see how they are connected. Just inspect the socket and work out which of the three solder tags go to the tip and the ring and attach the audio output wires to these. The wires should be tightly twisted around these solder tags. If you can solder then they are better soldered.

The layout of the improvement is shown in Fig. 4.2. The crystal earpiece socket has been removed and a new link wire takes the ground side of the output to the strip of sockets named "A". The transformer is mounted, as shown, at right angles to the rest of the circuit. The stereo socket takes the output from the secondary wiring points.

Using the stereo headphones should considerably improve the quality of the signals. It may also increase the output. It would also be possible to use full-size stereo headphones, but in this case the socket will have to be a 0.25in stereo socket. □

YOU WILL NEED

T1 Audio transformer LT700 (Maplin LB14Q or Electrovalue); 3.5mm stereo socket; Personal stereo headphones.

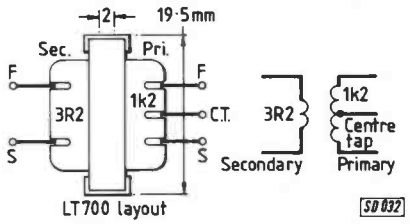
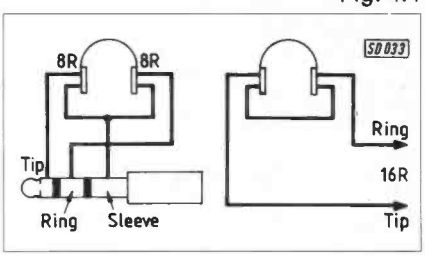


Fig. 4.3

Fig. 4.4



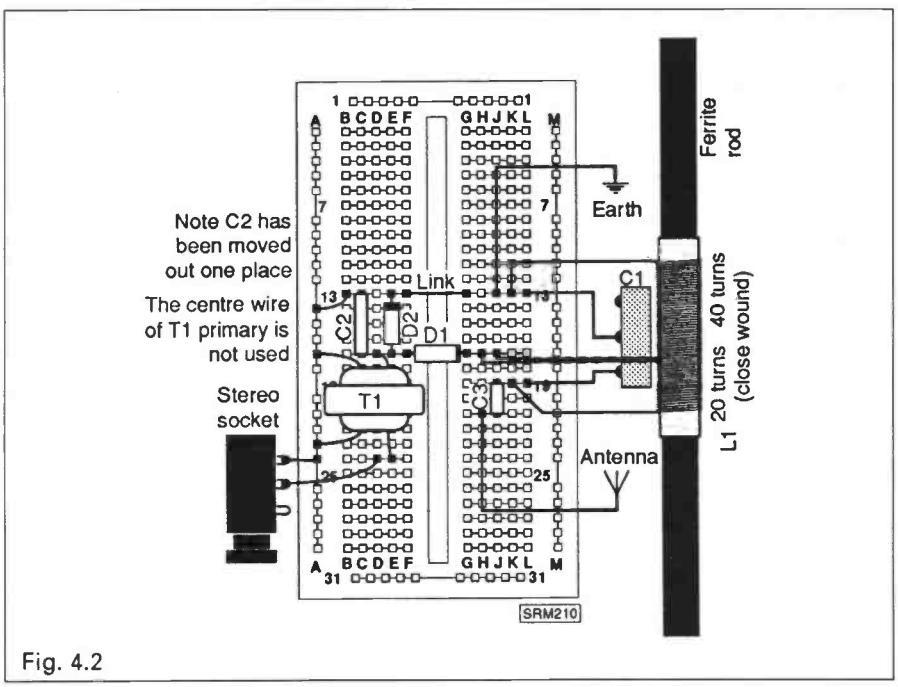


Fig. 4.2

RIGHT THE FIRST TIME

Capacitors

Along with resistors, the other very common circuit element is the CAPACITOR. Capacitors come in all sorts of shapes and sizes but essentially they consist of two plates (or sets of plates) separated by an insulating material. The insulator is usually called the **Dielectric**.

A very simple form of capacitor is shown in Fig. 1a. You can see two plates separated by an air space. If a battery is connected as shown, current cannot pass because of the gap (the dielectric). The result will be that one plate will have a positive charge and the other a negative charge. If the battery is removed, the charge will remain and connecting a volt meter across the plates would show reading. The reading would very quickly disappear as the plates discharge. The amount of charge that is stored depends upon the surface area of the plates and the separation of the plates. Larger plates and smaller separation both aid greater charge capacity. The capability to store charge is called the **Capacitance**.

Capacitance is measured in **farads**. In radio work very small fractions of a farad are used for component values. These are the **microfarad**: a millionth of a farad (μF), the picofarad : a **millionth** of a microfarad (pF) and, in increasingly common use these days, the **nanofarad** : a thousandth of a microfarad (nF). They are related as:

1F = 1000000μF; 1μF = 1000nF; 1nF = 1000pF.

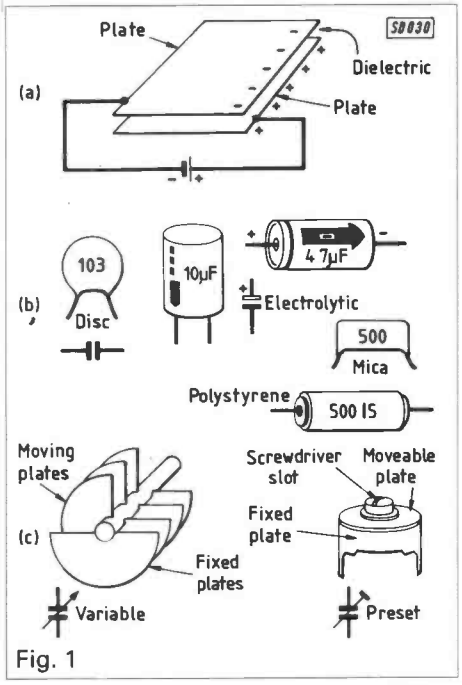


Fig. 1

Capacitors use the most convenient unit for their value. For example: 0.0005μF = 0.5nF = 500pF and would probably be designated as 500pF.

0.000001μF = 1nF = 1000pF and may be marked 1nF.

Some examples of fixed capacitors in common use and the circuit symbols are shown in Fig. 1b. They are usually drawn as two parallel plates with leads. The 'odd man out' is the **electrolytic** capacitor. These are capacitors with high values of capacitance made in such a way that they are polarised and can only be used one way round in a circuit. The positive (+) side is shown on the circuit symbol as an open or hollow plate and must be connected to the positive side of a circuit.

Also shown in Fig. 1b are two types of variable capacitors: components in which the capacitance can be changed or controlled. The variable capacitor has one set of fixed and one set of moving plates which are rotated in and out of the fixed plates to vary capacitance. Usually these are air spaced but some have a plastic dielectric. Semi-variable capacitors, usually called **pre-set** or **trimmer** capacitors, work on the same principle but can only be adjusted by a screwdriver or special trimming tool.

Fig. 1a shows that a current cannot pass through a capacitor, but that refers to a d.c. (direct) current. An a.c. (alternating) current will pass because the charge on the plates is constantly being changed. The property of a capacitor to block d.c. but pass a.c. currents is widely used in electronic circuits as we shall see.

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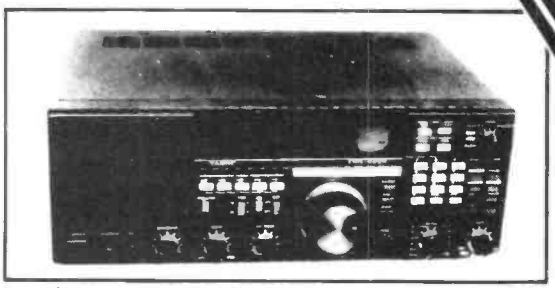

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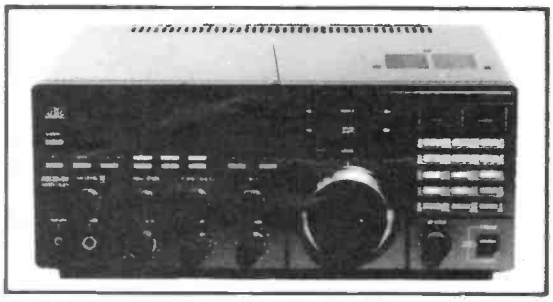

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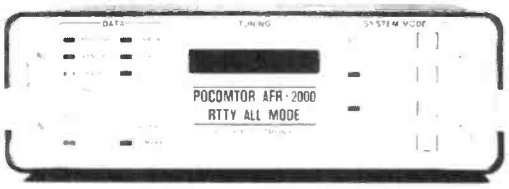

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SEEN & HEARD

AMATEUR BANDS ROUND-UP

Paul Essery GW3KFE
PO Box 4, Newtown, Powys SY16 1ZZ

How nice to meet so many of you at Leicester on the Friday. I hadn't meant to attend at all, let alone be on the stand, but the day before there was a spare seat on offer to the show. When I got there the stand seemed awful busy, so I joined in the fun. Thanks to you all for the nice words and comments.

Now to the bands. That October 16 flare with the resulting events on October 19 seems to have knocked the bands about a bit, and followed up with another dose a month later! However, at the time of writing things have been a mite livelier. All the h.f. bands have had something to offer, on v.h.f. and u.h.f. there have also been pickings for those who care to take the trouble to look and have a site and antenna systems to suit.

These ups-and-downs are well-known to old-timers, but for the benefit of the New Chums, may I say that it is a very rare event that takes out all the bands. In other words, the more bands and modes you can receive the better, since if one band is not 'giving' you can then try another.

Have you thought about having a listen for the various amateur radio satellites, for example? To do this, you need a reasonably sensitive receiver that can be tuned, plus an antenna that, for preference, can be tilted as well as rotated, plus of course the appropriate receiver, which could very well be a converter feeding the existing h.f. receiver. Imagine a satellite coming straight over your head From the moment of first hearing it (AOS) as it comes over the horizon it is approaching; from overhead down the moment it dips below the horizon and is lost (LOS) it is going away. Thus you will have the same Doppler Shift that you notice on a railway station when an express passes at 130km.p.h., or when a fast car passes your viewpoint at a motor-race; the perceived frequency changes. However, the capital difficulty with our satellite is this: not every orbit will pass directly overhead. At the opposite limit, we may have a pass where the satellite just peers over the horizon for a few seconds. High orbits and low ones follow each other predictably. Obviously the amount of doppler shift will be different in each case. This leads to our first requirement: we need to know the time when the 'bird' will poke it's nose over the horizon, and where to aim the beam, to effect acquisition of satellite. Once you have this, and the bird's true frequency then with a bit of a fudge you can copy the pass through to loss of satellite time, and maybe with a bit of a lift on you might hear it for a few seconds longer. In normal conditions, you won't hear anything from the bird if it's not above the horizon. Thus you need to know where to get hold of those predictions and how to apply them to your own case. For this you need to be talking to AMSAT-UK's Ron Broadbent, G3AAJ, 94 Herongate Road, London E12 5EQ, and, indeed joining AMSAT.

Comments

A nice long letter now from **Andy Brown**, of Barnet, who will be recalled as winner of the SLP; he recalls the remarks of John Heath in the November *SWM*, about using more than one receiver being not in the spirit of the competition. Andy writes, "To set the record straight, I currently use four radios (and indeed I used each of these at various times in the period); these are a Realistic PRO-2003 v.h.f./u.h.f. scanner, a Realistic DX-400 general coverage receiver, Trio JR-500S valved amateur bands only receiver, and Trio 9R59D valved general-coverage receiver. As to why I use them, first I'm particularly interested in old radios, secondly my success proves they are far from 'over the hill', thirdly no one of these would give me coverage of all the bands allowed in the SLPs, and fourthly, I can't afford the pleasures of new equipment at umpteen hundred pounds a go. I make do with what I've got, and seem to do reasonably well.'

"As to whether I was at some kind of unfair advantage because I had more than one modest and mainly aged receiver, instead of one new FRG8800, I would have thought it would have been the other way round!"

I've quoted Andy's letter at some length because it has something to say to us all. The scanner gives coverage of the v.h.f./u.h.f. bands. It's not too sensitive, but the days when these bands were quiet enough that a noise factor mattered are, alas, over, thanks to the urban level of r.f. pollution. The DX-400 and 9R59D are both general-coverage and so will have broad selectivity in the i.f., but the JR-500S was, as we recall a receiver which was meant to be used in the amateur station as a cheap but effective replacement of such things as the HRO or AR88 as an amateur station receiver, when s.s.b. was sweeping a.m. into limbo. Having reviewed one, nearly thirty years ago, I have to admit that for s.s.b. reception on the amateur bands it was better than a modern general-coverage receiver for the simple reason that it contained an i.f. designed for s.s.b. reception only. Like many receivers of that time the JR-310S was useless for c.w. reception because there wasn't a place to fit a c.w. filter. So, Andy is, in effect, saying that we should forget the salesman's blurb, and try to organise ourselves a station based on the three Fs - form fit and function. We agree.

Events

Thanks to your reports, my eaves-dropping receiver, The DX *Bulletin*, *DX News Sheet*, and CARF's *The Canadian Amateur*.

By the time you read this, HA5PP and HA5MY will have been on for ten days from Laos, if all goes well; the callsigns will be XW8CW and XW8DX. These two veterans of the 3W8CW/3W8DX saga will be using gear donated by NCDXF and HyGain. If you heard them, doubtless you will have lent an ear out too for them on Spratly Is. However, the latter is rather doubtful, as Spratly is very much disputed territory, and the last attempt resulted in fatal casualties from gunfire. Europeans QSL via FDXF, Box 88, Bruz F35170, France. However, this one has so many rumours surrounding it that we just don't know what the true situation is; the above can only be said to be our own educated guess.

Another one due between the time this goes down and the time you get to read it, is the Revillagigedo, XF4T activity by four XEs; QSLs go to XE2TCQ.

The problems of getting around have upset the plans of Mats SM7PKK in the Pacific. By the time you get to read this, he should have made it to Rotuma - he says he'll get there if he has to swim!

IOTA

Those of you who look for something of interest in the competitive line may be interested in IOTA. This stands for 'Islands on the Air' and involves hearing or working stations in islands around the world, of which there are of course many hundreds. There are various details to consider, and the man to get in touch with nowadays is G3KMA; Roger's address is in the current Call Book. Anyone not having access, an s.a.e. to me produce the needful.

Talking of competitive activities, another one to have a go at is the WAB programme which has a section for s.w.l.s; and of course the profit after expenses goes to RAIBC, which helps disabled or blind s.w.l.s and amateurs to get operational.

And, the first for a long time a real new country! This one is over 1.5 million square miles, to be known as 'Nunavut', lying between Hudsons Bay and the North Pole, handed over by the Canadian government to the Inuit Eskimos. Nunavut, by the way, means 'Our Land'.

Finally another note about our local 'sponsored' station, to aid, equally, the Shropshire & Montgomery Canal restoration and Powys REMAP - the latter is a nationwide organisation, part of RADAR, devoted to help for the disabled. Our last note indicated the intent to set it up; this time we can say all the gear is organised, including a magnificent loan of a 20m trailer-mounted crank-up tower by Strumech Versatower. The date for the station will be a weekend in April 1990, and a special GB callsign is being applied for.

Now to the other letters. The first one comes from Tony Price, who had to take his support mast down for repairs and hence the KW Trapped Dipole it supoported. As a 'temporary' Tony slung up some 24 metres of wire, and fed it through a KW E-Zee Match against earth; this resulted in some agreeable surprises in the way of stations heard. As he says, the lesson to be learned from this is that while the results from the dipole may have been better, he will never again underestimate the end-fed wire.

Thanks to the business of moving house, **Phil Boorman** has been off the air for several months. However, he now has his planning permission, and has put up a telescopic fifty-foot mast, topped by a Cushcraft A3 beam and complemented by a half-sized G5RV for the WARC bands and an occasional end-fed. Phil finds the beam to be better than the G5RV by between two and six S-points better on a change-over test, although when relating things carefully in his second letter he comes down for a gain of 7-8dBd. However, I have no doubt that Phil will be most impressed by the QRM-reducing properties of the back and sides of the beam; activity has been on all bands, c.w./s.s.b./SSTV, although to be sure only locals have been worked on Top Band. For the latter, the work needed is not so much up in the air, as down below, at ground level by way of surface and buried radials, alas.

