shortwave magazine

BRITAIN'S BEST RADIO MAGAZINE

JULY 1998 £2.75

APPROVED AND REVIEWED AT LAST!

JW ON THE HOT NEW NRD-545

MODIFY YOUR PRO-50 SCANNER

VERTICAL ANTENNAS

all your Favourites inside

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JRC NRD 345G

A cracking new receiver aimed at the Broadcast and Shortwave listener. JRC build some of the World's finest receivers and this is no exception. Designed to give clarity and interference free reception.

- AM synchronous detector
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- 100 memories
- Clock/Timer functions
- Supplied c/w AC mains adaptor

ICOM 8500

Icom's TOP OF THE RANGE receiver! NEVADA are ICOM 'MAIN' DEALERS

- 100kHz - 2GHz
- 1000 memories
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- SSB, CW, FM, WFM, AM
- Audio filter
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ICOM PCR-1000

ICOM'S NEW COMPUTER RADIO SYSTEM

- 100kHz - 1300MHz
- All mode reception
- Plus *LOTS MORE!*

NEW
PCR OPTION DSP UNIT UT 106
£59.95

DRAKE SW2

A new low cost receiver with exceptional sensitivity, selectivity and dynamic range.

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- Easy tuning
- Dual antenna inputs
- 12V DC operation

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This receiver provides solid coverage from 50kHz to 30MHz with all mode reception of AM, SSB and CW. 50 fully tunable memory channels store frequency, mode and filter selections. The FRG-100 has twin 12 hour and 24 hour programmable clocks with on timer and sleep timer. The set requires 12V DC.

FM option available - add £39

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SYNTHESISED RECEIVER FM STEREO/MW/LW/SW PLL

- 307 memories (261 in SW, 18 each in MW/FM, 9 in LW plus priority station)
- ATS auto scan and preset in priority pf signal strength in FM/MW/LW bands
- E2 PROM for memory
- FM stereo via earphones
- 29 pages SW stations memory, 9 mems in every page
- 8 characters for editing station name
- Built-in 42 world cities time plus DST devicer
- Battery & signal strength indicator

SONY ICF-SW7600G

PORTABLE SHORTWAVE RADIO

- Covers 153kHz - 30MHz
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- 10 key Direct Access Tuning
- 22 Station presets
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- Tone control
- External antenna & record jacks
- Clock/Timer with sleep & standby functions
- Includes compact reel antenna & carrying case

YUPITERU

probably the

WORLD'S BEST SCANNER RANGE

YUPITERU MVT 3300EU

An exciting new handheld packed with features - but at a price you can afford! The receiver has "breathtaking performance" ensuring this set is destined to be a number one seller

- *FREQUENCY:* 66 - 88MHz 300 - 470MHz 108 -170MHz 806 - 1000MHz
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- *MEMORIES:* 200
- *BAND MEMORIES:* 10 (user re-programmable)
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£179.95

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- 530kHz-1650MHz
- AM/FM/WFM/SSB/CW
- 1000 Memories
- C/w NiCads & charger

£269.00

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Yupiteru's flagship model, with a range exceeding 2000MHz, a real time bandscope, twin VFO receiver, and a host of other features. EU version is especially designated by Yupiteru for the UK and Europe.

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PRICE MATCH

ALINCO DJ-X10E

- RECEIVES 100kHz - 2000MHz
- MULTI MODE RECEPTION
- 1200 MEMORY CHANNELS
- CHANNEL SCOPE SPECTRUM ANALYSER
- CHANNEL SCOPE PEAK SEARCH
- ADVANCED SCANNING FEATURES
- USER FRIENDLY FEATURES
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- TIMER FUNCTIONS
- BATTERY SAVE FACILITY
- SQUELCH CONTROL
- STYLISH CABINET WITH LARGE SPEAKER
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- SELECTABLE CONTROL BEEP TONE
- KEYPAD LOCK CONTROL

DJ-X10E includes FREE

- MAINS DROP IN CHARGER
  For easy and convenient use
- NICAD BATTERY PACK
  4.8V DC 700mAH NiCad battery pack
- BELT CLIP
- CARRYING STRAP
- FLEXIBLE LOW PROFILE ANTENNA

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EME-6 .....Earphone.....£10.95

£295.00

Bearcat
BEST VALUE!

UBC 120XLT

An Airband Handheld that's easy to use with TURBO SCAN and wide frequency coverage.

- 66-512MHz (with gaps)
- 100 memories
- Supplied c/w NiCads & charger

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A Wideband Scanner covering Aircraft, Land Mobile and UHF Band. Easy to use with the famous Bearcat reliability and performance.

- 66-956MHz (with gaps)
- 200 Memories
- Supplied c/w NiCads & charger

£149.95

PRICE MATCH

AOR AR8000

STILL the No1 seller!

- All mode FM, WFM, SSB, CW, AM
- 500kHz-1900MHz
- Computer control
- Data clone
- 1000 Memories
- C/w NiCads & charger

£299.00

PRICE MATCH

ICOM IC-R10

- All mode - FM, WFM, SSB, CW, AM RX
- Newly designed 'BUSY CATCH SCAN'
- (0.5MHz -1300MHz)
- 1000 memory channels
- VSC (Voice Scan Control)
- Full computer access capability
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DEALERS! - for further details contact
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in our TRADE DEPARTMENT
Phone: Intl (0044) 1705 698113
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R11

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Xplorer Test Receiver:
- 30MHz - 2GHz
- Two line LCD frequency display
- Decode CTCSS, DCS, and DTMF
- 500 memories
- 1000 frequency lockout
- Built-in PC interface
- Capture 5 watt UHF signal from 800 feet

R11 Test Receiver:
- 30MHz - 2GHz wide band receiver
- Built-in speaker for instant audio demodulation
- LED frequency range indication display
- Reaction Tune with Scout
- Capture 5 watt UHF signal from 500 feet
- 1000 frequency lockout

OS456/535

Optolinx

PC Control

OS456 / OS535:
Computer control scanning interface board for the popular RadioShack Pro 2005/6 and Pro 2035/42

Optolinx Universal Interface:
PC interface for downloading frequencies from Scout to a PC, or computer control the ICOM R7000, R7100, R8500 R9000, R10 and also the AOR AR8000. Use built-in data slicer circuit for use with Trunker® software. (Trunker® software not included with Optolinx)

Scout

3000A+

M1

Cub

Counters

Scout Frequency Recorder
- 10MHz - 1.4GHz
- Stores 400 frequencies in memory
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Handheld frequency counters, all incorporating patented Digital Filter and Digital Auto Capture. All counters come with initial accuracy of +/- 1ppm. High impedance amplifiers standard on M1 and 3000APlus. Call for additional features on all three counters.

While on the job or just having fun, take along an Optoelectronics product and experience an entire world of wireless communications.

If you need to calibrate a radio oscillator or just find frequencies around town, you will always be prepared with an Optoelectronics product. Experience the performance of Test Receivers, Frequency Counters, and Computer Control interfaces as so many professional technicians and hobbyist alike have relied upon to get the job done.

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short wave magazine

July 1998 Issue

Broadcast

Scanning Special

Cover Subject
Approved and reviewed at last - the hot new NRD-545!
Photo Craig Dyball

features

regular columns

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Vol. 56 Issue 7 July 1998
ISSN 0037-4261
ON SALE JUNE 25
Next issue on sale July 23

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Air Tattoo Competition Winners

The following readers have won tickets to the International Air Tattoo, which is being held over the weekend of 25-26th July 1998.

Mr I. Fairman, Swansea
J. Pluquet, Hampshire
Mr M. Andrews, W. Midlands
C.K. Usher, Essex
R. Mason, Bournemouth
Roy Medcalf, Warwick
Mr T.A. Ledger, W. Yorkshire
Reginald Featherstone, Nr. Sheffield
T.F. Minns, Dorset
Peter Charante, Roxburghshire
Mr M. Morley, Wolverhampton
I.N. Scott-Dunn, Cheshire
Frank Lowe, Wigan
Alan Moulsdale, South Glos
Mr L.T. Burgess, Scotland

Well done and we hope you enjoy the show!

RAE Course

Interested in Amateur Radio? Do you want to become a Radio Amateur and transmit your signals to other Radio Amateurs all over the world? Then now's the time to enrol for the Radio Amateurs Examination Course held at **Huntington School** in York on 1st July 1998.

The course will be held on Tuesday evenings, commencing on 15th September leading to the City & Guilds RAE in May 1999. The course tutor will be **Tony Skaife G4XIV** and he can be contacted for further details on **(01904) 330502**.

A BIG HIT!

The new AOR AR8200 hand-held scanner was a big hit at this year's Dayton Hamvention, with large crowds around the AOR stand. Pictured here is Phil Jeffery, Commercial Manager of **Nevada Communications**, who managed to get his hands on the radio before the show opened.

Phil commented "We believe this radio will quickly become the UKs most popular scanner, Nevada has ordered large quantities which should be arriving shortly". Judging from the reaction at Dayton, he could be right!

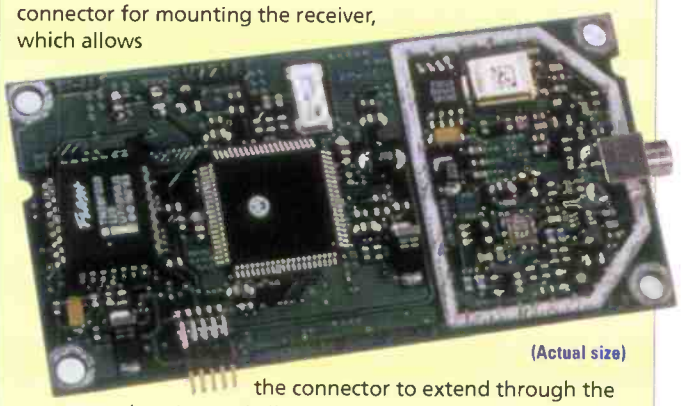
SMALL & POWERFUL!

THE SL ONCORE GPS RECEIVER

The smallest Oncore GPS receiver available to date, the SL Oncore, has recently been launched by Motorola. The SL Oncore GPS receiver has been designed specifically for automotive OEMs and system integrators. Although measuring only 40 x 80 x 12.2mm and weighing just 22g, the new GPS receiver delivers maximum performance and configuration flexibility.

The GPS has been built using high speed Motorola Integrated Circuits and like all Motorola Oncore receivers, the SL Oncore also offers fast start up times, signal requisition in a split second, simultaneous eight satellite tracking capabilities (typically the most in view at any given time) and enhanced performance in environments such as built up areas or dense foliage.

The product is available with a bulkhead SMB antenna connector for mounting the receiver, which allows



(Actual size)

the connector to extend through the system housing and eliminates the need for an expensive interconnecting cable within the housing. Additional options include a right- angled OSX antenna connector and a rechargeable/replaceable battery for retention of time, position and satellite data for rapid start ups.

If you would like to find out more about the Motorola GPS receivers, a full list of European Distributors can be obtained from **Tina Connolly** at **Motorola's Automotive, Components, Computer & Energy Sector, 27 Market Street, Maidenhead, Berkshire, Tel: +44 (0) 1628 763260, FAX: +44 (0) 1628 637059**.

RADIO & TVDX NEWS

Less than wonderful news - though not unexpected - for TVDXers. The Spanish telecomms authorities in Madrid confirm that their terrestrial digital TV bill should be government approved by September '98 and that **all analogue TV transmissions will cease by 2010**. The present timetable suggests that by January '99 terrestrial digital TV will be reaching to 50% population, 70% in 2000 and 95% by 2008. The commercial channels Tele 5 and Antenna 3 will have to simulcast analogue/digital by April 2002 and Canal+ by April 2003.

The cellular press reports a recent court case where a motorist attended the Knightsbridge, London court for using a radar detector, the police claiming that such devices are illegal. The motorist challenged the police understanding of the law and learned evidence eventually ruled on the side of the motorist in that the radar device 'detected' transmissions rather than 'received' them, the radar device merely noting the existence of such transmissions.

Had the court decided the radar detector was illegal to use, so would the countless microwave oven leakage detectors found in repair shops and councils' environmental health departments have also been illegal to use! Lord Justice Simon Brown

and Mr. Justice Marice ruled that the radar detector devices are now covered by the Wireless Telegraphy Apparatus (Receivers) (Exemption) Regulations (SI 1989 No.123) and as such is law. Legislation will be required to change this ruling.

Australia will allow her three existing national commercial TV free-to-air channels freedom of competition when they open digital transmissions - at least until 2008 when a fourth network will be given access to the digital spectrum. HDTV is timetabled to open Jan 1, 2000, the situation and progress of digital/HDTV will be reviewed during 2005.

Though it's rare these days to see a test card on any UK TV network, Snell and Wilcox have been working alongside the UK broadcasters to produce a test card suitable for the digital era. And so Test Card M has appeared - with certain familiar component parts - which will provide suitable test and measurement of the transmission path to help maintain quality standards. Industry views are sought and the Test Card M may change slightly in the near future (is it M for MPEG?).

ASAPS V4.0 NOW AVAILABLE

As UK distributor of Advanced Stand Alone Prediction System (ASAPS), the professional grade h.f. propagation prediction program from IPS Radio and Space Services, Simon Collings announces a new version of this package. ASAPS continues to be available to UK customers at the new low price of £150 + £2.50 P&P. An upgrade from DOS v2.0 and any previous Windows version is only £21.50 + £2.50 P&P.

A demonstration of the package can be downloaded from the website or may be obtained on floppy disk by sending three 3.5in formatted floppy disks with return postage to: **Simon Collings, Radio Communications Consultant, 46 St Michaels Road, Cheltenham, Gloucestershire GL51 5RR, Tel/FAX: (01242) 514429, E-mail: simon.collings@cableinet.co.uk, Website: http://wkweb4.cableinet.co.uk/simon.collings**

NEW DXTV CONVERTER

A completely restyled D-100 DXTV Converter is now available from HS Publications. Known as the *DE LUXE*, it is simple to operate and allows multi-system TV sound via an f.m. radio.

It has easy-to-read tuning scales calibrated in DX channels and covers virtually all v.h.f. and u.h.f. terrestrial frequencies, including special Russian and CIS channels in band II. However, it's main feature is variable vision i.f. bandwidth reduction. A reduced bandwidth lifts the reception threshold thus helping to resolve weak signals that are normally lost in the noise when using a conventional TV with its inherently wide i.f. bandwidth.