Now to **Dale Dhuglas**, up in Scotland who was very pleased indeed to snaffle KC4AAA from the South Pole, on 14MHz. On 28MHz, we note JT0DX (QSL via HA6KNB), RZ0Y/UA9YX (QSL via UA9YX), HS4WW, BY8AC, all W call areas, CN0A (QSL via French DX Association), PJ5JR (QSL via K3BYV), V47K, F5/KC1F, 6W7OG, ZP5XHM, PJ1B, KP2A, 3DA0BK (QSL to Box 122, Eveni), EL7X, YV5ANF, PZ5JR (QSL via K3BYV), and VP9AD. Dale is now in need of the address of K3BYV, plus any information on the QSL Manager for 3B8DM - anyone out there who can help? If so please drop a line to the writer who will pass it on.

Eric Marten is using the Lake DTR3 kit, a QRP c.w. transceiver and has had much fun putting it together, as indeed he did with his Howes Direct conversion receiver. Now, having got it up and running, Eric is having fun and bringing his Morse up to scratch listening in particular to the QRP operators around 3560kHz. On the antenna side, Colin has 23 metres end-fed, with a quarter-wave counterpoise.

Next I have a nice letter from **Kevin Walton 9M2ZZ**, PO Box 10035 Kuala Lumpur; Kevin is usually working into G around 1600-1800Z, and has chatted to G3NKQ, G3WCY, G4WDW, G0KON, G0JHP, G4WTD, G0EYN, G3FPQ, EI5FA, G0LRJ, G0JNZ, GM4ORL, G4PDQ and others. so - if you want that country in your collection you know what to do!

Talking of 'when to find them' **R. Alexander** points out that ZL4DJ and ZL4QY are on 18.112MHz (±QRM of course) from 0530-0630Z most days, and indeed sometimes later. And of course one can listen for them by long-path on 14MHz most mornings too. On a different tack, reader Alexander is using a four-band completely home-brew set-up capable of copying both c.w. and s.s.b.

P. Parmentier (Kortrijt, Belgium) loves his c.w. and uses all bands between 28MHz and 3.5MHz. In fact, Pat now has more than 100 countries confirmed on each of the bands 3.5-28MHz in this mode. From the current list we pick out this stuff on Eighty: HC8/WA7EGA, 9Q5DX, JT0DX, ZL4IE at 0620Z, 9Y4SD, ZL3GQ, UG6GAW, UF6FEI, UD6DDK, UL7PHB, UI8IAY/UI1C, HK1AMW, and DK8FD/VP9. That would be a good crop even on the h.f. bands for most of us!

Alistair Boyd, having been a reader for a while finally plucked up his courage and wrote to us - good for you! - with a log on his first bash at the bands after being almost inactive for three years. Alistair operates

mainly from the car, when he is on night shift, for a quick listen at 'coffee-break' times, after putting up the G-Whip antenna. He doesn't mention which band he uses but we think it may be 21MHz, with 4U1ITU, SK0LM, YV5ANF, YV5VR, YV5KIN, UC1OWA/RB9M, 9M2HB, VO1BL, WA4WTG, W3BRU, 4Z4ZW, 4X4RL, U1LP, JT0DX, DJ0MAA who hails from Edinburgh, LY2WR the new prefix for Latvia/Estonia, 4X4JU, 7X7ZA, JI2EMF, JA7OYF, NZ8H, CU3BI, N4RXT, NL7MF/W1 in Maine, W8NJS, W1/P/CU3AO (New York), W4PTH, 9K2RA, K1UN, VE8RCS, TF6JZ, A51AD (QSL via WB3DND), UF7FWR, SV0DR, TA4A, PJ2/OH6VY, 4X4HQ, UG7GWB, and on 28MHz N2JTV (New York) and DK8FD/VP9.

D. McLean considers that conditions were disturbed during October, one way and another. On 28MHz around 0800 there were the long path openings to JA-HL-UA0. Very few Pacific stations were noted. North Americans came in from 1000Z, until 2000, South Americans were noted around 1100 and in the early evenings. Africans were few, with the best time seeming to be around 0900Z. On 21MHz the longpath opened 0700-0900Z to BY-JA-HL-VK-ZL, followed by short path between 0900 and 1200Z. Pacific stations were noted over the North Pole path between 0900 and 1100. N Americans between 1000 and 2300Z, South Americans 1000-1200 and again 2100Z. A few Africans were noted 1600-1800Z. A somewhat similar pattern appeared on 18MHz, but Don notes that this time he hardly bothered at all with 14MHz.

Ted Trowell was one of those we met at Leicester, and among other things he notes the removal of the KW Electronics outfit to Sandling, between M2 and M20, ten minutes from either Maidstone or Chatham and much easier to find. We gather they are now handling handling Icom and Trio equipment, too. On a different tack, Ted notes the amount of 14MHz RTTY packet around these days, QRM-ing all and sundry. Bad enough when they get as low as 14.005MHz, but even more annoying when they sit on the beacon network around 14.1MHz and completely wipe them out. After all, most people use the beacons as indicators of the condition of the band. A one watt beacon doesn't stand much chance when it is sat on by some computer sending packets to some other computer while both owners are probably either at work or asleep!

DECODE

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

Readers Letters

In Saffron Walden, ***Peter Starling*** has a set up comprising an Astrad CPC6128 computer with the 'Megahertz RTTY' software from SARUG. The receiver is a Lowe HF-125 with a simple long wire antenna, now at about 20m. He has tried experimenting with the length of the antenna but has found it doesn't seem to be critical. His demodulator is home-made and he's just built a narrow audio filter from Maplin Electronics.

Since mid-summer he has been monitoring an outlet of ANSA Rome on 16.066MHz or 16.067MHz, but can't find it in any of the frequency lists he has. Have any readers got information on this station?

Over in Southern Ireland, it is apparently quite difficult to get hold of amateur equipment as it has to be mostly ordered from the UK. **John O'Neill** uses a Yaesu FRG-7700, FRT-770 and FRV-770 at the moment but isn't sure which direction to go for his RTTY equipment. Hopefully John, the details of other readers' stations will help you arrive at your decision.

Harry Jubb of Barnsley writes asking if I could increase the size of the column. I'm afraid that such mighty decisions are down to the Editor so drop him a line pleading for more! Included with Harry's letter was a selection of stations from his log which I will of course add to the frequency list. Incidentally Harry's station comprises a Saisho 5000, Spectrum +2 with a cassette port from J&P Electronics, G1FTU RTTY and c.w. software from Pearsons Computing and about 10m of wire for an antenna.

The Microreader is such a popular piece of equipment, another reader who has recently purchased one is **Maurice Lloyd**. So now, with his Magnavox D2999 receiver, Datong active antenna and thermal compact printer, he's off discovering the world of RTTY and c.w. By now, a copy of the frequency list will be winging its way to him. Hopefully that will make finding the interesting stations easier.

"Does anyone do a RTTY program for the Commodore +4?" asks **T. Heard**. Well, I'm not actually sure, but I'm sure there must be another reader somewhere who is using the +4, if so drop me a line and I'll pass the news on. One possibility the CRUG (Commodore Radio Users Group). If you send an s.a.e. to CRUG, 22 Whiteford Avenue, Bellsmyre, Dumbarton GB2 3JT.

"However did I do without one", says **John Evans** after investing in a Microreader. The rest of his stations comprises a Racal RA17L or a Larkspur R210. He poses a very interesting question, should he mention the content of a broadcast in his report to that station for a QSL card. I know that you must give a utility station enough information to prove it was that station you heard and that you didn't get the information from a frequency listing. If you have had success in QSLing utility stations, drop me a line and tell me how you put together your report. Perhaps I can pull together some of the information for a future Decode.

Michael Davies of Barry is particularly interested in the marine bands and wonders what equipment he needs. The two predominant modes on the Marine bands are simple c.w. and SITOR so any equipment for utility monitoring on these bands should ideally be able to decode both modes. Rather than recommend a whole range of alternatives here, I would suggest you keep an eye on the column to get a feel for what other users are operating. Unfortunately the rally season is over for this year, but if you can wait these events are a great for evaluating the different systems available.

Fred Staggall of Woolwich has a very impressive station for the reception of utility transmissions. On the computing front he uses a Dragon 32 with G4BMK software for RTTY and a Spectrum 48K and J & P Software for FAX. One rather unusual item is a Oceanfax 1 combined eight channel FAX receiver and printer. It is in relation with this unit that Fred writes as he is having great difficulty obtaining supplies of the special paper required by this machine. Can any readers help - if so please drop me a line and I will pass the information on to Fred.

Interference

I think I opened a hornets nest when I mentioned Mr Innes's interference cure in the November issue.

The first contribution comes from **Mr K. Seddon** who has identified a source of split ferrite beads. You will remember that Mr Innes's initial problem was that he could not used ferrite rings because the moulded plugs on his leads were too big to pass through the hole in the ring. The ferrite beads that Mr Seddon has located come with two sizes of hole, 6 or 13mm. Installation is easy, just place the beads around the cable and hold them in place using insulating tape.

The split beads are available from TMP Electronics and cost 1.50 per pair for the 6mm version and 3.00 per pair for the 13mm beads. Post and packing is 75p, all prices exclusive of VAT.

Mr Gore-Thorne from Ringwood cured the interference from his Spectrum using the rather drastic technique of lining the case with aluminium foil covered with tape. The result seems to have justified the means as the interference is now cured. A word of warning before any of rush out and do the same. it is very easy to damage you r computer with bits of foil lying around, so this sort of job should only be taken on if you are really confindent in your ability. In addition you may well find that the interference is emenating from the connecting leads in which case screening the computer will have little or no effect!

Doug Middleton of Broadstone was also sparked off by my comments on interference. Doug has a very comprehensive station which has been achieved with extensive screening and filtering at all potential sources of interference.

The computer currently in use is a Dragon and the monitor is a Ferguson 14in with RGB input. Doug has fitted filters to the computer power unit - both input and output. all other leads are screened with good quality cable, with one common earth for the whole station which is connected to every metallic item! Another point which is often forgotten is to short out the TV antenna socket when using RGB inputs.

Video Recorders

An interesting point raised by **Mr Thorne** is that he is currently using a video recorder to record utility QSOs! The technique is to connect the video recorder between the TV output of the Spectrum and the TV itself. Although this might seem like overkill it's probably simpler than trying to record the audio signal and play it back - at least you can quickly see where you are and move about quickly using the fast search facility provided on most recorders. It is of course possible to use this technique with most computer systems that use a conventional TV. If your video recorder has a direct video input it could also be used with computers running composite video into a video monitor.

Don't forget to drop me a line if you're using any unusual equipment or techniques for your utility listening.

ERA Microreader II

Regular readers will no doubt have noticed the immense popularity of the Microreader with readers of this column. I know that there are people who regard this device with contempt but this is usually based either on jealousy or ignorance!

The diminutive Microreader is in fact a very powerful unit with many ingenious features designed to make life as simple as possible for the utility enthusiast. These features also make the unit particularly attractive for the newcomer to this mode as its operation is so simple.

So what's so special about the microreader? First of all it was originally designed for c.w. reception rather than RTTY, which is opposite to most other decoding systems. It was also specifically designed to perform well with hand sent morse which again is contrary to normal convention. There are two microprocessors in the Microreader with the main processing being carried out by a Intel 8032 running at 12MHz. Operation at this high speed means that many tasks can be carried out in addition to the basic signal decoding, such as frequency measurement, noise blanking and digital filtering.

When receiving c.w. the Microreader has three basic options - slow, fast or auto. The most used mode is auto which allows automatic tracking of a wide range of hand and machine sent c.w. signals. The other two modes are really for signals at the extremes of the capabilities of the Microreader, i.e. very fast or slow.

One very unusual and very

advanced feature is the Microreaders ability to insert missed spaces and even correct some spelling mistakes! This of course is only possible thanks to the spare processing capacity.

The diplay of the received text in all modes is by a sixteen character liquid crystal display which scrolls from right to left. Although this might at first seem rather limiting I have received many letters from readers expressing their delight with the Microreader. If you do want a larger display there is an standard RS-232 output which can be connected to a computer allowing the received text to be displayed on the computer screen. The speeds available on the RS-232 port range from 600 baud to 4800 baud, so interfacing should not be a problem.

The only slightly odd point about the c.w. reception is that it requires the receiver to be adjusted to give a 1275Hz beat note as opposed to the more normal 800Hz used for c.w. The only problem this causes is when using c.w. filters on the more sophisticated receivers as these are usually set up to produce a 800Hz note. Having said that the Microreader is equipped with comprehensive input filtering so that it can handle the type of signals encountered from the wider s.s.b. filters which are more common.

Moving on to RTTY reception this is also very straight forward. The Microreader allows manual selection of 45, 50 or 75 baud plus shifts of 170Hz, 425Hz or 850Hz. This covers most of the more common commercial and amateur transmissions.

The correct tuning and shift selection is confirmed by the ten element l.e.d. bargraph.

As if all this was not enough, the Microreader also contains a Morse tutor! The tutor can send and receive c.w. at up to 26 words per minute in 2 words per minute steps. The transmitted characters can be various combinations of letters, numbers and punctuation with the audio coming from the internal piezo sounder.

So as you can see the Microreader II is quite a comprehensive piece of equipment which judging by readers letters is to be recommended especially considering the all-in price of £139.95.

If you're interested in obtaining one the address is Unit 26, Clarendon Court, Winwick Quay, Warrington WA2 8QP.

Tandy 100/102 Computers

This is a plea from yours truly! I am the proud owner of a couple of these computers which at the moment are used primarily for text entry - where they excel. I would like to be able to use them for utility decoding but cannot find a source of software. So, before I spend a lot of hours writing some software, does anyone outthere have any software for these machines? An alternative would be a listing for RTTY or c.w. decoding routines in 8080 code. If anyone can help please drop me a line.

Frequency List

I'll finish as usual this month with a few frequencies selected from readers logs. Don't forget if you would like a copy of my frequency list just send three first or second class stamps to the address at the head of the column. It is obviously helpful to me if you include a few of your own loggings and some details of the equipment in use. Lists will be sent out as soon as possible, but if there are too many requests delays are to be expected. Also make alowances for the Christmas post at this time of year. The format used is the usual, i.e. frequency, mode, speed, shift, callsign, time and notes.

2.68MHz, CW, ?, ?, NAWS2FL, 2012UTC, Weather F/casts

2.682MHz, CW, ?, ?, G23B, 2025UTC, Weather Reports

9.226MHz, RTTY, 50, ?, RPFN, 2108UTC, PN Monsanto

10.198MHz RTTY 50, ?, HSW62, 1846UTC, Bangkok Meteo

10.7628MHz, RTTY, 50, ?, HMY56, 1729, PTT Pyongyang

11.112MHz, RTTY, 50, ?, ETD3, 1833UTC, Addis Ababa Air

13.524MHz, RTTY, 50, ?, YIO72, 1322UTC, INA Bagdad

15.935MHz, RTTY, 50, ?, SUA291, 2034UTC, MENA Cairo

18.215MHz, RTTY, 75, ?, WFG93, 2014UTC, Voice of America

18.5425MHz, RTTY, 75, ?, WFK48, 2023UTC, USIA New York

19.87MHz, RTTY, 50, ?, Y2O07, 1606UTC, DP Berlin

INFO IN ORBIT

Lawrence Harris
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New Meteor Satellite

During the late evening of October 25 I was constructing an antenna for a radio astronomy project when my main scanner picked up the bleeps of Russian infra-red pictures of the Met 3/2 variety. This was at 2114UTC and Met 3/2 had already passed by without transmissions so I switched on the framestore, wrote down the time, checked my schedules and confirmed that nothing else should have been on.

The last new meteor weather satellite was 2/18 launched many months ago and so I was most interested to see to which series this new one belonged. It was transmitting good quality infra-red pictures with the clouds black and so therefore likely to be Meteor 3/3. From the short duration of the pass it could only be a far easterly or westerly. Having been listening for many hours the chances were that it was on for the first time and so I estimated the time for its next pass and set my tape and reference clock to record it, and subsequent passes. The following morning I had a tape full of data!

That evening I played back the passes and could identify the ground track quite easily - it was northbound. During the following hours I carefully timed aos (acquisition of signal) and los for a couple of passes while estimating the pass elevations and then started to generate dummy Kepler elements. The idea is to select a satellite with a similar orbit and then adjust the RAAN figure until the observed times agree reasonably well with the predicted times.

On this occasion I was very lucky, using the elements for Met 3/2 recently sent to me by **Des Watson** of the Remote Imaging Group, I changed RAAN from 93 to 30 and after a few trial runs produced useable elements that gave the calculated times to within a minute, enabling me to set the recorder quite accurately.