The new D-100 DE LUXE DXTV Converter.

Selectivity is improved too, thus helping to separate interleaved DX channels in Bands I and III. Automatic gain and i.f. bandwidth control maintains optimum picture definition when widely fluctuating signal strengths are encountered, for example, during Sporadic-E openings. It also includes an automatic band-scanning facility, which is useful when a Sporadic-E opening is imminent and there is even an output for an optional DX signal alarm module which emits a tone immediately reception occurs.

The new *D-100 DE LUXE* is available for **£149.95** (which includes a p.s.u. and UK postage). A leaflet giving full details of the converter is available by sending a stamped addressed envelope (or 2 IRCs) to: **HS Publications, 7 Epping Close, Derby DE22 4HR.**

A fully illustrated catalogue is also available, from the above address, costing 75p (UK stamps or 3 IRCs accepted) and gives full details of TV DXing, equipment, antennas, publications and videos. There is also a section devoted to TV nostalgia with details about various publications, videos and BBC Test Card music CDs.

Annual Radio Rally

The **Milton Keynes Amateur Radio Society** are holding their Annual Radio Rally at Bletchley Park Museum on **Sunday 13 September 1998** starting at 9am. Entrance fee is £1 and as usual there will be full refreshments and all facilities, including Morse tests on demand, talk-in on 145.550 and 433.550MHz.

The Museum will be specially opened for those who wish to look around it and this will be at the extra charge of only £1. More details from **Dave G3ZPA** on **(01908) 501310** or **Verdun G0RKV** on **(01908) 672920**.


Part of Bletchely Park Radio Rally outside the Mansion back in the summer of 1997.

rallies

June 28: The Horncastle Rally is to be held at Horncastle Youth Centre. This Rally is held as a joint venture between the Youth Centre and the Fenland Repeater Group. The Rally is held on one level with very good access for disabled visitors. Food and drink is available, including the now legendary Horncastle Bacon Butties. Tables are only £2 for six foot table (bookable and payable in advance). Cheques should be made payable to the Horncastle Youth Club, sent to: **Area Youth Office, Cagthorpe, Horncastle, Lincs LN9 6HW.** Entry fee for customers is £1. **Please call Tony Nightingale G6CZV** on **(01507) 522482** or E-mail Tony at: **antony.n@virgin.net** for further details.

July 5: The Harlow & District Amateur Radio Society are holding their Rally and Car Boot Sale (free entrance and parking) at a new and better venue, Mark Hall School, Harlow (A414), First Avenue. Tables inside £15, car boot plots, £7. For the best plots, book early! Talk-in on S22 & SU22. Morse tests on demand. **Len G7UFF** on **(01279) 832700** or FAX on **(01279) 864973** or E-mail: **len.brackstone@virgin.net**

July 5: The 9th York Radio Rally will be held in the Knavesmire Building, York Racecourse, York. Doors open at 1030 and admission is £1.50. Children accompanied with an adult go free and there is ample free car parking. There will be Amateur Radio, electronics and computers, Morse tests and repeater groups, refreshments and a licensed bar. Talk-in on S22. Further details from **Pat Trask G0DRF** on **(01904) 628036**.

July 12: The 18th Sussex Amateur Radio & Computer Fair will take place at the Brighton Race Course from 1030 to 1600. There will be free on-site parking and admission to the event is £2. The rally is one of the largest in the South of England with well over 100 trade stands covering Amateur Radio and CB radio, computer and electronics, etc. There is also a large Bring & Buy display area. Refreshments and bars at reasonable prices and a picnic area with views over the South Downs makes this a rally not to be missed! Further details on **(01323) 485704**.

July 19: The McMichael Mobile Rally will be held at the Haymill Youth & Community Centre, 112 Burnham Lane, Slough. Doors open at 1000. There will be trade stands, car boot sale, food and licensed facilities. Talk-in on S22. There will be disabled facilities also. **Dave Chislett** on **(01628) 625720** or for information on bookings, ring **0118-972 3504**.

July 26: The Colchester Radio & Computer Rally is to be held at St Helena School, Sheepen Road, Colchester, adjacent to the Colchester bypass, Avenue of Remembrance. Doors open 1000 till 1600. There will be a wide range of radio and computer traders, amateur radio, car boot sale and a Bring & Buy. RSGB Morse Tests on demand - don't forget to bring two passport size photos. Admission is £1.50. There will be ample free parking and disabled parking which is adjacent to the entrance with full access for wheelchair users. Contact

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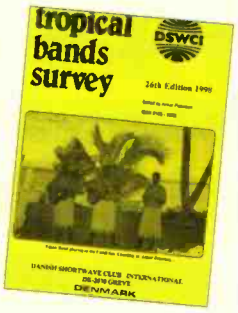
Send your news to Zoë Crabb at the Editorial Offices

New Editions

Now available from the **Danish Shortwave Club International** (DSWCI) are the new editions of the annual publications for



DXers, the ***Tropical Bands Survey*** (*TBS*), edited in its 26th edition by DSWCI Chairman Anker Peterson and the ***Clandestine Stations List*** (*CSL*),

now in its 14th revision, is edited by Finn Krone.

To obtain your copies, contact **DSWCI, c/o Bent Nielsen, Egekrogen 14, DK 3500 Vaerloese, Denmark**. Costs are: 50 DKK, 8 USD, 5 GBP, 13 DEM of 10 IRCs per issue. However, if a DX club orders a total of 20 copies or more, a 15% discount is given. Cash notes are accepted.

FREEDOM 10

The Freedom 10 combination charger/invertor.

The New Freedom 10 combination charger/invertor from **Merlin Equipment** is a complete power system in just one box! Designed for use in vehicles, boats, PV installations, remote locations and wherever mobile a.c. power is required, the Freedom 10 simply and silently converts 12 or 24V d.c. battery power to 230V a.c. mains electricity allowing the operation of computer, catering, communication audio visual, test and domestic equipment with the noise, hassle and expense of a generator. As soon as an outside source of power becomes available (i.e. a vehicle returns back to base) the unit automatically switches over to start changing the battery.

The highly efficient invertor utilises proven switchmode technology to provide up to 1kW of power continuously. However, appliances as large as 2kW can be operated for up to 10 minutes thanks to generous built-in surge capabilities.

Unlike most other combination charger/invertor units on the market, the Freedom 10's battery charger uses three stage charging techniques to ensure the batteries are charged in accordance to manufacturer's recommendations. These stages are called bulk, absorption and float modes.

Installation of the unit is very straightforward. Just three main connections are needed: a.c. input, a.c. output and d.c. connections. Even 4m of heavy duty cable is supplied for direct connection to the battery bank. Prices start at just £799, which is considerably less than a standalone 50A three stage battery charger and 1000W invertor.

To find out more about the Freedom 10's advanced functions, why not contact them direct at **The Merlin Group, Unit 1 Hithercroft Court, Lupton Road, Wallingford, Oxfordshire OX10 9BT, Tel: (01491) 824333 or FAX: (01491) 824466.**

PACK THAT TRUNK WITH OPTO

It is with baited breath that the UK scanning community await the launch of two new offerings from Optoelectronics, the Floridian radio specialists. The OPTOTRAKKER and the OPTOCOM will allow enthusiast to monitor European trunked system. Something the disappointing Uniden BC235XLT failed to deliver since it only operated on the 800MHz band, which is fine for stateside traffic, but of little use in continental Europe.

Both Optoelectronics products allow the users to track Motorola systems. The OPTOTRAKKER is used in conjunction with a scanning receiver that allows computer control such as an AOR, Icom or suitably equipped Radio Shack unit. OPTOCOM is a high speed computer controlled receiver capable of scanning at a rate of 100 channels per second. Contained within, are the essential components of the OPTOTRAKKER allowing the receiver to also perform the Motorola trunked system monitoring functions.

The OPTOTRAKKER operating with one of the many compatible scanners, the Icom R8500.

Both of forthcoming products will be available from the usual Optoelectronics outlets. More information can be obtained from the web site at **www.optoelectronics.com** or via **Haydon Communications Tel: 0181-951 5781, Nevada Communications Tel: (01705) 690626**, or **Waters & Stanton Electronics Tel: (01702) 206835**. Keep a close eye on *SWM* for reviews of these products just as soon as they are released.

The OPTOCOM computer controlled scanner.

SMALL BUT PERFECTLY FORMED

Now available from Icom (UK) Ltd., specialists in the field of radio communications, is the IC-Q7, the latest hand-held 2m/70cm f.m. transceiver to excite even the most seasoned amateur operator. The tiny IC-Q7 is a 300mW r.f. output transceiver incorporating a wide band receiver covering 30 to 1300MHz and capable of reception in a.m., f.m. and w.b.f.m. modes.

The latest offering from Icom - the IC-Q7.

This state-of-the-art product with its ultra compact and lightweight design fits neatly in the palm of a hand or in a shirt pocket allowing excellent freedom of movement. The IC-Q7 is the perfect choice for those who require local operation and at a cost of only £215, it represents excellent value for money.

More information about the IC-Q7 is obtainable from **Icom (UK) Ltd., Sea Street, Herne Bay, Kent CT6 8LD, Tel: (01227) 741741, FAX: (01227) 741742, E-mail: icomsales@icomuk.co.uk**

DOUBLE CELEBRATION

TransMissioners, **FEBA Radio's** exciting initiative to encourage support for Christian Radio, recently had cause for a double celebration. Both it's first anniversary **and** its 400th member! TransMissioners are a group of people who have joined together in helping thousands of people in Africa, Asia and the Middle East hear the Gospel by radio. Mr W. Uwins from Tunbridge Wells, became the 400th member to join TransMissioners.

Each month, members of TransMissioners support a different radio programme - in a different language - by prayer and giving. Members sponsor two minutes of broadcast time at £7 each month. Programmes in Arabic, Hindi, Tibetan and Swahili are some of those that have been supported over the last year.

A regular flow of information about programmes and listeners, helps members to be closely involved with what they're supporting. They are also kept up-to-date with news about programmes they have already supported, showing how God is changing lives through radio.

If you would like to know more about TransMissioners, please contact: **TransMissioners, FEBA Radio, Ivy Arch Road, Worthing, West Sussex BN14 8BX, Tel: (01903) 237281 (24 hours) or E-mail: reception@feba.org.uk**

RADIO AMATEUR AWARD

Communiqué have recently heard from **Roy Smyth GI4CBG**, who has taken over as the Award Manager for the 'Worked All GI' (WAGI) Award. So, what are the rules?

Well, here they are: **1)** the award is open to licensed amateurs and s.w.l.s (on a heard basis), **2)** all bands, 1.8 to 1296MHz, **3)** cards must be for valid contacts on or after 1st January 1979 (1-1-79), **4)** contacts via terrestrial repeaters or with mobile stations are not valid for the award, **5)** the award will be endorsed as follows: A, mode, c.w., s.s.b., RTTY, mixed, etc., B, Band, h.f. or v.h.f. (but not a mixture of both and **6)** a check list of QSLs, set out in log form and certified by two licensed amateurs or photocopies of QSLs must be submitted with all applications. Do not send QSLs!

A specimen of the Certificate.

The costs are as follows: Europe £3.50 (10 IRCs), outside Europe £4, US$7 or 12 IRCs. Payment to accompany all applications. Northern Ireland consists of six countries. These are: Antrim, Londonderry, Tyrone, Armagh, Down and Fermanagh. Please not that the city of Belfast is divided by the River Lagan into Co. Antrim and Co. Down.

Stations outside Europe require the following cards: two from each of Co. Antrim and Co. Down, one from each of the four remaining countries, making a total of eight cards.

Stations from Europe require the following cards: four from each of Co. Antrim and Co. Down, two from each of the remaining four countries, thus making a total of 16 cards.

Applications for the award should be forwarded to: **The Award Manager - WAGI, Roy Smyth GI4CBG, 58 Gilnahirk Road, Belfast, N. Ireland BT5 7DH.**

FEEDBACK REDUCES PRICES

Feedback Instruments Ltd. can now supply the top quality Kenwood PAC and PAC-R regulated d.c. power supplies, extensively used by test engineers, universities, schools and electronics enthusiasts, at new, low prices, starting from as little as £122 for the PAC20-3. The range of six power supplies includes instruments with 20, 30 or 60V output at currents from 1 to 3A. All have low ripple and low noise characteristics, simultaneous setting and display of voltage and current with a 3 digit l.e.d. display for each and floating output terminals.

Four of the range - the PAC-R series - have remote control terminals on the rear panel, which can be used for the control of output voltage and current by external resistance or voltage. These PAC-R models also offer series/parallel operation, by which the output current can be increased by series operation and the output voltage by parallel operation, and a remote sensing terminal facility by which the PAC-R power supply allows monitoring of the voltage at the load to stabilise the output voltage at the load.

Engineers and enthusiasts interested in taking advantage of the new low prices can reach Feedback Instruments on **(01892) 653322**.

SMC OPEN DAY

We have just been informed that SMC Ltd will be holding their usual annual open day at their Chandlers Ford HQ Saturday 1st August. For more information Tel: **Ailsa** on **(01703) 251549.**

Send your news to Zoë Crabb at the Editorial Offices

rallies

David 2E1FRO on **(01206) 369226**.

July 26: The Rugby Radio Rally will take place at the BP Truckstop, A5 Watling Street, Nr Rugby. **Arthur M0ASD** on **(01788) 550778** or **(0966) 433497**.

August 9: The Flight Refuelling ARS Hamfest 98 will take place at the Flight Refuelling Sports Centre, Merley, Wimborne, Dorset. The event will run from 1000 till 1700 and will include the usual mix of traders, a Bring & Buy, craft exhibitors, car boot sale and field events. Overnight camping facilities are available for Saturday 8th. Talk-in will be on S22. **Richard Hogan G4VCQ** on **(01202) 691021**.

August 14: The Cockenzie & Port Seton Amateur Radio Club are holding their 5th Annual Radio Junk Night at the Cockenzie & Port Seton Community Centre, South Seton Park, Port Seton, East Lothian. Open from 1830 to 2130. Bring along your 'junk' and sell it yourself. Tables will be provided on a first come first served basis (no charge for the table). A raffle will be held at approx. 2100. Refreshments will also be available, and there is access for any disabled visitors. Entry fee is £1 for all persons. All money will be donated to the British Heart Foundation. Further details from **Bob Glasgow GM4UYZ @ GB7EDN** or telephone on **(01875) 811723**.