Many of my satellite contacts had gone to a meeting in the provinces so I was unable to have detailed discussions on the satellite but it did occur to me that this column would probably be the amongst the first to announce the details.

Des has kindly provided the latest Kepler elements for Met 3/3:

Epoch	89306.78155603
inc	82.5577
RAAN	17.6866
ecc	0.0016296
ArgP	169.5569
MA	190.5893
MM	13.15843177
Decay	0.0000077
Rev	117

Other Weather Satellites

During recent weeks Met 2/18 and then 2/16 passed through twilight orbits and were off. I presume that this is part of a routine operation by the Russian weather satellite controllers because the pattern of non-operation during such orbits seems to be regular.

Met 2/16 was off during much of October, (at least while over the UK) and I did not hear any slow scan infra-red transmissions - until the 12th November that is! During the afternoon I heard 2/16 come over the north pole transmitting SSIR which I haven't heard for many weeks.

Met 2/17 and 2/18 continue to transmit APT in visible format only. NOAAs 9, 10 and 11 have continued transmitting good quality APT on their respective frequencies listed below and their beacons can be heard on either 136.77 or 137.77MHz.

Pollution Monitoring

With the approach of winter the NOAAs can reveal the location of fog around our coastlines. Also revealed is coastal pollution! **Pat Gowen G3IOR**, a regular contributor to this column asked me if I could get a picture of the eastern coastline of the UK during the summer months by using one of the weather satellites.

The morning came when NOAA 10 passed over the UK with the sun at a fairly low angle reflecting off the North Sea. The picture showed what I presumed was surface algae so I took a photograph and sent it to him. It seems that my assumption was right and the picture will be shown in a future column after enlargement.

This is just one application of what is quite a wide field of research that amateurs can do while monitoring the planet.

Frequencies

Met 2/16 and 2/17 use 137.40MHz
Met 2/18 uses 137.30MHz
Met 3/3 uses 137.85MHz
NOAAs 9 and 11 use 137.62MHz
NOAA 10 uses 137.50MHz

Meteosat and GOES-E

For those with a suitable dish and down-converter good signals can be received from both these geostationary satellites. Meteosat is nearly due south and about 25 degrees elevation and GOES-E is positioned near our western horizon.

Solar flare

Solar activity is high during the present sunspot maximum and although we are protected by our own atmosphere from solar particles the cosmonauts on MIR do not have that protection. On September 30 there was a major flare and an official

Fig. 1: Pat Gowen G3IOR

SEEN & HEARD

from the Soviet Academy of Sciences passed the information to the Radiation Safety Group of the flight control centre.

After analysis it was decided that no special precautions were required. Measurements later indicated that the crew received 0.6 bars, about the usual dose for a 2 week space mission. It would have been different for an interplanetary mission, according to an article in Izvestia. Thanks to Novosti Press Agency for this data.

Letters

Pat Gowen has also written to me about the effects of recent solar activity on several satellites that he uses or receives data about. The amateur radio satellite Oscar-13 had its memory clobbered twice by flare activity. Oscar-9 re-entered in October as reported last month. Pat adds that Magellan suffered a 'crash' as did Voyager 1 and various geostationary spacecraft had to be repositioned. With the peak of the current solar cycle now expected around February we may have another 2 years of activity and probably lose more satellites!

Pat has sent me a picture of his station, shown in Fig 1.

Weather Satellite Receivers

I have had a letter from **P A Cardwell** of Meersbrook who has an impressive collection of equipment including an Icom IC-R7000, a Royal 1300 discone, a Signal Communications R-535 Airband receiver and a Commodore C64 computer. Mr Cardwell has a variety of software for his computer and can track satellites and decode SSTV transmissions as well. He asks whether his receivers are suitable for satellite picture data and whether there is any source of software to do this on the Commodore 64.

Unfortunately there are problems here. For the production of good quality satellite pictures the receiver has to be designed specifically for this job. It needs to have an i.f. bandwidth of about 50kHz to accommodate the f.m. deviation of some 39kHz which contains the picture information, and an additional doppler frequency shift of about 11kHz caused by the relative movement of the satellite.

It follows that any receiver with a smaller i.f. will produce a signal which will lack much of the picture information.

My Tandy PRO-2004 has 3 selectable modes, n.b.f.m., w.b.f.m. and a.m. With the n.b.f.m. mode selected my frame store can produce a fair picture but with fewer grey levels than normal because the information is missing. This is not unreasonable because the receiver is designed to cover a large part of the radio spectrum where nearly all modes require quite narrow bandwidths.

So although it is fairly easy to receive satellite signals on many receivers, such as an airband receiver, using them to produce quality pictures requires modifications to the i.f. circuitry and so most enthusiasts go the whole way and build or buy a special wx receiver.

Commodore Software

The second part of his letter asks about software for the Commodore 64 to decode APT data. In principle it should be possible to use a C64 to produce a picture with up to 8 grey scales in the same way that commercial systems were initially set up with the BBC computer for this purpose. I don't know of any such software myself but if anyone can let me know of any source I will pass the information on.

Finally Mr Cardwell wonders whether his SSTV software can decode WX satellite pictures. This is unlikely because of the difference in the way that picture data is modulated onto the carrier signal. There is no harm in trying it out though!

A few weeks ago I tuned in my h.f. receiver, a Lowe 225, to a station transmitting FAX and fed the signal into my framestore as an experiment. With a lot of adjustment I was able to produce a recognisable picture though obviously not of the correct quality.

The times taken for each line of picture to be scanned may be very different and so the picture may remain unsynchronised. The station that I tuned into was transmitting a picture at a line scan rate the same as Cosmos weather satellites and so I was able to produce a recognisable picture.

More Letters

I mentioned **Brian Coupe's G4RHZ** letter last month, on the topic of the various satellite frequencies to be heard in the 137MHz band, and elsewhere. Brian has very kindly sent me a large quantity of information regarding transmission schedules and telemetry analysis which will take some time to digest - thanks!

He mentions that Amsat UK have a net on 3780kHz at 1015am on Sunday mornings and at 7pm on Monday and Wednesday evenings for passing on satellite information. There are a number of local nets of this type and I must remember to write down a list to put on my wall because I keep forgetting to tune in!

Mr D Hardman of Littleborough has sent me a list of RTTY and FAX stations including those involved in satellite launch announcements, following my comment about this in a previous column. Over the Christmas holiday period I hope to catch up on all of this information and include summaries in a future column.

My thanks to all those readers who have sent in such useful data and kind comments about the column.

MIR

The cosmonauts broadcast regularly on 143.625MHz but those using the published Kepler elements should allow for the regular orbital height adjustments. The predictions may be out by several minutes as happened recently when I heard MIR exactly on time on October 28th at 0951UTC but the next day it was some 40 minutes out.

Pat Gowen G3IOR mentions that a new voice frequency is being used on MIR on 143.621MHz as well as the usual one.

Shuttle

The Goddard Amateur Radio Club station WA3NAN will broadcast all future shuttle launches (except military ones) on 3.860, 7.185, 14.295, 21.395, and 28.650MHz while the astronauts are active writes Pat Gowen and suggests that they can best be heard in the UK on the last 3 frequencies.

School Rocketry

In my first column several months ago I mentioned about the programme of rocket launches and development work carried out by Acton High School in west London. Mr Hewitt, a staff member involved with the team rang me recently to ask whether I had any contacts who could advise on the availability of small transmitters for inclusion in the payloads. He anticipates using the 30MHz band for this data and would be very interested to hear of any company or person that might be able to help in this most worthwhile project.

Back in the sixties I was involved with this sort of idea and Acton seems to be channelling enthusiasm in the right direction.

Radio Astronomy

Having an interest in both radio reception and astronomy it seemed logical to attempt to combine the two so I recently bought a low-noise pre-amp and down converter to use at 150MHz primarily for the sun but also to look for other sources. It is worth remembering that it was radio workers who first discovered that strong radio signals from the sun and cosmos can be received.

Several letters arrived too late for inclusion here so I'll mention them next time. This article will be appearing in the middle of the Christmas festivities so I hope that all our readers are enjoying seasonal cheer and may I wish you all a very Happy New Year.

Weather

Although the levels of rainfall can vary considerably throughout the UK, the weather buffs among you may like to add the details in Fig. 1 to your archives. The barchart in Fig. 1, produced with the graphics package in Mini-Office Professional on my Amstrad 8512 computer, represents the amount of rain that I recorded at home each month from January to October 1989. The November figure at the time of writing is already 2.46in and a further rise during the following 14 days will certainly help our current water shortage. We all keep a watchful eye on the prevailing weather and when the barograph was reading high, around 1026mb (30.3in) and the sky was bright and clear around 1000 on Tuesday October 24, Joan and I decided to see the autumn colours at the National Trust garden, Sheffield Park, in East Sussex. However, soon after we left home those wispy clouds, indicating a change, were starting to build up and by 1300 the atmospheric pressure was beginning to fall.

BAND II DX

Ron Ham
Faraday, Greyfriars, Storrington, West Sussex RH20 4HE

Tropospheric Openings

After lunch my thoughts were turning toward DX and, true to form, by 1600 Band II was showing signs of a lift. I tuned through the band, using my Plustron TVR5D with its own rod antenna and although my car was surrounded by trees I could hear strong "warbles" of co-channel interference around 94.5MHz, BBC Radio Solent, GLR and a few French stations around 98MHz. The pressure continued to fall slightly and gradually overnight and at 0930 on the 25th I checked the band at home with my ex-military R216, fed by a chimney mounted dipole and heard BBC Radio Bristol, GLR again and counted at least 18, predominantly German, foreign voices spread between 87.5 and 102MHz. There may well have been more but some of the 'extra' stations were transmitting music and therefore could not be positively classified as originating from 'home or away'. This event was confirmed by **Simon Hamer** who was on holiday in Dorset at the time and heard on f.m. on his car radio, heard BBC Radio WM from Birmingham and programmes from stations in the Benelux countries, Eire, France and West Germany. Similar conditions occurred again during a rapid pressure fall at 0845 on the 27th

Conditions were right again for Band II DXing in mid-November helped along by a large area of high pressure, 30.5in (1032mb) and widespread fog. I found many French stations throughout the band on the 12th, predominantly Dutch and German on the 13th, French again on the 14th and while parked in Chichester and later near Goodwood on the 14th, I received a variety of very strong French signals on my Plustron between 87.5 and 106MHz. Although the peak of the opening passed on the 14th, I could still hear a few French voices around 100MHz during my travels on the 15th.

Back home in New Radnor, Simon logged BBC Radios Norfolk and Sussex, ILR Horizon Radio and broadcasts from Scandinavia and West Germany on the 13th.

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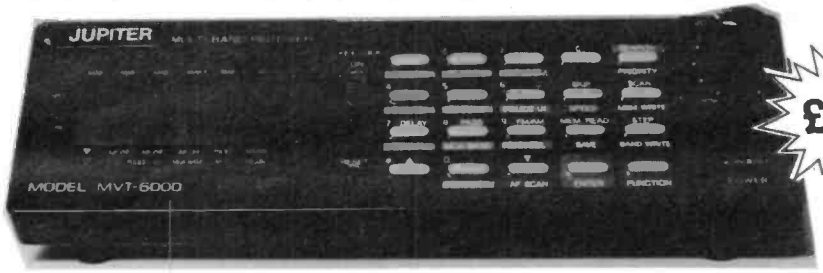

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SEEN & HEARD

Sporadic-E

During one of those rare out of season Sporadic-E openings which occurred during the morning of November 6, I counted 19 very strong East European f.m. broadcast stations between 66 and 73MHz and, at 0930, heard the 'chimes' of Radio Moscow's ident.

Info

"BBC CWR at Coventry is now testing on 94.8 and 103.7MHz with announcements and recorded music," wrote **Roy Patrick** (Mackworth) on November 4 and continued "BBC Radio Leicester is now loud and clear on the new frequency 104.9MHz from Copt Oak."

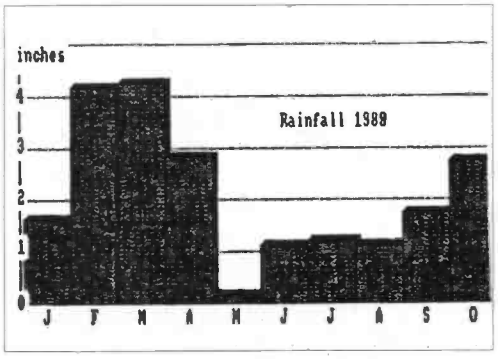

Fig. 1: Monthly rainfall at Storrington.

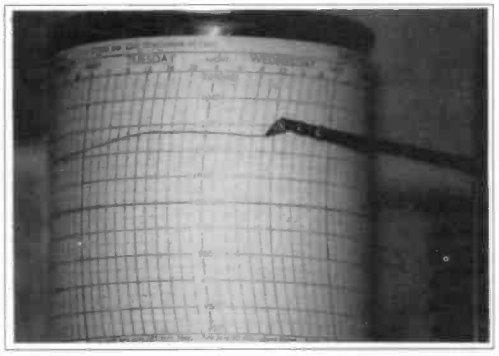

Fig. 2: Ron's barograph.

Band I

Neil Purling (Hull) made a good start to 'F2' DXing when he saw very smeary Arabic type text, captions and motor racing, most likely from Malaysia (RTM) on Ch. E2 (48.25MHz) at 0928 and 1110 on October 29 and two test cards (JTV AMMAN and a blank, possibly RTM) fighting each other on Ch. E3 (55.25MHz) at 0935 on the 30th. Neil also saw two pianists playing on grand pianos accompanying a singer and an episode of *Santa Babera* from Spain (TVE1), via Sporadic-E, around 1100 on the 30th. "Plenty of 'F2' in the last few days from November 1st to 12th. Most unidentified except for possibly China and Malaysia on the morning of the 5th," wrote **Edwina** and **Tony Mancini** (Belper) on the 13th and added, "The screens were full of stuff from approximately 0800 to 1400 on the dates mentioned." They too logged pictures via Sporadic-E from the USSR on the 2nd and 3rd with the addition of Sweden on the 2nd, Spain on the 3rd, ballet "from the 'F2' murk" on the 9th and "some sort of news type programme" on the 12th. In New Radnor, **Simon Hamer** also saw Chinese characters on Ch. R1 (49.75MHz) around 0830 on the 5th and strong sync-pulses but weak vision from Australia on Ch. A0 (46.25MHz) at 0800 on the 4th and 0830 on the 5th. The "interweaving" Sporadic-E gave him Finland (YLE) on the 3rd and Denmark on the 5th.

TELEVISION

Ron Ham
Faraday, Greyfriars, Storrington, West Sussex RH20 4HE

During the 'F2' openings between 0800 and midday on November 1, 5, 6, 8, 9, 10, 11, 12 and 13 a mixture of smeary, streaky, wavy and unlockable television signals were spread across Chs. E2 and R1 which I proved by listening to the varying synchronising pulses on my R216 v.h.f. communications receiver. The outbreaks of Sporadic E which occurred on some of these days meant very careful tuning amid the 'F2' enhanced signals with my D100 converter switched to narrow band and by this method, I managed to hold a test card briefly from Sweden (Kanal1 Sverige) around 1000 on the 1st and, between 0900 and 1000 on the 6th, I saw an orchestral concert and a part of a play on Ch. R2 (59.25MHz). The sound was heard on the R216 tuned to 65.75MHz. **David Glenday** (Arbroath) reported, "Massive Band I activity caused by 'F2' and Sporadic-E from 0915" on the 1st and 2nd and **Andrew Jackson** (Birkenhead) found a test card, followed by cartoons, from Czechoslovakia hidden among the 'F2' signals on Ch. R1. on the 1st. David's Sporadic-E haul included test cards from Czechoslovakia (CST 1SR-P), Spain, Sweden and the USSR (TSS Leningrad and EESTI TV Tallinn), a wildlife programme and a clock caption from West Germany (ARD1 ZDF), football from Italy, a nautical romance soap opera from Switzerland and ballet and skiing fashions from the USSR. He also logged test cards from the USSR and Spain at 0935 and 1022 respectively via Sporadic-E and, typically 'F2', an unidentified programme with Arabic subtitle-like text at the foot of the screen, on Ch. E2, at 1315 on the 3rd.