August 16: The 9th Great Eastern Radio & Computer Rally is to be held at Wallington Hall, Nr Kings Lynn. Doors open at 1000 (0945 for disabled visitors). The event will feature Amateur Radio, computer and electronic component exhibitors, a Bring & Buy, and lots more. Food and drink is served all day. Talk-in on S22. There is also ample free parking. For further details or trader information, contact **Ian G0BMS** on **(01553) 765614**.

August 16: The 3rd Cardiff Amateur Radio & Computer Fair will be held at The Star Sports & Recreation Centre, Splott, Cardiff. Doors open 1030 till 1500. **Stuart Robinson GW0WMT** on **(01222) 613070**.

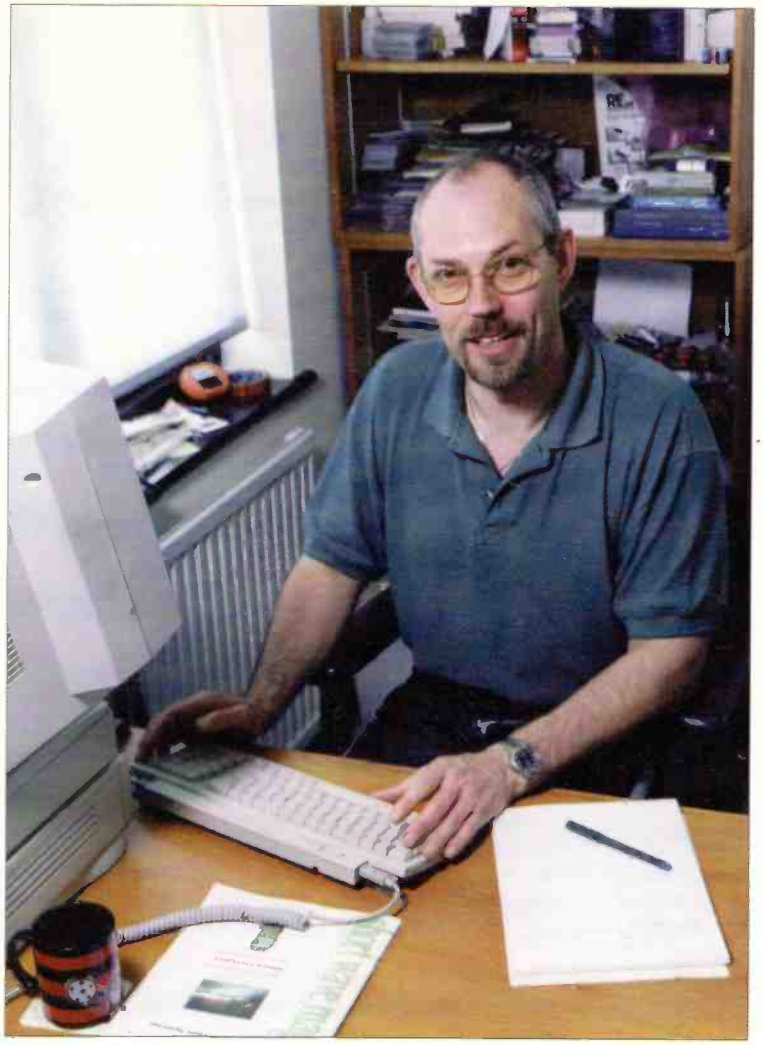
August 16: The Stroud Radio Society Rally will be held at Archway School, Stroud, Glos. Doors open 1030 (1000 for disabled visitors). There will be a talk-in on S22 and admission is £1.50. There will also be a Bring & Buy. **Stuart G0GNM** on **(01453) 752411** or **Steve G7EUW** on **(01453) 758032**.

August 23: The Telford Rally will be held this year at the Telford International Centre. There will be major dealers, a flea market, Bring & Buy, all in purpose built exhibition halls with good disabled access and plenty of space to move around. There will be catering, Morse testing and good local attractions including the famous Ironbridge Gorge Museum. **Jim G8UGL** on **(01952) 684173** or **Tony M0AMP** on **(01743) 235619**, E-mail: **zeroamp@hotmail.com**

August 30: The Galashiels and DARS are holding their Open Day and Rally in the Volunteer Hall, St Johns Street, Galashiels, Scottish Borders from 1100 to 1600. There will be traders, refreshments, Bring & Buy, etc. **Jim GM7LUN** on **(01896) 850245** or packet @ GB7JED.

August 31: The Huntingdonshire Amateur Radio Rally Annual Bank Holiday Monday Rally is to be held at Emulf Community School, St Neots, Cambridgeshire (near Tesco Superstore on A428). Doors open 1000 to 1400 and admission is £1. There will be hot and cold refreshments available and a hall and car boot sale on hardstanding. Talk-in on S22. **David Leech G7DIU** on **(01480) 431333** (between 0900 and 2100).

ed's comments



The WEB We Weave

Many of you will be glad to know that we now have a web site - and I guess some of you won't. The URL for our site is **www.pwpublishing.ltd.uk** This takes you to the main contents page for both *SWM* and our sister magazine *PW*. Take a look, if you have Internet access, and let me have your comments. The site will be developed considerably over the coming months, so keep an eye on what's happening. It is possible, to contact us here in the Editorial Offices, buy books and subscribe via the site as well as checking out what's coming up in future issues.

QRZ de G7TZC

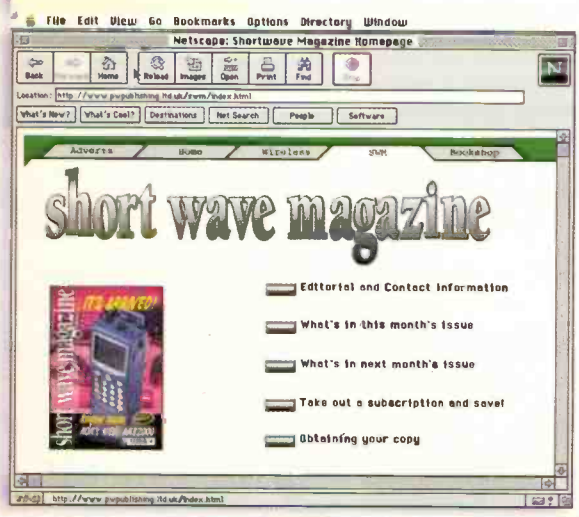
Hi there everybody. Welcome to the first issue of *Short Wave Magazine* with yours truly at the controls. First-off I'd like to thank Dick for all his efforts over the past 147 issues, what a great job he's done transforming an ailing amateur radio magazine into a very successful listeners' monthly compulsion. On a personal note I'd like to thank him for bringing me on board and hence, allowing me to sit here composing this editorial piece. I sincerely hope that I too can have the same magnitude of influence on the success of this prestigious listeners' monthly bible - I certainly intend that I will!

It is now many years ago that a tender thirteen year old saved up for eight months, after having tinkered with many portable radios with 'short wave' coverage, to buy his first 'real' communications receiver.

I remember well writing to a then, regular advertiser in *SWM*, the late Jack Tweedy, to ask what second-hand equipment he had available that was suitable for a keen fledgling s.w.l. Jack's prompt response had me visiting his 22 mile distant Woodhall Spa emporium to view the suggested radio. On offer, was a used, but clean Trio 9R59DE. It was love at first sight - Sold! Many radios, much encouragement, and lots of years later here I am. In a position that even that youthful, totally committed short wave enthusiast never imagined possible.

I owe great thanks to many people to mention but a few, my departed grandparents Frank and Olive for much enthusiasm and hobby related Christmas and birthday presents, my parents for so much patience and for allowing me to erect dubious antennas around the garden and fill their home with, "radio junk". In *PW* terms, my two Elmers, unfortunately both are now operating from that great shack in the sky, Tony G3JIN and Bob G3UNR, collectively they must have been blessed with the patience of Job as neither ever tired of my perpetual company and questions. Finally my school friends Chris Archer (now G4VFK) and David Dean for sharing interests and providing essential good honoured rivalry and companionship. Without these people I most definitely would not be the one writing this now.

Enough reminiscing, what of the future I hear you ask. Well I've always been a great believer of "if it ain't broke - don't fix it". This is very much the case with most of *Short Wave Magazine* so be assured that things won't be changing beyond all recognition. I do however believe that most things can be improved, and over the months you will see some changes taking place. Watch closely to what happens, please let me have your feedback - more on this subject in future issues.



Coming Up

I genuinely want to know what you, the reason for all our efforts, the readers actually think about *SWM*. To this end, there will be a Reader Survey included in August's issue. Please, please, please take the time to fill it in so that your views can be heard. As an additional incentive, I have organised a prize draw, with a first prize of both, an RF Systems' active antenna and a Yupiteru MVT-7100 scanner. So watch out for the August *SWM* and be heard! Broadcast listeners will also be delighted to know that the latest *Global Radio Guide* will also be included **free** to UK readers.

Kevin Nice

Dear Sir

I am writing to compliment you on the improvements to *SWM* over the last few months.

Reading the comments made by G.E.R. Denman and others in your Letters page, one might wonder what exactly they want from the magazine. Radio as a hobby is facing greater competition from other activities such as home computing and the Internet than ever, it also appears to me that the age of the average radio enthusiast is ever increasing. Unless 'new blood' is attracted to the hobby, in time it risks disappearing.

Unjustified whinging will only hurt an already ailing pastime. Reviewing out of production receivers is **not** a waste of time - there may be many readers who do not have the funds to afford a new piece of equipment, and who may manage to purchase a used receiver. We are not all old enough to remember when the likes of the RA17 were new!

I was attracted back into short wave listening about eighteen months ago after a gap of seven years. The reason for my return was *SWM*, I picked up a copy in WH Smiths and I was hooked.

I purchased a JRC NRD-345, built an a.t.u. and ran a 30m wire down the garden. Now I have just sat the RAE and I'm awaiting the result, the Morse test now beckons. The team at *SWM/PW* are responsible for this - many thanks!

I would suggest to those who still criticise the magazine's layout and colour scheme that they invest in a trip to the opticians (maybe it's those ageing eyes...!).

Hugh Neal
'Tony Palmer' - Radio Caroline '90-92
Erith
Kent

*Welcome back to the hobby Hugh - **Ed**.*

Is there something you want to get off your chest? Do you have a problem fellow readers can solve? If so then drop a line to the Editor.

THE BEST LETTER WILL RECEIVE A £20 VOUCHER TO SPEND ON ANY SWM SERVICE.

Dear Sir

I read with interest B. Williams' account (*SWM*, June 1998) of his activity in the stated band of 1.610 to 1.705MHz. The services within that band are itemised in a free publication, RA306, from the Radiocommunications Agency, which lists services on all frequencies between 9kHz and 30MHz. A further publication, RA193, gives a brief description of the technicalities and usage of Cordless Phones in the UK, (1642 to 1782kHz in eight channels).

It is obvious that listening to these conversations is illegal (unless of course the eavesdropper is in possession of a Warrant issued on behalf of the Home Office). Confiscation of equipment used, huge fines and even imprisonment are the punishments that can be brought to bear.

Snooping by the ordinary person is common. No technical knowledge or a 'scanner' is required. Possession of the humble transistor radio is all that is needed. Tune to the h.f. end of the medium wave and there they are, ringing tones, dialling tones, conversations and the final buzz as another cordless 'phone is switched off. The cheaper the transistor radio, the wider the bandwidth, (*and poorer i.f. image rejection- Ed.*) the more chance of interception.

An article entitled 'Americans get the Snooping bug' was printed in the *Sunday Times* of 14th October 1990 and was the result of an interview between author Mike Graham, and Steve Douglass (*Monitoring Times*). Within the text of the piece Graham remarks "Anyone with a cordless 'phone is fair game for Douglass and his ilk."

Douglass then raises the issue of Baby alarms. "People don't realise that having a baby monitor is like planting a bug in your own house for your neighbours' pleasure." The article ends with "Having a cordless 'phone nowadays is like walking into a crowded theatre and yelling out all your personal and intimate details," said Douglass. "And believe me there is an audience out there just dying to hear about them."

But what is the difference between those who regularly monitor a telephone conversation of 'Joe Public' a few roads away and those who monitor transmissions from Acme Airways flying the Atlantic, or who use the latest in computer software to decode diplomatic traffic from the Embassy of another country? There is of course, no difference, these activities are illegal.

'Joe Public' is not likely to raise a complaint unless he finds out that you have been listening to his conversations and the air traffic control authorities know of s.w.l. activity and compound it by sending QSL cards.

If Diplomatic circles were concerned there might be some form of complaint, or with some regimes, a ricin pellet loaded umbrella poked into the thigh of the hapless short wave listener! This likelihood is remote. Any organisation with sensitive material to relay will encrypt and send by the most secure means at their disposal.

Commercially the cellular telephone has been a multi-million pound success. The early flaw was obvious. Scanner operators trawled away picking up conversations of pauper and royalty alike. Newspapers ran story lines about the interception of conversations for weeks on end. The banning of the import of Scanning receivers that could tune above 512MHz was suggested.

The reality was that the Scanners already available at that time could easily tune the cellular frequencies by selecting around 407MHz and just scanning through about 15MHz. All due to the design of the scanner r.f. and i.f. stages. A little trimming of the u.h.f. tuner of the redundant B&W TV also brought results of varying quality. A near microwave band was not needed.

The more astute service providers asked for something more secure. They got it in the form of digitised speech, now used on cellular telephones that outnumber the analogue types. They are only secure against casual listening. The dedicated, technical listener will attempt to demodulate the signals, whilst the security services have requested that the digitising and encoding is done only to a depth that they can easily break.

There was a court case, I recall, some years back involving a number of licensed radio amateurs who monitored certain v.h.f. frequencies and then discussed the results on the 2m band. It was reported, at length, in the *New Statesman* and even frequencies and callsigns were listed. The accused were all found guilty and received fines totalling £10,000 plus loss of equipment.

Duncan Campbell, who penned the piece, stated the users and their frequencies. Whether that was the cause, or just a tightening up of security those users started employing deep encryption techniques and/or a change of frequency.