Mike Bennett (Slough) logged 'F2' multiple images at 1230 on October 25 and around 0945 on days 20, 29, 30 and 31 and November 4, 5 and 6. Mike saw an Arabic or Indian caption at 1109 on October 29 and bands marching with Arabic subtitles at 1011 on the 30th. He also logged pictures via Sporadic-E from Spain (TVE1) on October 26, Italy (RAI) on Ch. Ib (62.25MHz) at 1123 on the 30th, an RAI film on Ch. Ia (53.75MHz), strong colour test cards from the Norwegian regionals Bremanger, Gamlem, Hemnes, Melhus and Steigen on Ch. E2 and Sweden on Ch. E3 (55.25MHz) between 1045 and 1125 on November 2, RAI News and a test card from Switzerland (PTT SRG1) around 1100 on the 6th and a schools programme from Austria (ORT) on Ch. E2a (49.75MHz), films from the USSR and a test card from Poland during the morning of the 7th. Early on the 5th, **George Garden** (Edinburgh) received pictures from a Russian source.

Fig. 1: Dubai

Fig. 2: USSR

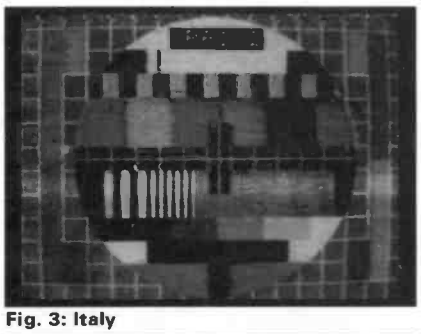

Fig. 3: Italy

Fig. 4: USSR

Fig. 5: Estonia

Fig. 6: Estonia

SEEN & HEARD

Fig. 7: East Berlin

Fig. 8: Denmark

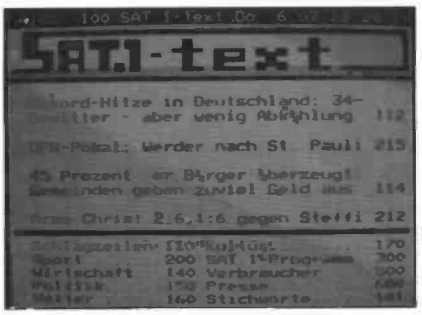

Fig. 9: Sat. 1

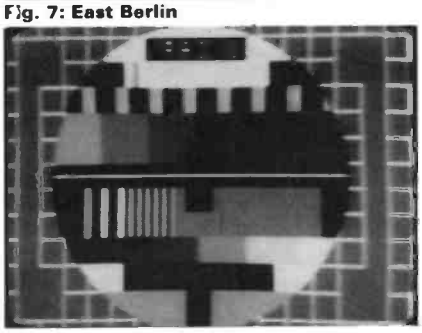

Fig. 10: Italy via satellite

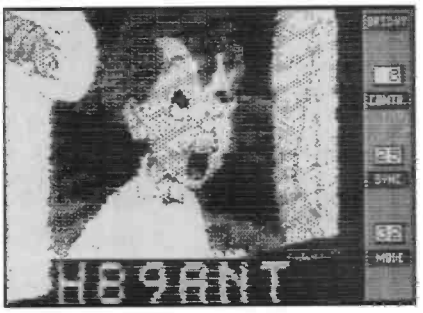

Fig. 11: SSTV

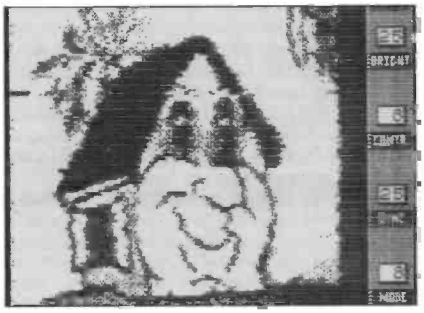

Fig. 12: SSTV

Picture Archives

Looking back to the 1989 Sporadic-E season, **Lt. Col. Rana Roy** (Meerut) received pictures from Dubai, Fig. 1, on Ch. E2 on May 29 and the USSR, Fig. 2, on Ch. R1 on August 3. **John Woodcock** (Basingstoke) added Italy's RAI 1 test card, Fig. 3, to his records at 0800 on August 2 and said, "This was very short in duration I only just had time to set the camera up." Between 1849 and 1915 on June 12, Neil Purling logged the 'Gosteleradio' caption from the USSR, Fig 4 and Sport and News, Figs. 5 and 6, from Estonian TV on Ch. R2. During the tropospheric opening on July 7, David Glenday received pictures of the live coverage of the closing ceremony of the International Youth Festival in Pyongyang (North Korea), Fig. 7, from East Berlin (DFF 2), on Ch. E27 and early on the 8th he received a test card from Denmark (TV2), Fig. 8, on Ch. E52.

Tropospheric

While the tropospheric opening was in progress on October 17 and 18, Andrew Jackson and David Glenday received pictures from Holland (NCRV and PTT NED2&3) and West Germany (ZDF) in the u.h.f. band. Another opening was brewing up on the 24th, because, a routine check with my Plustron TVR5D and its own rod antenna, from Sheffield Park, East Sussex, around 1600 revealed a couple of weak frame bars in Band III. [see Band II DX on the previous page] However, by 1000 on the 25th my home equipment was receiving pictures from Belgium (BRT1), France (Canal+) and West Germany (ZDF1). The pressure steadied until early on the 27th and at 0845 while a rapid decline was in progress I received a strong coloured test card from West Germany (WDR1) on Ch. E9. Mike Bennett received pictures in Band III from France (Canal+) and test cards from Belgium (BRT and RTBF) around noon on the 27th and John Woodcock logged Canal+ on days 25, 27 and 29. George Garden was at his favourite DX spot high on Cairn O' Mounth between 1015 and 1230 on November 5 and received strong CH4 signals from the u.h.f. transmitter at Davel in Ayrshire. The Mancinis received Band III pictures from Denmark (DR) early on October 26, France (Canal+) on days 16, 17, 18, 23, 25, 26, 27, 29 and 30 and November 1, 3 and 4 and Ireland (RTE1&2) on October 30 and November 1, 3 and 4. The high atmospheric pressure of 30.5in (1032mb) was among the governing factors that produced the tropo-opening which I first saw during the evening of the 12th when weak negative pictures from France appeared in Band III and some u.h.f. channels were disturbed by co-channel interference. The French pictures were stronger on the 13th and at 0900 on the 14th I received a colour test-card from Holland (PTT NED 1) accompanied by a French signal at the lower end of Band III. I spent most of the 14th in Chichester and with the Plustron on the rear seat of my car I received very strong negative pictures from France on several spots in Band III and in the u.h.f. band. In addition to a good Band III haul on the 12th and 13th, Simon Hamer received u.h.f. pictures from Belgium, Denmark (TV2 Danmark), Holland, East and West Germany, Ireland, Luxembourg (RTL) and Sweden.

Satellite TV

During the tropo-opening last July 6, David Glenday received a SAT-1 teletext transmission, Fig. 9, from an unknown German relay station on Ch. E52 and Edwina and Tony Mancini received a colour test-card from Italy (RAI 2), Fig. 10, direct from a satellite.

SSTV

John Taylor G3OHV (Tunbridge Wells) has added Technical Services' RX4 programme and interface to his BBC computer for the reception, via his KW2000A, of slow scan television to his station. John's first results came on 14MHz at 1340 on October 27 when he resolved a picture from DL9HBF. Although 14.230MHz is the popular frequency for this mode, do remember that, depending on atmospheric conditions and the time of day, the 'twittering' of SSTV activity can also be found around 3.74, 7.04, 21.34 and 28.65MHz. Between October 21 and November 1, **Max Wustrau G7BLH** (Houghton Conquest) received captions and pictures on 14.230MHz from Stations in Austria, Denmark, East and West Germany, Holland, Hungary, Italy, Poland, Spain and Switzerland. Max uses a Sinclair Spectrum 48K computer with G1FTU software to resolve and store the pictures and a Timex 2040 printer for hard copy. Among the captions he received were "CQ JOTA PA0JHN SCOUTING...NI JVERDAL PSE K", "MY NAME: BERT QTH: NR HANNOVER", "SORRY QRM TOO STRONG TNX LACI", the callsign HB9ANT, Fig.11 and a cartoon style house, Fig. 12.

LONG MEDIUM & SHORT

Brian Oddy G3FEX
Three Corners, Merryfield Way, Storrington,
West Sussex RH20 4NS

The New Year should prove to be an exceptional one for DXers, as the conditions in the h.f. bands are likely to continue to improve! At the last World Administrative Radio Conference (WARC) it was decided that single sideband (s.s.b.) transmissions should be adopted for s.w. broadcasting in the future - they urged receiver manufacturers to commence the production of relatively inexpensive s.s.b short wave receivers and these new designs should soon be on sale!

Long Wave DX

Note: l.w. & m.w. frequencies in kHz; s.w. in MHz; Time in UTC (=GMT).

In an attempt to avoid interference to existing transmissions on 254kHz, the operators of Atlantic 252, the new l.w. station in Clarkestown, S.Ireland have restricted their broadcasts to the period 0500-1800UTC daily, but owing to the early onset of darkness quite strong sky wave signals now reach the UK from Tipiza, Algeria on 254 before 1800 and co-channel interference has arisen in some areas. In view of this it would seem unlikely that 24 hour broadcasting from Atlantic 252 could be contemplated.

Encouraged by an initial check last month, **Sheila Hughes** (Morden) says "I am becoming increasingly interested in this band - I especially like the classical music broadcast via Kalundborg, Denmark." A total of fifteen stations were noted in her latest report.

The premature change in frequency of the transmissions from Topolna, Czechoslovakia which **Philip Rambaut** (Macclesfield) reported last month, now appears to be permanent. Their move from 272 to 270kHz is in compliance with the final stage of the l.w. band plan, which

SEEN & HEARD

will be implemented on 1 February 1990.

MW Transatlantic DX

The latest report from **Mark Thompson** in Wakefield should encourage those listeners who have felt they would like to try this aspect of our hobby, as he logged five transatlantic signals before midnight! A total of twenty-one of the broadcasts from the USA, Canada and the Caribbean were heard, but only fifteen of them could be positively identified. The earliest signal to reach him stemmed from VOCM in St.John's, Newfoundland on 590, which rated as SIO 233 at 2220. A close runner up was WINS in New York, NY on 1010 - their transmission rated as SIO 222 at 2235, peaked up to SIO 333 and could be heard until 0445. The broadcasts from the Caribbean Beacon, Anguilla on 1610 were logged as SIO 222 at 2350. Mark was very surprised to find that he could still hear the broadcasts from VOCM on 590 and CKLM in Level, Quebec on 1570 until 0745!

An improvement in the conditions was also noted by **Tim Shirley** in Bristol. During one night he picked up the broadcasts from KHEY in El Paso, Texas on 690 at good strength around 0230. Using a new Lowe HF225 receiver in Cambridge, **Mike Smith** heard for the first time the broadcasts from WINS New York on 1010 and WKKU in Boston, MA on 1510. He also picked up an unidentified transatlantic signal on 1220. The only transatlantic signal he had ever heard with his old receiver was CJYQ in St.John's, Newfoundland on 930, but the improved conditions may have also played a part in his latest results.

Writing from Prenton, **Kenneth Reece** says "It must be over 20 years since I last monitored the m.w. band and the list is the result of a pure accident. I was testing out the R-9000 at the l.w. end of the spectrum and continued up into the m.w. band when I came across a faint "American" accent on 590, but could not identify it. I kept scanning the band and eventually obtained the station identifications in the short list." It seems that this may have re-kindled his interest in transatlantic DXing, as he intends to search the band again in the near future!

Other MW DX

Listening in Derby at 2355, **Roy Patrick** heard AIR via Nagpur, India on 1566 (1000kW) for the first time. Following some music played on a flute, an announcement in Hindi was just audible. During two nights he picked up the 1000kW transmissions from Quayyat, Saudi Arabia on 900.

Two of the broadcasts from Saudi Arabia were logged by **Matthew King** in Hayes - they stemmed from Jeddah 1512 (1000kW), rated as 55444 at 0116 and Duba 1521 (2000kW) - 44444 at 2131. Several of the transmissions from Algeria, Egypt, Morocco and Tunisia were logged by Matthew and other DXers - see chart.

Several of the low power transmissions from Australia reached **Dick Moon** in George, S.Africa! Between 1710 and 1750UTC he logged 6DL Dalwallinu 531 (10kW); 6WF Perth 720 (50kW); 2BA Bega 810 (10kW); 6PR Perth 882 (2kW); 5AD Adelaide 1062 (2kW); 6KY Perth 1206 (2kW).

MW Local Radio DX

A short visit to Aberdeen enabled **Ike Odoom** (Glasgow) to explore the band from a new location. While listening to Radio Cumbria on 1458 he heard an ident from co-channel GLR. Surprising as it may seem, the ground wave signals from the ILR Red Dragon Radio 0.2kW transmitter in Newport on 1305 reached him at 0700!

Some remarkably long hauls were also noted in the report from **George Millmore** in Wootton, IOW. No doubt the sea paths help the ground wave signals to reach him from BBC Radio Cornwall via Redruth 630 (2kW), Radio Jersey 1026 (1kW) and Radio Guernsey 1116 (0.5kW).

John Coulter at his listening post in Winchester.

Short Wave DX

The effects of solar flares have disrupted reception in the **25MHz (11m)** band during some days, but usually very potent signals have been noted in the chosen target areas. The broadcasts to Europe from Radio RSA Johannesburg, S.Africa 25.790 (Du 0830-1000 Sun only; Du 0900-1000 Sat only; Ger 1000-1100 Sat/Sun; Eng, Fr 1100-1300; Eng 1400-1600) have been reaching their target well. Using a portable with just the built-in whip antenna, **Edward Broadsmith** (Worcester) found that this band provides the clearest reception of their broadcasts. During a period of 28 days **Alan Roberts** logged their transmissions in Quebec, Canada - the best SINPO rating was 35555 at 1810.

The Voice of the UAE in Abu Dhabi have changed their transmission frequency several times recently - at the time of going to press their broadcasts in Arabic are on 25.690 prior to 0955 and then move to 25.890. Others using the band include RTB Brussels, Belgium 25.645; Radio Norway Int, Oslo 25.730; BBC via Daventry, UK 25.750; RFI via Issoudun, France 25.820; Radio Denmark, Copenhagen 25.850; Radio Nederlands via Flevo, Holland 25.970 and BRT Brussels 26.050. Radio Moscow's broadcasts on 25.780 appear to have ceased.

From time to time the **21MHz (13m)** band has also been disrupted by solar events, but good long distance reception has also been noted. During some days Radio Australia's broadcasts to Indonesia, Malaysia and Singapore on 21.525 have been reaching the UK - they stem from Carnarvon, W.Australia between 0100-0900 and from Darwin, N.Australia between 1300-1430. Reception varies, but the SIO 322 noted at 0821 by Philip Rambaut and the SIO 433 at 1405 by **Alan Smith** (Northampton) are fairly typical ratings. Their broadcasts to the S.Pacific area via Shepparton 21.740 (Eng 2200-0730) were logged as 23222 at 0519 by Kenneth Reece, but they seldom reached our shores. However they were noted in the report from **Rhoderick Illman** in Thumrait, Oman as 34333 at 0600.

The broadcasters who beam their programmes direct to listeners in Europe during the day include Radio Japan, Yamata 21.500 (Fr, Eng, Jap 0630-0900), rated as 34543 at 0745 by **John Parry** in Northwich; Radio Pakistan, Islamabad 21.580 (Eng ?-?) - 35543 at 0628 by **David Edwardson** in Wallsend; Voice of Israel, Jerusalem 21.760 (Eng 1000-1030) - SIO 444 at 1041 by **John Coulter** in Winchester; Radio Pakistan, Islamabad 21.575 (Eng 1105-1120) - 54444 at 1110 by **Chris Shorten** in Norwich; Radio Kuwait, Sulaibiyah 21.675 (Ar ?-1800) - SIO 555 at 1600 by **Kenneth Buck** in Edinburgh; Radio Pakistan, Islamabad 21.740 (Eng to Middle East 1600-1630) - 55444 at 1600 by **David Wratten** in Cambridge; UAE Radio Dubai 21.605 (Ar, Eng 0615-1730) - 44454 at 1640 by **Carl Yates** in St.Helens; Radio RSA Johannesburg, S.Africa 21.535 (Du, Eng 1800-2000) - SIO 444 at 1800 by **Alf Gray** in Birmingham; WYFR via Okeechobee, FL 21.615 (Eng 2000-2100) - 54454 by **Andy Cadier** in Folkestone.