Surely the moral is that if you have to monitor disclose nothing to anyone, and keep your frequencies in your head. Does *SWM* intend to start an illegal intercepts column?

73 and good listening.

Paul Beaumont

Dear Sir

I'll be sorry if *SWM* is ever limited to reviews of new equipment. In the 1970s I lived in London bedsits, never having outdoor aerials for my home-brew regenerative sets. Not ideal, but I had fun and learned a lot, often helped by *SWM*.

I'm still having fun, but these days with a longwire, my Eddystones and R210. I value these for what they let me do, rather then their vintage. Also, like John Wilson, for the simple pleasure of using them.

LM&S and G.E.R. Denman's 'minority interest' propagation articles help me get the best from my rigs. They also help me get the best from brand new equipment. Please don't ditch these articles, or the equipment reviews, as both are worth reading.

Dr S.M. Newstead
Nuneaton
Warks

As the old saying goes, "one man's meat is another man's poison". Diversity of interests is what makes not only this hobby, but the world too, varied and appealing. Long live differing opinions. Here at SWM *we will continue to provide a broad coverage of radio related topics - **Ed.***

Dear Sir

I refer to the comments in the June issue of *Short Wave Magazine* regarding the Yupiteru MVT-9000 manual. As you may know, Nevada Communications have been authorised to distribute Yupiteru products in England since 1991. We purchase our products direct from the Yupiteru factory and, as such, all the scanners we import are supplied with an English manual printed directly by Yupiteru Industries in Japan - this manual appears to have none of the errors outlined by your readers.

We can, therefore, only assume that the manuals to which they refer have not been produced by Yupiteru Japan, but are possibly translations of the Japanese manual produced by third parties in England who have imported the scanners indirectly from the Japanese market. I am sending you a copy of the original Yupiteru manual by post so that you can compare. I am sure this information will be of interest to your readers.

Mike Devereux
Managing Director
Nevada Communications
Portsmouth

*Does your manual look like this? **Ed**.*

PETER SHORE c/o *SWM* EDITORIAL OFFICES, ARROWSMITH COURT, STATION APPROACH, BROADSTONE, DORSET BH18 8PW.
E-MAIL: petershore@pwpublishing.ltd.uk

Bandscan Europe

As I write this, Britain is engulfed in a molten mass of football mania, with Tesco, one of the country's leading supermarket chains, selling 40000 televisions costing £169.00 in the course of a single week. However, it's comforting to know that radio is still important in many people's minds. In fact, radio is currently so financially attractive that a group of entrepreneurs, led by former pirate radio man Paul Rusling, is behind a bid to launch a new long wave broadcasting station beaming programmes from the Isle of Man to the mainland.

It seems that the Manx government, the Tynwald, is being persuaded to licence 279kHz for a high-power station on the tiny island midway in the Irish Sea between Blackpool and Ireland. This frequency was allocated in the last round of international agreements to Belarus, but now the Isle of Man International Broadcasting Company has secured the rights to this channel.

But anyone wanting to start a high-power long wave station should study the workings of Atlantic 252, the long wave station in the Republic of Ireland which beams a menu of pop music to Britain. The Irish station had tremendous difficulty in getting the huge antennas needed for long wave sanctioned by the local authorities, and today has to spend more than £500000 each year on electricity alone.

Despite this, and similar problems affecting the proposed Radio Delta, a long wave operation to be based in the Netherlands, Rusling is someone who does not want to be defeated. He has assembled a team of financiers and broadcasters to put the Isle of Man on the international broadcasting map. Personally I am a little doubtful that we shall ever hear long wave signals from the island, but I am prepared to be proved wrong.

Difficult Discussions

BBC World Service is currently engaged in difficult discussions with Britain's Foreign Office - the international radio service's paymasters - over its budget. The BBC is seeking an increase of around £8 million in order to maintain its existing output and is threatening to cut complete language services if additional funding is not forthcoming.

The German language service is one which has been named as a likely candidate for closure, although this may be sabre rattling on the part of Bush House strategists. Some years ago the Managing Director of BBC World Service said that the German service would remain on the air as long as the BBC has an f.m. transmitter in Berlin. That transmitter is still on the air, and its licence runs until well into the next century.

This September marks the 60th anniversary of the German service, and celebrations are being planned by Bush House staff. The mood at the parties will be very muted if indeed the German service is axed, just as the Finnish service was at the beginning of the year.

At the same time, BBC World Service is appealing to the government for funds to make some specialist television programmes to supplement its radio output. These programmes would be separate from the 24 hour-a-day television news service, BBC World. Instead they would be 30-minute programmes in languages like Russian, Korean and Azeri, and made available for airing in existing local and national television services in countries where those languages are spoken.

The BBC is clearly worried about the continued spread of television in some of its most important markets, and wants to fight to retain a foothold.

Digital Delivery

Swiss Radio International plans to drop its analogue satellite channels in favour of digital delivery during the next six months. This means that if you are listening to the 24 hour-a-day English-language service on Astra, you'll have to buy a new piece of equipment to receive something called ADR (Astra Digital Radio).

ADR has been promoted heavily in Germany for satellite radio listening and tens of stations are using this particular form of transmission. But outside German-speaking countries, penetration is all but non existent. This could prove problematic for listeners initially, but provide a great incentive for dealers in the UK and elsewhere in Europe to sell the ADR receivers.

Uniquely in the international broadcasting world, Swiss Radio has started a process of consultation with its listeners on this proposed change. If you want to let SRI know your opinion, drop a line to **English Service, SRI, Giacomettistrasse 1, CH-3000 Bern 15, Switzerland**, or FAX: **+41 31 350 9569.**

Hotting Up

In Africa, things seem to be hotting up for satellite radio services. WorldSpace, an entrepreneurial company based in Washington DC will launch the first of three digital radio satellites towards the end of this year. AfriStar will deliver digital-quality radio to a new generation of receivers on the ground, and two more African broadcasters have signed up to provide programming over this new system.

At the recent Africa Telecom event in Johannesburg, WorldSpace announced that both the Liberian Broadcasting System, the national broadcaster in Liberia, and Sanyu FM, Uganda's first private station, will be broadcasting via the WorldSpace system. Already announced are contracts with the Kenya Broadcasting Corporation and financial news provider Bloomberg.

There is still hesitation on the part of the big international broadcasters to sign with WorldSpace - the digital transmission system is proprietary (in other words the specification has not been released by the company) and there are doubts whether the satellite signal can be received in anything other than direct line-of-sight between the satellite and the receiver. This begs the question whether there is any advantage in buying one of the new WorldSpace receivers - which will retail at around US$300 in the world's poorest continent - over investing in a fixed dish to receive the combined digital television and radio service offered by South Africa's MultiChoice direct-to-home operation.

Services Independent

I was pleased to learn that Rwanda is seeking to make its state-controlled radio and television services independent from the government. The Rwanda Office of Information is seeking consultants who will put together a plan to cut the staff numbers from 400 to 200 and make all the country's radio and television services self-funding through commercial ventures.

This is the first step towards making freedom of speech commonplace in Rwanda, which is still suffering after the blood letting of recent years. Sadly there is still a 'hate radio' on the air, probably beamed in from rebels in Tanzania, inciting more violence. The Voice of the Patriot seems to be an offspring of the infamous Radio Mille Collines which, in 1994, incited Rwandans to murder Tutsis and moderate Hutus.