Many of the broadcasts intended for listeners in distant places can also be heard in the UK. They include Radio Prague, Czechoslovakia 21.705 (Eng to SE.Asia 0730-0800), noted as

LongWave DX Chart

Freq kHz	Station	Location	Power (W)	DXer
153	Bechar	Algeria	1000	M*
153	DLF Donebach	Germany (W)	500	B,D,E,F*,G*,H,I*,J,L,Q*,R
153	Brasov	Romania	1200	H,L,M*
162	Allouis	France	2000	B,C,D,E,F*,G*,H,I*,J,L,O,P,Q*,R
171	Medi 1-Nador	Morocco	2000	C,H*,L*
171	Kaliningrad	USSR	1000	D*,G*,H,I*,L
171	Moscow	USSR	500	B,E,F*
177	Oranienburg	Germany (E)	750	B,D,F*,H*,I*,J,L,R
183	Saarlouis	Germany (W)	2000	B,C,D,E*,F*,G*,H,I*,J,L,O,P,Q*,R
189	Motala	Sweden	300	B,C,D*,F*,H*,L*,R*
198	BBC Droitwich	UK	400	C,E,F*,G*,H,I*,J,L,O,P,Q*,R
198	BBC Westerglen	UK	50	B
207	DLF Munich	Germany (W)	500	B,E,G*,H,I*,O,Q*
207	Azilal	Morocco	800	H*,I*
216	Roumoules	Monaco	1400	A*,B,C,D,E,F*,G*,H,I*,J,L,O,Q*,R
216	Oslo	Norway	200	A*,B,H*,L*,R
225	Konstantinow	Poland	2000	A*,B,C,D,E,F*,G*,H,I*,L,Q*,R
234	Junglinster	Luxembourg	2000	A,B,C,D,E,F*,G,H,I*,J,L,O,P,Q*,R
234	Kishinev	USSR	1000	H*,L*,M*
245	Kalundborg	Denmark	300	A.B.C.D.F*.G*.H.I*,L,O,Q*,R
254	Tipaza	Algeria	1500	C*,H*,I*,L*,Q*,R*
254	Lahti	Finland	200	H*
254	Atlantic 252	S.Ireland	500	B,C,D,E,F*,G,H,I,J,K,L,N,O,R,S
263	Burg (R.Volga)	Germany (E)	200	D*,F*,H,I*,L,M*,Q*,R
263	Moscow	USSR	2000	A*,B,E,G*,H*
270	Topolna	Czechoslovakia	1500	A,B,C*,D*,E*,F*,G*,H*,I*,L,Q*,R
281	Minsk	USSR	500	B,C*,F*,H*,L,M*

Note: Entries marked * were logged during darkness. All other entries were logged during daylight.

DXers:
A: Leo Barr, Sunderland.
B: Kenneth Buck, Edinburgh.
C: Andie Cadier, Folkestone.
D: Peter Easton, Edinburgh
E: Raymond Edwards, Chatham.
F: David Edwardson, Wallsend.
G: Sheila Hughes, Morden.
H: Matthew King, Hayes.
I: George Millmore, Wootton, IOW.
J: Ike Odoom, Aberdeen.
K: Roy Patrick, Derby.
L: Philip Rambaut, Macclesfield.
M: Tim Shirley, Bristol.
N: Chris Shorten, Norwich.
O: Paul Strickland, Fleetwood.
P: Harry Sutcliffe, Totnes.
Q: Phil Townsend, London.
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S: Carl Yates, St.Helen's.

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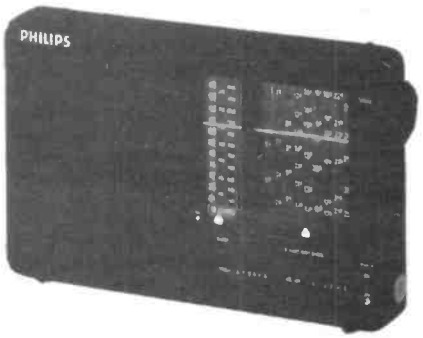

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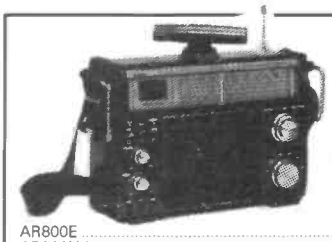

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55545 at 0734 by **John Nash** in Brighton; Radio Moscow, USSR 21.725 (Eng to Africa 0700-1600) - 23433 at 0743 by **Leo Barr** in Sunderland; BBC via Limassol, Cyprus 21.470 (Eng to E.Africa 0900-1615) - SIO 333 at 0957 by **Ron Pearce** in Bungay; Radio Finland 21.550 (Eng to USA 1100-1400) - 55555 at 1305 by **Ted Agombar** in Norwich; Radio Prague, Czechoslovakia 21.505 (Eng to Africa 1730-1830) - 24222 at 1733 by **Jim Cash** in Swanwick; WCSN Scotts Corner, Maine 21.640 (Eng to Africa 1600-2000) - SIO 444 at 1752 by **Darren Beasley** in Bridgwater; Radio Nederlands via Bonaire, Ned.Antilles 21.685 (Eng, Fr to C.Africa 1830-2025, Du to W.Africa 2030-2125) - 44333 at 2053 by **Raymond Edwards** in Chatham.

Despite disturbances caused by solar flares, good long distance reception has been frequently noted in the **17MHz (16m)** band. The broadcasts to Pacific areas from Radio New Zealand, Wellington 17.705 (Eng 2245-0045; 0230-0630; *0045-0230 *Sat/Sun only) have reached the UK during some mornings. Whilst monitoring them on a daily basis, Kenneth Reece noted variations in reception ranging from "just audible" around 0331 to a remarkable 44433 at 0530. Good reception of Radio Australia's transmissions to C.Pacific areas and W.USA via Shepparton 17.795 (Eng 2200-0800) has also been noted here during the early morning - Chris Shorten quoted 43333 at 0515. Their transmission to S.Asia via Carnarvon 17.715 (Eng 0100-0915) was logged in Bristol as SIO 333 at 0715 by **Francis Hearne**.

Quite a number of the broadcasts to other areas were logged, including KHBI Saipan, N.Mariana Islands 17.780 (Eng to Japan, China 0200-0800), noted as 34433 at 0452 by Kenneth Reece; SRI Berne, Switzerland 17.670 (Eng to Australia, New Zealand 0745-1030) - 55555 at 0836 by Ted Agombar; Voice of Greece, Athens 17.550 (Eng to Australia 0800-0850) - 44444 at 0840 by David Wratten; Radio Beijing, China 17.710 (Eng to S.Pacific 0830-1000) - SIO 222 at 0921 by Philip Rambaut; Radio DW via Wertachtal, W.Germany 17.845 (Ger to SE.Asia 1000-1200) - SIO 444 at 1055 by John Coulter; RTM Tanger, Morocco 17.595 (Fr, Eng to Middle East, N.Africa 1400-1700) - 43443 at 1540 by Carl Yates; Radio Oman via Thumrait 17.735 (Ar to N.Africa, Middle East 1700-2130) - SIO 433 at 1900 by Kenneth Buck; Radio RSA Johannesburg, S.Africa 17.765 (Eng to Africa, Middle East 1900-2000) - 33333 at 1909 by Jim Cash; Radio Nederlands via Bonaire, Ned.Antilles 17.605 (Eng, Fr, Du to W.Africa 1830-2125) - SIO 333 at 1934 by **Ted Walden-Vincent** in Gt.Yarmouth; BBC via Antigua, W.Indies 17.760 (Eng to S.America 2000-2115) - SIO 433 at 2030 by Alan Smith; VOA via Greenville, USA 17.785 (Eng to W.Africa 1600-2200) - 44434 at 2035 by **Graham Johnson** in Nuneaton; RCI via Sackville, E.Canada 17.820 (Eng to Africa 2130-2200) - 45344 at 2138 by John Nash.

In contrast, only a few of the many broadcasts to Europe were noted: RNE Spain 17.730 (Sp 1030-1900) - 52333 at 1505 by Raymond Edwards; Radio Pakistan, Islamabad 17.660 (Ur, Eng 0715-1120) - 34433 at 1108 by **Darren Taplin** in Tonbridge; Radio Surinam Int. via RNB Brazil 17.755 (Du, Eng 1700-1750) - 44333 at 1700 by Sheila Hughes; Radio HCJB Quito, Ecuador 17.790 (Cz, Ger, Sw, Norw, Da, Fr, Eng 1900-2230) - SIO 433 at 1952 by Darren Beasley; VOFC via Okeechobee, Florida 17.612 (Ger, Eng 2100-2300) - 23423 at 2159 by Leo Barr.

The reception conditions prevailing in the **15MHz (19m)** band have also been affected by solar events during some days. Much to the annoyance of UK DXers the broadcasts from Radio New Zealand, Wellington on 15.485 (Eng to Australia, Papua, New Guinea 0230-0630) are marred by co-channel interference by the Voice of Israel, Jerusalem between 0500 and 0530. Daily monitoring by Kenneth Reece has revealed that reception of RNZ is virtually impossible during that period, as the news bulletins from Israel are jammed. The reception of RNZ in this band is, therefore, severely limited.

Generally good reception of Radio Australia's broadcasts via Shepparton have been noted here during the evening. Their transmission to Asia 15.245 (Eng 1530-1830) was rated as 44434 at 1810 by Carl Yates; to C.Pacific 15.160 (Eng 2100-0700) - 43343 at 2105 by Chris Shorten; to S.Pacific 15.240 (Eng 2100-0730) - 54433 at 2158 by Raymond Edwards.

The logs included some of the many broadcasts to areas outside Europe: UAE Radio Dubai 15.435 (Ar, Eng to SE.Asia 0416-0600), noted as 44344 at 0530 by Rhoderick Illman in Oman; Voice of Malaysia 15.295 (Eng to Australia, New Zealand, Indonesia 0555-0825) - SIO 232 at 0600 by **John Evans** in Stacksteads; Radio Moscow via Irkutsk, Siberia 15.545 (Chin to C.Asia 0300-0900) - SIO 322 at 0845 by Philip Rambaut; Radio Tashkent, USSR 15.470 (Eng to ? 1200-1230), noted as 'fair' at 1220 by **Harry Sutcliffe** in Totnes; Radio Yugoslavia, Belgrade 15.325 (Eng to USA 1300-1330) - 44444 at 1325 by Ted Agombar; SRI via Schwarzenburg, Switzerland 15.430 (Eng, Fr, Ger to Middle East, Africa 1515-1700) - SIO 534 at 1559 by Darren Beasley; KUSW Salt Lake City, USA 15.650 (Eng to Canada 1500-2200) - SIO 333 at 1940 by Alan Smith; Africa No.1, Gabon 15.475 (Fr, Eng to W.Africa 1600-2100) - 44434 at 1957 by Leo Barr; Radio Beijing, China 15.110 (Eng to W.Africa 2000-?) - 22232 at 2012 by Andy Cadier; VOA via Monrovia, Liberia 15.600 (Eng to Africa 1600-2200) - 24242 at 2020 by

Local Radio DX Chart

Freq kHz	Station	ILR BBC	Power (kW)	DXer
585	R. Solway	B	2.00	J,L,O
603	Invicta Snd(Coast)	I	0.10	D,F,G,H,N,P
603	R. Gloucester	B	0.10	G,H,P
630	R. Bedfordshire	B	0.20	D,G,I,L,M,N,P
630	R. Cornwall	B	2.00	H
657	R. Clwyd	B	2.00	F,G,H,I,M,N,P
657	R. Cornwall	B	0.50	G*
666	DevonAir R	I	0.34	G,H,P
666	R. York	B	0.80	F,G,I,J,M,O,P
729	BBC Essex	B	0.20	D,G,H,N,P
738	Hereford/Worcester	B	0.037	G,H,P
756	R. Cumbria	B	1.00	A,C,M,O
756	R. Shropshire	B	0.63	G,H,M,P
765	BBC Essex	B	0.50	D,F,G,H,N*,P
774	R. Kent	B	0.70	D,G,H,N*,P
774	R. Leeds	B	0.50	A,G,I,M,O
774	Severn Sound	I	0.14	P
792	Chiltern R	I	0.27	O,F,G,H,N*,P
792	R. Foyle	B	1.00	J
801	R.Devon	B	2.00	G,H,P
819	Hereford/Worcester	B	0.037	G,P
828	2CR	I	0.27	D,H
828	R. WM	B	0.20	P
828	R. Aire	I	0.12	I,M
828	Chiltern R	I	0.20	F,G,N*,P
837	R. Furness	B	1.00	G,I,M
837	R. Leicester	B	0.45	D,F,G,H,P
855	R. Devon	B	1.00	L
855	R. Lancashire	B	1.50	I,M,P
855	R. Norfolk	B	1.50	D,F,G,H,I,P
873	R. Norfolk	B	0.30	O,F,G,H,I,P
936	GWR (Brunel R.)	I	0.18	G,K,P
945	R.Trent (GEM-AM)	I	0.20	G,I,M,P
954	DevonAir R	I	0.32	G,H,P
954	R. Wyvern	I	0.16	G*,P
990	R. Aberdeen	B	1.00	C,J
990	Beacon R. (WABC)	I	0.09	G,K,P
990	R. Devon	B	1.00	F,G,H,P
990	Hallam R.(C.Gold)	I	0.25	I,K,L*,P
999	Red Rose R	I	0.80	I,M
999	R. Solent	B	1.00	F,G,H,P
999	R.Trent (GEM-AM)	I	0.25	P
1026	R. Cambridgeshire	B	0.50	D,F,G,I,N,P
1026	Downtown R	I	1.70	J*,M
1026	R. Jersey	B	1.00	F,G,H
1035	R. Kent	B	0.50	D,G,H,N,P
1035	NorthSound R	I	0.78	C,J,O
1035	R. Sheffield	B	1.00	I
1035	West Sound	I	0.32	G*
1107	Moray Firth R	I	1.50	J
1107	R. Northampton	B	0.50	F,G,H,P
1116	R. Derby	B	1.20	G,I,M,P
1116	R. Guernsey	B	0.50	G,H,P
1152	R. Broadland	I	0.83	J*,P
1152	R. Clyde	I	3.60	C,J
1152	LBC (L.Talkback R)	I	23.50	D,G,H,P
1152	Metro R. (GNR)	I	1.80	J,L*,O
1152	Piccadilly R	I	1.50	I,M
1161	R. Bedfordshire	B	0.10	G,P
1161	GWR (Brunel R.)	I	0.16	G,J*
1161	R. Sussex	B	1.00	D,F,G,H
1161	R. Tay	I	1.40	C,J
1161	Viking R.(Gold)	I	0.35	I,M
1170	R. Orwell	I	0.28	D,G,P
1170	Signal R	I	0.20	M
1170	Swansea Sound	I	0.58	E,G*
1170	TFM Radio (GNR)	I	0.32	G*,I,J*,M,O
1170	Ocean Sound	I	0.12	F,G,H
1242	Invicta Sound(Coast)	I	0.32	D,F,G,H,P
1251	Saxon R	I	0.76	G,P
1260	GWR (Brunel R.)	I	1.60	G,H,P
1260	Marcher Sound	I	0.64	J*,M
1260	Leicester (GEM-AM)	I	0.29	F,G,P
1260	R. York	B	0.50	J
1278	Pennine R.(C.Gold)	I	0.43	I,J
1305	R. Hallam (C.Gold)	I	0.15	G,I,M
1305	Red Dragon R	I	0.20	G,H,J
1323	R. Bristol	B	0.63	G*
1323	Southern Sound	I	0.50	D,G,H,N
1332	Hereward R	I	0.60	G,P
1332	Wiltshire Sound	B	0.30	F,G,H
1359	Essex R.(Breeze)	I	0.28	D,G,J*,N,P
1359	Mercia Snd(Xtra-AM)	I	0.27	G,P
1359	R. Solent	B	0.85	G*,H
1368	R. Lincolnshire	B	2.00	G,I,P
1368	R. Sussex	B	0.50	D,F,G,H,P
1368	Wiltshire Sound	B	0.10	G,H
1431	Essex R.(Breeze)	I	0.35	D,G,K,N,P
1431	Radio 210	I	0.14	G,H,J,P
1449	R. Cambridgeshire	B	0.15	G,P
1458	R. Cumbria	B	0.50	J,M
1458	GLR	B	50.00	D,G,H,I*,J,P
1458	GMR	B	5.00	I*,M
1458	R. Newcastle	B	2.00	I,O
1458	Radio WM	B	5.00	G*,P
1476	County Sound Gold	I	0.50	D,G,H,J,P
1485	R. Humberside	B	1.00	I,J,P
1485	R. Merseyside	B	1.20	J,M
1485	R. Oxford	B	0.50	G,P
1485	R.Sussex	B	1.00	F,G,H,P
1503	R.Stoke-on-Trent	B	1.00	G,H,I,J*,M,P
1521	R. Mercury	I	0.64	D,F*,G,H,P
1521	R. Nottingham	B	0.50	G,J*,P
1530	R. Essex	B	0.15	D,G,P
1530	Pennine R.(C.Gold)	I	0.74	G*,I,J,M
1530	R. Wyvern	I	0.52	G*,H,J
1548	R. Bristol	B	5.00	G*,H
1548	Capital R. (Gold)	I	97.50	D,G,H,I*,J*,P
1548	R. City	I	4.40	M
1548	R. Cleveland	B	1.00	I,J,O
1548	R. Forth	I	2.20	G*
1557	R. Lancashire	B	0.25	G*,J,M
1557	Chiltern R	I	0.76	G,I*,P
1557	Ocean Sound	I	0.50	B,G,H,I*
1584	R. Nottingham	B	1.00	G,I,P
1584	R. Shropshire	B	0.50	G
1584	R. Tay	I	0.21	C,J
1602	R. Kent	B	0.25	D,G,H,P

Note: Entries marked * were logged during darkness. All other entries were logged during daylight.

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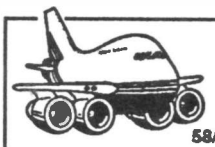

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SEEN & HEARD

Medium Wave DX Chart

Freq kHz	Station	Country	Power (kW)	DXer
531	Ain Beida	Algeria	600	G*,H*
531	Dalwallinu 2BA	Australia	10	I
531	Leipzig	Germany (E)	100	A*,D*
531	Dviedo	Spain	10	H*
540	BRT-2 Wavre	Belgium	150/50	D,H*,K,P,R
540	Sidi Bennour	Morocco	600	G*,H*
549	Les Trembles	Algeria	600	G*,H*
549	DLF Bayreuth	Germany (W)	200	H*,K,P
558	Valencia	Spain	20	H*
567	RTE-1 Tullamore	S.Ireland	500	C,E,H*,J,D,P,S*
567	West Berlin	Germany (W)	100	M*
567	Volgograd	USSR	250	D*
576	Stuttgart	Germany (W)	300	H*
576	Braga	Portugal	10	H*
585	FIP Paris	France	8	H,P
585	RNE-1 Madrid	Spain	200	D*,H*
585	Gafsa	Tunisia	350	G*
585	BBC-R3 Dumfries	UK	2	C,O
594	HRF Frankfurt	Germany (W)	400	D*,H*
594	Dujda-1	Morocco	100	G*
594	Muge	Portugal	100	H*
603	Sevilla	Spain	20	H*
603	BBC-R4 Newcastle	UK	2	C,H,J,D
612	RTE-2 Athlone	S.Ireland	100	C,H*,J,D,S
621	RTBF-1 Wavre	Belgium	300	D,H*,P
621	Batra	Egypt	2000	D*,G*
630	Dannenberg	Germany (W)	100	C
630	Vigra	Norway	100	A*
630	Sta. Isabel	Portugal	50	H*
630	Timisoara	Romania	400	K
639	BBC Limmasol	Cyprus	500	M*
639	La Coruna	Spain	100	O*,H*
648	BBC Orfordness	UK	500	A,D,E,H*,J
657	RCE-2 Madrid	Spain	20	H*
666	Bodenseesender	Germany (W)	300/180	H*
675	Marseille	France	600	H*
675	Hilversum-3 Lopic	Holland	120	C,O,H*,K,P
684	RNE-1 Sevilla	Spain	250	H*
684	Beograd	Yugoslavia	2000	H*
693	BBC-R2 Barrow	UK	1	O
702	Zamora	Spain	5	D*
702	Yerevan	USSR	100	H*
711	Rennes 1	France	300	D,H*
711	Heidelberg	Germany (W)	5	D*
711	Laayoune	Morocco	600	G*
720	Perth 6WF	Australia	50	I
720	BBC-R4 Lisnagarvey	N.Ireland	10	C,O
720	BBC-R4 Londonderry	N.Ireland	0.25	J*
720	Norte	Portugal	100	D*,H*
720	BBC-R4 Lots Rd London	UK	0.5	D,H
729	RTE-1 Cork	S.Ireland	10	J*
729	Oviedo	Spain	50	H*
738	Paris	France	4	H
738	Poznan	Poland	300	N*
738	RNE-1 Barcelona	Spain	250	D*,E,H*
747	Hilversum-2 Flevo	Holland	400	D*,E,H*,O
756	Brunswick	Germany (W)	800/200	D*,H*
765	Sottens	Switzerland	500	H*
774	RNE-1 San Sebastian	Spain	60	H*
783	Burg	Germany (E)	1000	D*,H*,O
792	Sevilla	Spain	20	D*,H*
801	BRF via Munich	Germany (W)	420	H*
810	Bega 2BA	Australia	10	I
810	SER Madrid	Spain	20	H
810	BBC-Scot.Westerglen	UK	100	B*,H*,J,O,P*
819	Sud-Radio	Andorra	900	H*
819	Batra	Egypt	450	G*
837	Nancy	France	200	D*
837	R.Popular, Sevilla	Spain	10	A*,H*
846	Rome	Italy	540	H*
855	RAIS Berlin	Germany (W)	100	A*
855	Murcia	Spain	125	H*,K*
864	Santah	Egypt	500	G*
864	Yerevan	USSR	150	H*
873	AFN Frankfurt	Germany (W)	150	A*,E*,H*,J*,K*
882	Perth 6PR	Australia	2	I
882	BBC-Wales Washford	UK	70	C,D,H*,J,K,O
891	Algiers	Algeria	600/300	E*,G*,H*,R*
891	Hulsberg	Holland	20	H*
900	Milan	Italy	600	D*
900	Qurayyat	Saudi Arabia	1000	L*
909	BBC-R2 Moorside Edge	UK	200	D,O
918	R.Intercont. Madrid	Spain	20	D*,H*
918	R.Ljubljana	Yugoslavia	600/100	H*,R*
927	BRT-1 Wolvertem	Belgium	300	A,D,H*,K
936	Radio Bremen	Germany (W)	100	A*,H*,K
936	Agadir	Morocco	600	D*
945	Toulouse	France	300	E*
954	RCE Madrid	Spain	20	D*
963	Sofia	Bulgaria	150	H*
963	Pori	Finland	600	D*,H*,S*
972	NDR/WDR Hamburg	Germany (W)	300	D*,H*,K
981	Alger	Algeria	600/300	G*,H*,R*
990	RIAS Berlin	Germany (W)	300	H*
990	SER R.Bilbao	Spain	10	H*
1008	Hilversum-5 Flevo	Holland	400	D,H*,P
1017	Batna	Algeria	2	G*
1017	Wolfsheim	Germany (W)	600	D*,H*
1035	Milan	Italy	50	H*
1044	DDR-1 Burg	Germany (E)	250	H*
1044	Sebaa-Aioun	Morocco	300	G*,H*
1053	BBC-R1 Barrow	UK	1	D
1062	Adelaide 5AD	Australia	2	I
1062	Kalundborg	Denmark	250	H*
1062	Diyabakir	Turkey	300	G*
1071	Prague	Czechoslovakia	60	H*
1071	Brest	France	20	D,H
1089	Adrar	Algeria	5	G*
1089	BBC-R1 Moreside Edge	UK	150	O
1098	Duargla	Algeria	5	G*
1098	Bratislava	Czechoslovakia	750	H*
1107	Batra	Egypt	600	G*
1107	AFN via Berlin	Germany (W)	10	D*,K*
1107	AFN via Munich	Germany (W)	40	E*,J*,O*
1107	RCE Madrid	Spain	20	H*
1107	BBC-R1 Wallasey	UK	0.5	D
1116	Bari	Italy	150	H*
1125	La Louviere	Belgium	20	H
1125	Stara Zagora	Bulgaria	500	H*
1125	Zagreb	Yugoslavia	200	R*
1134	Sulaibiyah	Kuwait	750	K*
1143	AFN via Stuttgart	Germany (W)	10	D*,E*,K
1143	Century R. Dublin	Ireland (S)	?	L,O
1143	Kaliningrad	USSR	150	J*,K*,R*
1161	Strasbourg (F.Int)	France	200	D*
1170	Bernburg	Germany (E)	20	D*
1179	Santiago	Spain	10	D*
1179	Solvesborg	Sweden	600	O,J*,K*
1188	Kuurne	Belgium	5	H,K
1188	Szolnok	Hungary	135	H*
1197	VOA via Munich	Germany (W)	300	J*,K*
1197	Agadir	Morocco	20	G*
1197	BBC-R3 Bournemouth	UK	0.5	D
1206	Perth 6KY	Australia	2	I
1206	Bordeaux	France	100	H*
1206	Wroclaw	Poland	200	E*,N*
1215	Lushnje	Albania	500	R
1215	BBC-R3 Moorside Edge	UK	100	D,O
1215	Tartu	USSR	50	M*
1233	Prague	Czechoslovakia	400	H*
1233	Tanger	Morocco	200	G*,H*
1242	Marseille	France	150	H*
1251	Tripoli	Libya	500	G*
1260	Valencia	Spain	20	A*,H*
1269	Neuminster	Germany (W)	600	D*,H*,J*,K,S*
1278	Strasbourg	France	300	H*
1278	RTE-2 Dublin/Cork	S.Ireland	10	J*,K,L,O,R
1287	Litomysl/Liblice	Czechoslovakia	300/200	H*
1296	BBC Orfordness	UK	500	H*,J*
1305	Rzeszow	Poland	100	H*
1314	Kvitsoy	Norway	1200	C,D*,H*,O
1323	R.Moscow via Leipzig	Germany (E)	150	H*,O
1332	Rome	Italy	300	H*
1341	BBC-Ulst.Lisnagarvey	N.Ireland	100	C,E*,H,K,O
1350	Nancy/Nice	France	100	H*
1359	RBI Berlin	Germany (E)	250/100	A*,J*
1368	Manx Radio, Foxdale	I.O.M	20	J*,K,O
1377	Lille	France	300	H*,R*
1386	Kaunas	USSR	1000	D*,E*,H*,M*
1395	R.Tirana via Lushnje	Albania	1000	H*,R
1395	Simferopol	USSR	?	K*
1404	Brest	France	20	H*
1413	RCE Zaragoza	Spain	20	H*
1413	Pristina	Yugoslavia	1000	R*
1422	Heusweiler	Germany (W)	600	D*,H*
1431	Dresden	Germany (E)	250	H*
1440	Marnach	Luxembourg	1200	D*,H*,K,O,P*
1449	BBC-R4 Redmoss	UK	2	C,K,M*
1458	R.Tirana, Lushnje	Albania	500	J*
1467	TWR Monte Carlo	Monaco	000/400	E*,H*,J*
1476	RCE Bilbao	Spain	20	H*
1485	BBC-R4 Carlisle	UK	1	O
1494	Komrat	USSR	30	D*
1494	Leningrad	USSR	1000	H*
1503	Stargard	Poland	300	E*,H*,K*,N*
1512	BRT Wolvertem	Belgium	600	E*,H*,J*,K,N*,P*
1512	Jeddah	Saudi Arabia	1000	G*
1521	Duba	Saudi Arabia	2000	G*
1521	Oviedo	Spain	5	H*
1530	Vatican Radio, Rome	Italy	150/450	E*,F*,H*,J*,P*
1539	DLF Mainflingen	Germany (W)	700	D*,P*
1539	Valladolid	Spain	5	H*
1557	Nice	France	300	H*
1566	Nagpur	India	1000	L*
1566	Sfax	Tunisia	1200	G*,H*
1575	RBI via Burg	Germany (E)	250	D*
1575	Genoa	Italy	50	H*
1584	Pamplona	Spain	2	H*
1593	Langenberg	Germany (W)	400/800	H*,K*,P*
1602	R.Onteniente	Spain	2	H*

Note: Entries marked * were logged during darkness. All other entries were logged during daylight.

DXers:
A: Leo Barr, Sunderland.
B: Darren Beasley, Bridgwater.
C: Peter Easton, Edinburgh.
D: Raymond Edwards, Chatham.
E: Sheila Hughes, Morden.
F: Graham Johnson, Nuneaton.
G: Matthew King, Hayes.
H: George Millmore, Wootton I.D.W.
I: Dick Moon, George, S.Africa
J: Chris Nykiel, Leeds.
K: Ike Odoom, while in Aberdeen.
L: Roy Patrick, Derby.
M: Tim Shirley, Bristol.
N: Chris Shorten, Norwich.
D: Paul Strickland, Fleetwood.
P: Phil Townsend, London.
Q: Ted Walden-Vincent, Gt.Yarmouth.
R: Neil Wheatley, Newcastle-upon-Tyne.
S: Carl Yates, St.Helen's.

Ken Whayman in New York; KUSW Salt Lake City, USA 15.650 (Eng to Canada 1500-2200) - 22222 at 2033 by Jim Cash; BBC via Daventry, UK 15.070 (Eng to N.Africa 0800-2030) - 44344 at 2027 by Graham Johnson; VOA via Poro, Philippines 15.290 (Eng to E.Asia 2200-0100) - SIO 333 at 2230 by Francis Hearne; Radio HCJB Quito, Ecuador 15.155 (Eng to USA 0400-0430), noted as 'good' by **Robin Harvey** in Bourne.

Also detailed were some of the interesting broadcasts to Europe during the evening: WWCR Nashville, USA 15.690 (Eng 1700-0200), rated as 34433 at 1700 by Darran Taplin; Radio Korea, Seoul 15.575 (Eng 1800-1900) - SIO 443 at 1855 by Kenneth Buck; Radio Moscow, USSR 15.135 (Eng 1800-1900), heard at 1858 by **Julian Wood** in Buckie; RCI via Sackville, Canada 15.325 (Eng, Fr 1930-2300) - SIO 333 at 2006 by Ted Walden-Vincent; Radio Beijing, China 15.100 (Fr ?-?) - 45554 at 2035 by John Parry; Voice of Israel, Jerusalem 15.640 (Eng 2000-?) - 55444 at 2130 by **Max Wustrau** in Bedford; WRNO New Orleans, USA 15.420 (Eng 1700-0000) - 43333 at 2219 by David Wratten; VOFC Taipei, Taiwan 15.345 (Ger, Eng 2100-2300) - 43444 at 2220 by John Nash.

Some broadcasters are making more extensive use of the **13MHz** (22m) band. Those active include SRI via Sottens, Switzerland 13.685 (Eng to Australia, New Zealand 0745 to 1030), rated as 33333 at 0830 by Ted Agombar; WSHB Cypress Creek, USA 13.760 Eng to Pacific areas 0800-1000) - SIO 323 at 0900 by Philip Rambaut; Radio Jordan, Amman 13.655 (Eng to Europe 0500-1315) - 44433 at 1118 by Darran Taplin; Radio Nederlands via Flevo 13.770 (Eng, Ar to S.Asia, Middle East 1430-1625) - 45444 at 1430 by David Wratten; KSDA Agat, Guam 13.720 (Bur, Ta, Mal, Hi, Tel to S.Asia 1400-1700) - SIO 322 at 1606 by Alan Smith; RBI via Leipzig, GDR 13.610 (Ger, Swa, Ar, Eng to Middle East, E.Africa 1530-1915) - 55444 at 1715 by Max Wustrau; Radio Prague, Czechoslovakia 13.715 (Eng, Cz, Ar, Fr to Asia, Middle East 1400-2125) - 43344 at 1735 by Leo Barr; Radio Kuwait, Sulaibiyah 13.610 (Eng to ?) - 43433 at 1837 by Kenneth Reece; Radio DW via Wertachtal, W.Germany 13.790 (Eng to W.Africa 1900-1950) - 42222 at 1900 by Chris Shorten; Radio Baghdad, Iraq 13.660 (Fr, Ger, Eng to Europe 1800-2200) - 44444 at 1940 by John Nash; Voice of the UAE in Abu Dhabi 13.605 (Ar 1600-2130) - SIO 444 at 1950 by Kenneth Buck; Radio Austria Int. via Moosbrunn 13.730 (Ger, Fr, Eng to S.Africa 1700-2100) - 44344 at 1954 by Graham Johnson; WYFR via Okeechobee, Florida 13.695 (Fr, Eng to USA 1200-2245), noted as "very poor" at 2045 by Robin Harvey; WCSN Scotts Corner, Maine 13.770 (Eng to Europe 2000-2200) - 45444 at 2100 by Mike Smith; WHRI South Bend, USA 13.760 (Eng to USA, Europe 1700-0000) - 54455 at 2211 by Andy Cadier.

Many broadcasters use the **11MHz (25m)** band to reach listeners in Europe. They include Radio Australia via Shepparton 11.910 (Eng 0400-0630), rated as 34543 at 0615 by David Edwardson; Radio HCJB Quito, Ecuador 11.835 (Eng 0700-0830) - 54444 at 0720 by David Wratten; Radio Pakistan, Islamabad 11.570 (Ur, Eng 1645-2015) - SIO 454 at 1915 by Kenneth Buck; Voice of Greece, Athens 11.645 (Eng, Fr 1900-1950) - SIO 333 at 1926 by Ted Walden-Vincent; RNE via Aganda, Spain 11.790 (Fr, Eng 1800-2200) - 43333 at 1935 by Leo Barr; Radio Portugal, Lisbon 11.740 (Port, Eng, Fr, It 1700-2130) - SIO 555 at 2015 by Darren Beasley; Radio Beijing, China 11.500 (Eng 2000-2215), noted as 'very good' at 2050 by Robin Harvey; Voice of Vietnam, Hanoi 12.020 (Russ, Viet, Fr, Sp, Eng to Europe 1600-0000) - 45444 at 2050 by Jim Cash; Radio Bucharest, Romania 11.940 (Eng 2100-2150) - 54444 at 2111 by Carl Yates; Radio Sophia, Bulgaria 11.720 (Tur, Ger, It,

SEEN & HEARD

Transatlantic DX Chart

Freq kHz	Station	Location	Time (UTC)	DXer
		USA		
690	KHEY	El Paso, TEX	0230	C
710	WOR	New York, NY	0502	E
770	WABC	New York, NY	2330	C
840	WHAS	Louisville, KY	0300	C
1010	WINS	New York, NY	0155	B,C,0,E
1050	WEVD	New York, NY	0311	E
1050	WKSQ	New York, NY	0220	B
1130	WNEW	New York, NY	0606	E
1210	WCAU	Philadelphia, PA	0325	E
1510	WKKU	Boston, MA	2240	D,E
		Canada		
590	VOCM	St.John's, NF	2220	B,C,E
640	CBN	St.John's, NF	0300	E
680	CIYQ	Grandfalls, NF	0300	C,E
710	CKVO	Clarenceville, NF	0215	B,E
820	CHAM	Hamilton, ON	0115	C
930	CJYQ	St.John's, NF	0150	B,D,E
1010	CFRB	Toronto, ON	0500	E
1070	CBA	Moncton, NB	0430	C
1200	CFGO	Ottawa, ON	0330	C
1400	CBG	Gander,NF	0312	E
1570	CKLM	Lavel, PQ	2352	E
		C. America & Caribbean		
790	Voice of Barbados	St.George, Barbados	0252	A
1610	Caribbean Beacon	The Valley,Anguilla	2350	E
		South America		
1225	R.Popular Cuenca	Ecuador	0407	E

DXers:
A: Dick Moon, George, S.Africa.
B: Kenneth Reece, Prenton.
C: Tim Shirley, Bristol.
D: Mike Smith, Cambridge.
E: Mark Thompson, Wakefield.

Tropical Band Chart

Freq kHz	Station	Location	UTC	DXer
3.200	TWR	Swaziland	0436	0
3.210	R.Mozambique	Mozambique	0532	N
3.215	R.Orange	S.Africa	1840	Q
3.355	R.Botswana	Gabarone	1840	0,Q
3.905	AIR Delhi	India	0128	N
3.915	BBC Kranji	Singapore	1900	L,M
3.955	BBC Daventry	England	1900	B,D,F,H,K,L,N,R
3.960	R.L. Munich	W.Germany	0134	N
3.965	RFI Paris	France	1814	B,D,F,K,L,N
3.970	Nei Menggu, Hohhot	China	2210	F
3.975	BBC Skelton	England	0525	D,K,N
3.980	VOA Munich	W.Germany	1900	B,D,F,L,N
3.985	R.Beijing, China	via SRI Berne	2100	B,C,D,F,H,P
3.985	SRI Berne	Switzerland	1845	D,F,K,L,P,R,S
3.995	DW Cologne (Julich)	W.Germany	0533	D,F,H,K,N,P
4.060	R.Moscow Kharkov	USSR	2100	0
4.720	R.Abaroa	Bolivia	0341	N
4.735	Xinjiang	China	2302	A,G,N
4.740	R.Afghanistan	via USSR	1920	D,L,N
4.750	R.Bertoura	Cameroon	2031	0
4.750	PBS Xizang, Lhasa	China	2305	G
4.760	ELWA Monrovia	Liberia	1920	L,N
4.765	R.Moscow	via Cuba	0511	N
4.770	FRCN Kaduna	Nigeria	1920	L,N
4.785	RTM Bamako	Mali	2030	0
4.785	R.Baku	USSR	1925	D,L,N
4.795	R.Moscow, Kharkov	USSR	1920	H,N
4.800	AIR Hyderabad	India	0058	G,N
4.800	LNBS Lesotho	Maseru	1744	G,N
4.810	R.Yerevan	USSR	1925	D,L,N
4.815	R.diff TV Burkina	Ouagadougou	1925	B,J,L,N
4.820	E.Prov.Huila	Angola	1935	Q
4.820	Khanty-Mansiysk	USSR	0223	D,F,N
4.825	R.Ashkhabad	USSR	1920	B,L,N
4.830	Gaborone	Botswana	0356	G,L,N
4.830	R.Tachira	Venezuela	0241	N
4.835	RTM Bamako	Mali	1955	D,H,J,L,N,Q
4.840	AIR Bombay	India	0102	N
4.845	ORTM Nouakchott	Mauritania	0640	F,L,N
4.850	R.Yaounde	Cameroon	1905	B,J,L
4.850	R.Tashkent	USSR	0225	N
4.860	AIR New Delhi	India	?	I
4.860	R.Chita	USSR	1905	L
4.860	Kalinin	USSR	0606	N
4.865	PBS Lanzhou	China	2220	F,G
4.865	V of Cinaruco	Colombia	0500	D,G,N,Q
4.870	R.Cotonou	Benin	1915	D,L,N
4.875	R.Nac. Boa Vista	Brazil	?	I
4.875	R.Tbilisi	USSR	0244	D,N
4.880	SABC Radio 5	S.Africa	1800	B,H,L,N,Q
4.885	Voice of Kenya	Kenya	1735	H,L
4.890	RFI Paris	via Gabon	1845	E
4.895	Voz del Rio Arauca	Colombia	0445	N
4.895	R.Moscow, Kalinin	USSR	1905	H,L
4.895	R.Moscow (Tyumen)	USSR	0228	N
4.905	R.Nat.N'djamena	Chad	1915	B,D,H,L,N
4.915	R.Anhanguera	Brazil	0603	G,N
4.915	R.Ghana, Accra	Ghana	2147	B,G,J
4.915	Voice of Kenya	Kenya	1735	L,N
4.920	R.Moscow B, Yakutsk	USSR	1905	L
4.930	R.Moscow, Ashkhabad	USSR	1905	J,L
4.930	R.Moscow, Tbilisi	USSR	0250	D,H,N
4.935	Voice of Kenya	Kenya	1735	L,N,R
4.940	R.Abidjan	Ivory Coast	?	I
4.940	R.Kiev	USSR	2035	A,F,H,J,L,N,R
4.945	Caracol, Neiva	Colombia	0532	F,N
4.945	R.RSA, Johannesburg	S.Africa	0615	N
4.955	R.Marajoara, Belem	Brazil	?	I
4.958	R.Baku	USSR	1905	B,J,L,N
4.960	AIR New Delhi	India	0110	N
4.970	R.Rumbos, Caracas	Venezuela	0555	Q
4.975	R.Uganda, Kampala	Uganda	1930	L
4.975	R.Dushanbe	USSR	0232	N
4.980	R.Batallon Topater	Bolivia	0256	N
4.985	R.Brazil Central	Brazil	0632	J,N
4.990	AIR via Madras	India	2040	R
4.990	FRCN Lagos	Nigeria	1745	B,D,E,L,N
5.000	YVTO Caracas	Venezuela	0820	J
5.005	R.Nacional, Bata	Eq.Guinea	1930	L
5.015	R.Moscow Arkhangelsk	USSR	2115	H,J,N
5.015	R.Moscow Ashkhabad	USSR	0326	N
5.015	R.Moscow Vladivostok	USSR	1910	L
5.020	La Voix du Sahel	Niger	1920	D,G,L,N
5.025	R.Parakou	Benin	0538	N
5.030	R.Impacto	Costa Rica	0541	F,G,N
5.035	R.Bangui	C.Africa	1920	F,L,N
5.040	R.Tbilisi	USSR	0500	N
5.044	R.Impacto	Costa Rica	0517	D,N
5.045	R.Cultura do Para	Brazil	0637	I,N
5.047	R.Togo, Lome	Togo	0533	F,G,L,N
5.050	R.Tanzania	Tanzania	0302	I,L,N
5.057	R.Tirana Gjirokaster	Albania	1910	B,D,F,H,L,N
5.065	R.Candip, Bunia	Zaire	1740	L
5.075	Caracol Bogata	Colombia	0547	D,G,N,Q

Fr, Eng 1600-2225) - 54554 at 2130 by John Nash; AIR via Aligarh, India 11.620 (Eng 1845-2230) - 44444 at 2159 by Graham Johnson; RCI via Sackville, E.Canada 11.945 (Eng, Fr 1930-2300) - 54444 at 2229 by Andy Cadier; Radio Japan via Moyabi, Gabon 11.765 (Jap, Eng 2100-0000) - SIO 222 at 2345 by Francis Hearne.

There are many broadcasts to other areas throughout the day and night. Those noted originated from the BBC via Misirah, Oman 11.706 (Eng to Middle East 0300-0815), logged as 33333 at 0436 by Kenneth Reece; Radio Australia via Shepparton 11.720 (Eng to C.Pacific area 0830-0930) - SIO 111 at 0835 by Philip Rambaut; SDA Agat, Guam 11.980 (Can; Shan to C.Asia 1400-1600) - SIO 433 at 1400 by Alan Smith; Voice of Mediterranean via Cyclops, Malta 11.925 (Eng, Ar to N.Africa 1400-1600) - 43433 at 1445 by Darran Taplin; VOFC Taipei, Taiwan 11.860 (Fr, Ger, Chin, Sp to N.Africa, Middle East 1957-0000) - 55444 at 2141 by Raymond Edwards; BBC via Daventry, UK 12.095 (Eng to E.USA, Canada 2200-0330) - 55545 at 2200 by Ken Whayman in New York; VOA via Greenville, USA 11.580 (Eng to S.America 0000-0230) - 43333 at 0045 by Max Wustrau; TWR Bonaire, Ned.Antilles 11.930 (Eng to C.America, USA 0215-0530) - 44333 at 0302 by Sheila Hughes.

Good reception of many of the **9MHz (31m)** broadcasts to Europe was mentioned in the reports. They included Radio HCJB Quito, Equador 9.610 (Eng 0700-0830), rated as 54444 at 0700 by David Wratten; Radio Australia via Shepparton 9.655 (Eng 0700-1030) - 34433 at 0839 by Kenneth Reece; AWR via Sines, Portugal 9.670 (Pol, Ger, Eng 0730-0930 Sun.only) - 55545 at 0900 by John Nash; BBC via Daventry, UK 9.410 (Eng 0730-0915) - 55555 at 0905 by Ted Agombar; Radio Pyongyang, N.Korea 9.325 (Eng, Fr, Russ, Kor, Sp, Ger 1300-2150) - SIO 233 at 1330 by Ted Walden-Vincent; Voice of Ethiopia, Addis Ababa 9.660 (Eng 1800-1830) - SIO 322 at 1805 by John Evans; Radio Tirana via Lushnje, Albania 9.480 (Fr, Eng 1800-19000 - SIO 545 at 1847 by Darren Beasley; Radio Jordan, Amman 9.560 (Eng 1420-2200) - 42333 at 1900 by Graham Johnson; Voice of the UAE in Abu Dhabi 9.780 (Ar 1600-2130) - SIO 433 at 1920 by Kenneth Buck; Radio Budapest, Hungary 9.835 (Hung, Eng, Ger 1900-2200) - 53433 at 2046 by Raymond Edwards; Vatican Radio, Rome 9.645 (Pol, Ger, It, Eng, Fr, Sp 1900-2110) - 43333 at 2109 by Jim Cash; AIR via Delhi, India 9.910 (Eng 2000-2230) - 32232 at 2207 by Andy Cadier; Voice of Turkey, Ankara 9.685 (Eng, Tur 2300-0400) - SIO 444 at 2345 by Francis Hearne.

Some of the broadcasts to other areas were also received here. They stemmed from KNLS Anchor Point, Alaska 9.840 (Eng to E.Asia 0800-

DXers:
A: Leo Barr, Sunderland.
B: Andy Cadier, Folkestone.
C: Derek Carter, Cambridge.
D: Jim Cash, Swanwick.
E: John Coulter, Winchester.
F: Raymond Edwards, Chatham.
G: David Edwardson, Wallsend.
H: Sheila Hughes, Morden.
I: Dick Moon, George, S.Africa.
J: John Nash, Brighton.
K: Ike Odoom, Aberdeen.
L: Fred Pallant, Storrington.
M: Philip Rambaut, Macclesfield.
N: Kenneth Reece, Borth.
O: Tim Shirley, Bristol.
P: Chris Shorten, Norwich.
Q: Alan Smith, Northampton.
R: Ted Walden-Vincent, Gt.Yarmouth.
S: Carl Yates, St.Helen's.

0900), logged as SIO 322 at 0810 by Philip Rambaut; Radio New Zealand, Wellington 9.850 (Eng to Australia, Papua New Guinea 0800-1105) - 23322 at 0820 by David Edwardson; SRI via Schwarzenburg, Switzerland 9.885 (Ar. Eng Ger, Fr to Africa 1715-2000) - 44444 at 1830 by Sheila Hughes; RBI via Nauen, GDR 9.665 (Eng, Fr, Ger, Ar to N.W.Africa 1030-1400) - 55545 at 1200 by Carl Yates; VOA via Kavala, Greece 9.700 (Eng to Middle East, S.Asia 1500-2200) - 23332 at 1926 by Leo Barr; VOIRI Tehran, Iran 9.022 (Eng, Sp to Europe, N.Africa, USA 1930-2130) - 44433 at 1938 by Darran Taplin; ABC Brisbane, Australia 9.660 (Eng to N.E.Australia 1930-1402) - SIO 323 at 2000 by Alan Smith; Radio Australia via Shepparton 9.620 (Eng to E.Asia, W.Pacific areas 2000-2130) - 44444 at 2005 by Chris Shorten; Radio Austria Int, Moosbrunn 9.870 (Ger, Eng, Sp to S.America 2200-0200) - 54444 at 2316 by Max Wustrau.

With careful listening a number of broadcasts from distant places may be heard in the **7MHz (41m)** band. They include WYFR via Okeechobee, Florida 7.355 (Russ, Ger, Eng, Sp to Europe 0400-0720) - 55545 at 0718 by Andy Cadier; WHRI South Bend, USA 7.355 (Eng to USA 0800-1100) - 34433 at 1000 by Kenneth Reece; Radio Australia via Carnarvon 7.205 (Eng to Europe, S.Asia 1430-2030) - SIO 343 at 1505 by Kenneth Buck; Radio Beijing, China 7.800 (Chin, Fr to Europe, N.Africa 1730-2225) - 34333 at 1858 by Jim Cash; AIR via Delhi, India 7.412 (Eng to Europe 1845-2230) - 53443 at 1935 by John Nash; RCI Montreal, via Daventry, UK 7.235 (Fr, Eng, Ger, Hung, Cz, Uk to Europe 1700-2030) - SIO 444 at 2023 by John Coulter; KBS Seoul, Korea 7.550 (It, Fr, Kor, Ar, Ger, Eng, Sp, Port to Middle East, E.Africa 1545-2345) - 44343 at 2047 by David Wratten.

Some of the **6MHz (49m)** broadcasts to Europe originate from VOA via Tangier, Morocco 5.995 (Eng 0400-0700), rated as 32433 at 0638 by Kenneth Reece; Radio Australia via Carnarvon 6.035 (Eng 1530-2030) - 35553 at 1530 by David Edwardson; Radio Austria Int. via Moosbrunn 6.155 (Ger, Eng, Fr, Sp 0400-2300) - SIO 444 at 1735 by Alf Gray; Radio Pyongyang, N.Korea 6.576 (Russ, Fr, Kor, Sp, Ger, Eng 1500-2150) - 44434 at 2020 by Chris Shorten; Radio Mediterranean via Cyclops, Malta 6.110 (Fr, Eng to S.Europe, N.Africa 2130-2330) - 33232 at 2305 by Carl Yates.

Station Addresses

BBC Radio Devon, St. Davids Hill, Exeter EX4 4DB.
ILR Severn Sound, P.O.Box 388, Old Talbot House, Southgate Street, Gloucester GL1 2DQ.
Voice of Ethiopia, External Service, P.O.Box 654, Addis Ababa, Ethiopia.
Voice of Israel, External Services, P.O.Box 1082, Jerusalem 91010, Israel.
Radio Surinam Int., Postbus 2979, Paramaribo, Surinam.
Voice of Nigeria, Broadcasting House, PMB 12504, Ikoyi, Lagos, Fed.Rep. Nigeria.

EQUIPMENT USED

Ted Agombar: Grundig Yacht Boy 700 + 20m random wire.
Leo Barr: Matsui MR4099 + internal antenna.
Darren Beasley: Steepletone MBR7 + 20m random wire.
Edward Broadsmith: Portable + spiral wound whip.
Kenneth Buck: Home-built superhet + random wire.
Andy Cadier: Saisho SW500 + 40m random wire.
Derek Carter: Matsui MR4099 + randon wire.
Jim Cash: Sony ICF 2001D.
John Coulter: Yaesu FRG-7 + random wire.
Peter Easton: Kenwood R5000 + ERA BP34 audio filter.
Ray Edwards: Kenwood R5000 + Howes CTU30 ATU + double open loop.
David Edwardson: Trio R600 + trap dipole 22m long.
John Evans: Recal RA17L + ATU + G5RV.
Robin Harvey: Marsui MR 4099 + built-in whip.
Francis Hearne: Yoko world receiver + built-in whip.
Sheila Hughes: Panasonic DR48 + 15m inverted L or Vega 206 portable.
Rhoderick Illman: Sony ICF 7600DS + 23m random wire.
Graham Johnson: Panasonic DR49 + built-in whip.
Matthew King: Sony ICF 7600DS + ATU + 20m random wire
George Millmore: Tatung TMR 7602 portable + random wire.
Dick Moon: ICOM R-70.
John Nash: Kenwood R5000 + random wire.
Chris Nykiel: Realistic DX-260 + random wire.
Ike Odoom: Philips D-2395 portable.
Fred Pallant: Trio R2000 + random wire in loft.
John Parry: Realistic DX-400 + 33m random wire.
Roy Patrick: Lowe HF 125 + ATU + 20m wire.
Ron Pearce: Home built one valve (955 acorn) straight set.
Philip Rambaut: Int.Marine Radio R.700M + random wire.
Kenneth Reece: JRC NRD525; Icom R9000; Kenwood R5000 + vert wire, delta loop or random wire.
Alan Roberts: Panasonic RF-B40 + 70cm whip.
Tim Shirley: Trio R600 + random wire.
Alan Smith: Matsui MR4099 + Mizuho KX-3 ATU + dipole.
Mike Smith: Lowe HF-225.
Paul Strickland: Sony ICF 7600D portable.
Harry Sutcliffe: Sony ICF 2001D.
Darran Taplin: Eddystone 680X + Global ATU + 6m indoor wire.
Mark Thompson: JRC NRD525 + 1m loop or 20m random wire.
Phil Townsend: Lowe SRX-30 + ATU + random wire + LW convertor.
Ted Walden-Vincent: Grundig Satellit 1400SL + built-in whip.
Ken Whayman: Realistic DX-440 + 3m wire.
Neil Wheatley: Sangean ATS 803 or Clarion car radio + 1m wire.
Julian Wood: Trio R2000 + random wire.
David Wratten: Philips D2999 + loop or Trio R2000 + ATU + 30m random wire.
Max Wustrau: Datong PC-1 convertor + FDK-750 2m transceiver.
Carl Yates: Realistic DX-440 + random wire antenna.

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INDEX TO ADVERTISERS

STARTING OUT

Brian Oddy G3FEX

Powering a portable set at home from dry cells may well prove expensive. More economic rechargeable cells need long charge periods, so the best plan is to derive the power from the mains *via* an add-on power supply unit.

The national supply of electrical power is normally connected to private properties as a single phase 240V 50Hz alternating current (a.c.) supply, which is suitable for most UK-designed domestic electrical equipment. The majority of transistorised portable sets, however, require a supply of direct current (d.c.), which is usually derived from a 6, 9 or 12V battery, so the role of the add-on power supply unit (p.s.u.) will be to change or transform the incoming 240V a.c. supply to a very much lower voltage, and then convert it to d.c. The unit must also maintain the d.c. output at a constant voltage, otherwise it may soar during off-load conditions to a value which could instantly destroy the transistors when switching on the set.

Transformers

The device used to change the voltage of an incoming a.c. supply is known as a transformer, which in its simplest form consists of a core of soft iron wires around which is wound two coils of wire - see Fig. 1a.

Transformers rely on electromagnetic effects for their operation, so there is no electrical connection between the coils. The incoming mains supply is therefore isolated from the output circuit(s). The application of an incoming alternating voltage (Vp) to the primary winding (P) results in an alternating magnetic field (H) being set up through the coil - see Appendix, page 37, *SWM* October '89.

Soft iron Core

The soft iron core concentrates the magnetic field, which induces a voltage (Vs) in the secondary winding (S). The ratio of the number of turns forming the primary winding (Np) and secondary winding (Ns) determines the induced voltage in the secondary. This can be expressed as:

Np/Ns = Vp/Vs

For example, if the primary has 100 turns and the secondary has only 10 turns, the ratio will be 10:1, consequently with 240V applied to the primary, 24V will exist across the secondary if the transformer is 100 per cent efficient.

It can be shown that the magnitude of the magnetic field (H) developed by the primary is proportional to the current flowing (Ip) and the number of turns (Np) within the winding, so H = IpNp.

Inversely, this same field causes the secondary current (Is) in the secondary turns (Ns), consequently H = IsNs.

So, IpNp = IsNs and Ip/Is = NsNp.

For example, if the current flowing through a primary of 100 turns is 1A, a 10-turn secondary will have a current rating of 10A.

The foregoing shows that: Np/Ns = Vp/Vs = Is/Ip.

Laminations

In practice soft iron wires are seldom used for the core, as greater efficiency can be obtained by stacking insulated strips and stampings of soft iron called laminations to form other core shapes.

A shape which permits the primary and secondary windings to be mounted on separate limbs of the core is depicted in Fig. 1b. A commonly used design for small transformers allows both windings to be wound around a bobbin, which is then mounted on the centre limb of the core as shown in Fig. 1c. If required, additional voltages can be obtained by winding more than one secondary winding around the bobbin. A number of tapping points on the primary winding are usually provided to cater for variations in incoming supply voltage and in some designs the secondary windings may be centre-tapped - see later. Sometimes an additional winding is installed on the bobbin between the primary and secondary windings, one end of which is earthed so that it acts as a Faraday screen, thereby preventing mains-borne electrical interference from reaching the secondary winding.

Fig. 2

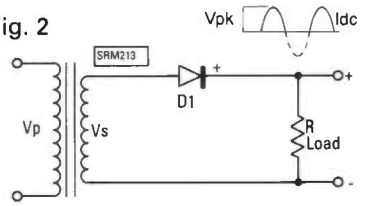
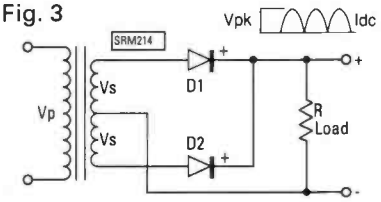


Fig. 3



Rectification

The next stage in obtaining the steady d.c. supply voltage required for a receiver is to convert the low alternating voltage from the transformer secondary into pulsating d.c. This process, called rectification, is achieved by employing a device which allows electrons to flow through it one way only, namely a diode. Silicon diodes are commonly used as the rectifying elements, since their forward resistance is very low and they can allow large currents to flow.

A single diode is employed in the half-wave rectifier circuit shown in Fig. 2. The application of Vs to the diode (D1) will cause it to conduct during positive half cycles and direct current (I) will flow through the load (R).

During the negative half cycles D1 will be reverse biased, so no current will flow through R. The output from D1 will therefore be a series of unidirectional pulses. Since there will only be one pulse per cycle, their frequency will be 50Hz. The average voltage across the load will be Vpk/π, where Vpk is the peak voltage and π = 3.1416.

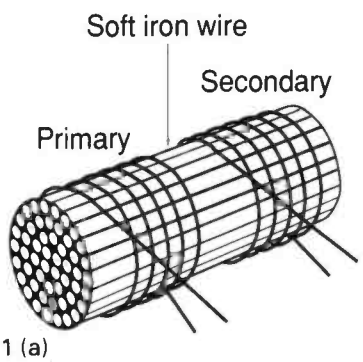


Fig. 1 (a)

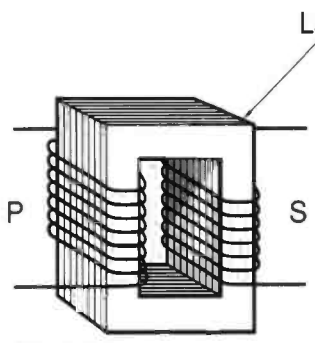


Fig. 1 (b)

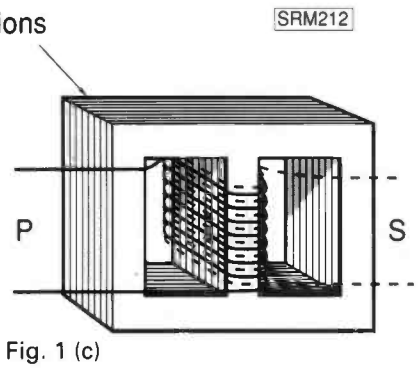


Fig. 1 (c)

Two diodes are employed in the commonly called full-wave rectifier circuit shown in Fig. 3. This arrangement is more correctly referred to as a bi-phase half-wave rectifier, since it can be likened to two half-wave rectifiers feeding into a common load. Each diode conducts on alternate half cycles of the alternating voltages (Vs-0-Vs) obtained from a centre tapped secondary winding on the transformer. Since the unidirectional voltage pulsations from each diode are applied to the common load (R) there will be two pulsations during each cycle and their frequency will be 100Hz. The average voltage across the load will be $2Vpk/\pi$.

Four diodes are employed in the bridge rectifier circuit shown in Fig. 4a. A transformer with a centre-tapped secondary is not required in this arrangement, although the pulsations across the load will be similar to those of the full-wave circuit. The alternating secondary voltage (Vs) is applied to all four of the diodes forming the bridge, but only two of them conduct during each half cycle. During the half cycle when the voltage at point 'X' is positive with respect to point 'Y', diodes D1 and D3 will conduct and D2 and D4 will be reverse biased. Point 'X' will be negative with respect to point 'Y' during the next half cycle, so D2 and D4 will conduct and D1 and D3 will be reverse biased. Note that half the load current passes through each pair of diodes. The average voltage across the load will be $2Vpk/\pi$.

Smoothing

The output from any of these rectifier circuits will be unsuitable for powering a receiver without further processing, because the unidirectional pulses would result in a loud 50 or 100Hz hum from the loudspeaker. In order to obtain the steady d.c. voltage required it is necessary to smooth out the pulsations. An almost constant voltage output can be obtained by connecting a large reservoir capacitor (C1) across the load as shown in Fig. 4b. The capacitor is charged or recharged during each positive pulsation and a small amount of the stored energy is then released to the load between each pulse. A gradual fall in the voltage across the capacitor will occur during the period when stored energy is being released, consequently a slight ripple in the smoothed output will exist. Owing to the half cycle gap between the positive pulses from a half-wave rectifier, a greater amount of the stored energy must be released to the load than would be needed when a full-wave or bridge rectifier is employed. The 50Hz ripple on the smoothed output from a half-wave rectifier will therefore be more pronounced than the 100Hz ripple present on the smoothed output from a full-wave or bridge rectifier.

Smoothing Choke

The unwanted ripple could be almost entirely eliminated by adding, after the reservoir capacitor, a smoothing choke followed by an additional capacitor, since the inductance of the choke would tend to oppose the alternating variations present and the capacitor would provide a low impedance to earth. However there are advantages to be gained by following the reservoir capacitor with a voltage regulator.

Regulation

If the load (R) is disconnected from the p.s.u. the voltage across the reservoir capacitor will rise to a value corresponding to the peak value of the alternating secondary voltage (Vs). For example, if Vs is 12V r.m.s. (root mean square), the peak voltage will be equal to 1.414 x 12 = 16.968V. Turning on the receiver with the p.s.u. already powered from the mains would result in the peak voltage being applied to the transistors in the set and permanent damage to them may well occur. It is therefore essential to employ some form of voltage regulator so that the output voltage remains constant irrespective of load variations. A suitable regulator will also provide additional smoothing since the variations in voltage due to the ripple will be automatically corrected by the regulator. The regulator will also compensate for variations in the incoming mains supply.

The circuit of a series regulator is shown in Fig. 4c. Regulation is achieved by varying the conduction of a control device, usually referred to as the pass transistor (TR1) in direct proportion to the variations in supply voltage or load current. The unregulated voltage across the reservoir capacitor (C1) is applied to a Zener diode (D5) via a current limiting resistor (R3).

The voltage across D5 will remain constant irrespective of the ripple and other variations in the unregulated voltage, so it can be used as a reference. A fraction of the output voltage from the regulator is derived from a potentiometer formed by two resistors (R1, R2). The difference in potential between this sample and the reference voltage across D5 is compared in an integrated circuit error amplifier (IC1).

The output from the error amplifier is applied to the base of TR1, which acts as an emitter follower. Depending upon the potential difference between the output sample and the reference, the error amplifier will either reduce or increase the drive current to the base of TR1, thereby reducing or increasing its conduction.

An adequate heat sink must be provided for TR1, since the power dissipated will be directly proportional to the difference between the input and output voltages and the load current. As a result of modern technology, complete voltage regulators can now be obtained as an integrated circuit. Bridge rectifiers are also available in a moulded plastics block, so you should find that building a regulated p.s.u. is a relatively simple and interesting project! □

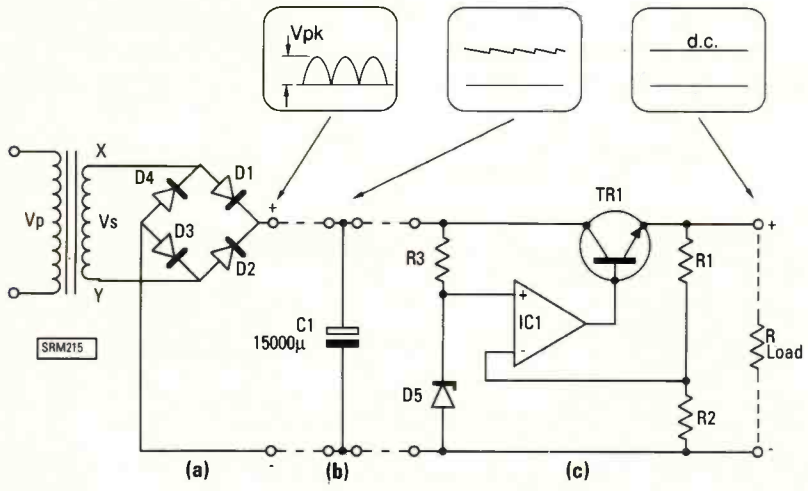


Fig. 4

Abbreviations	
A	amperes
a.c.	alternating current
d.c.	direct current
Hz	hertz
p.s.u.	power supply unit
π	pi (3.1416)
r.m.s.	root mean square
V	volts

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