Radio has been used to incite violence and murder in many places around the world - the example from Rwanda is particularly appalling. It is to be hoped that this latest hate station is soon silenced.

■ BRIAN ODDY G3FEX, THREE CORNERS, MERRYFIELD WAY, STORRINGTON, WEST SUSSEX RH20 4NS

LM&S

Hot sunny weather usually brings with it a number of thunderstorms and they can be a serious problem for anyone using an outdoor antenna. Apart from the danger of lightning during a storm, the raindrops carry an electrical charge which will be deposited on the antenna by any that land upon it. A very high potential will quickly build up unless there is a low resistance path between the antenna and earth.

To avoid this hazard always disconnect an external antenna from your receiver and effectively earth it when not in use - don't wait for a storm to arrive!

Long Wave Reports

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

Unless otherwise stated, all logs were compiled during April.

The latest reports from **Bernard Curtis** (Stalbridge), **Sheila Hughes** (Morden) and **Bryan Keyte** (Gt.Bookham) indicate that the transmitter at Burg, Germany, on **261kHz** is now being frequently used to relay the BBC World Service! Much to his surprise, Brian first noticed this at 2130UTC on April 11. The broadcast followed the same format as BBC 648. Bernard picked up a BBC programme on **261kHz** at 0940 and the station announcement in German followed at 1000. On the 21st Sheila heard the ident BBC World Service at 2130 and rated the transmission SINPO 33333.

The new Rikisutvarpid outlet at Gufuskalar, West Iceland, on **189kHz** was heard for the first time by Brian Keyte at midnight on the 12th. The 300kW transmission peaked 34343. This station was also logged at night by **Ernie Strong** in Ramsey, Cambs.

Particularly good reception of the Polskie R-1 broadcasts via the Raszyn reserve transmitter on **225kHz** was noted during the evening of the 25th by **David Stevenson** in Swansea. Until 2230 the signal rated SIO444.

Medium Wave Reports

The propagation of m.w. transmissions over transatlantic paths was found to be very poor during most nights in April by UK contributors to this section. On the 3rd **John Slater** (Scalloway, Shetland) picked up the broadcasts from two stations in St.John's, Newfoundland - VOCM on **590**, rated SIO222 at 0450UTC and CJYQ on **930** (SIO211 at 0500). At 0550 he heard CJCH in Halifax, Nova Scotia, on **920**, which was peaking SIO222. Better conditions on the 10th enabled him to receive WBBR in New York, NY on **1130** (SIO333 at 0540); WEEI Boston, MA on **850** (SIO333 at 0545); WBZ Boston, MA on **1030** (SIO222 at 0543); WINS New York, NY on **1010** (SIO333 at 0550); CJFX Antigonish, NS on **580** (SIO232 at 0552); also WNRB in Boston, MA on **1510** (SIO333 at 0555).

The broadcasts from WNRB in Boston on **1510** were used as a pointer to conditions by **Harry Richards** (Barton-upon-Humber). They were poor during April but on May 1st he logged their transmission as 24232 at 0350. He also heard WQEW in New York, NY on **1560**, which rated 23232 at 0350.

The sky waves from some m.w. stations in N.Africa, Europe, Russia and Scandinavia also reached our shores after dark. However, with the longer hours of daylight **George Millmore** (Wootton, IoW) noticed a general decline in the number of stations that could be received. By searching the band after midnight **Stephen & Michelle Jones** (Oswestry) were able to compile an interesting first list - see chart.

As the chart clearly shows, the ground waves from some m.w. local radio outlets reached quite distant places! In E.Bristol **Simon Hockenhull** used a directional portable to listen to BBC Radio Gloucestershire via their new Bourton-on-the-Water outlet on **1413kHz** but so far he has been unable to detect the co-channel outlet at Berkley Heath.

Short Wave Reports

Much to the disappointment of some listeners the **25MHz (11m)** band remains unused at present.

In contrast, the **21MHz (13m)** band is much in use during the hours of daylight. In the morning the Voice of Turkey **21.715** (Tur to W.Asia, Australia 0500-1000) was rated 34423 at 0656 by **John Eaton** in Woking; RAI Rome **21.520** (It to Africa 0600-1300) 33333 at 0820 in Stalbridge; UAER, Abu Dhabi **21.630** (Ar to Far East 0400?-1300?) 55545 at 1000 by **Ernest Wiles** in NE.Bedford; RFI via Issoudun **21.620** (Fr to E.Africa 0900?-1500) 41144 at 1025 by **David Hall** in Morpeth; UAER, Dubai **21.605** (Eng to Eur 1030-1100) 55333 at 1031 by **Darren Beasley** in Bridgwater; RFI via Issoudun? **21.580** (Fr to S.Africa 0900-1600) 24332 at 1033 by **Rhoderick Illman** in Oxted; Vatican R, Italy **21.850** (Port, Sp to S.America 1100-1130) SIO322 at 1128 by **Philip Rambaut** in Macclesfield; BSKSA Saudi Arabia **21.495** (Ar [Holy Quran] to SE.Asia 0900-1200) 54454 at 1130 by **Robert Hughes** in Liverpool.

After mid-day DW via Kigali, Rwanda **21.695** (Fr to W.Africa 1200-1300) was noted as 44444 at 1250 by **Robert Connolly** in Kilkeel; Voice of Russia **21.760** (Eng [WS]) 44444 at 1330 in Morden; UAER, Dubai **21.605** (Eng to Eur 1330-1355) heard at 1345 by **Martin Goodey** in St.Mary's, Isles of Scilly; HCJB Quito, Ecuador **21.455** (Eng [u.s.b. + p.c.] to N/S.America 1100-1600) 15342 at 1346 by **Fred Pallant** in Storrington; RAI Rome **21.535/21.710** (Tt [Football] to Lat Amer, Africa 1330-1700, Sun only) 34333 at 1400 by **Eddie McKeown** in Newry; BBC via Cyprus **21.470** (Eng to E.Africa 1400-1700) 35343 at 1530 in E.Bristol; BBC via Ascension Is **21.660** (Eng to W/E/S.Africa 1100-1700) 35553 at 1610 by **John Parry** in Larnaca, Cyprus; WYFR via Okeechobee, USA **21.525** (Eng, Fr, Port to Eur, Africa 1600-2000) 24222 at 1945 by **Thomas Williams** in Truro; HCJB Quito, Ecuador **21.455** (Eng [u.s.b. + p.c.] to Eur 1900-2200) 25542 at 2000 by **Ross Lockley** in Galashiels; R.For Peace Int, Costa Rica **21.465** (Eng to USA?) 44444 at 2130 by **Bill Griffith** while in Allentown PA, USA.

In the **17MHz (16m)** band R.Australia via Shepparton **17.750** (Eng to Asia 0600-0900) was received with fading at 0730 in St.Mary's, IoS; Africa No.1, Gabon **17.630** (Fr to W.Africa 0700-1100, 1200-1600) was 32233 at 0845 in Morpeth; R.Austria Int via Moosbrunn **17.870** (Eng, Ger to Australasia 0930-1030) 24433 at 0945 in Oxted; AIR via Bangalore **17.387** (Eng to Pacific areas 1000-1100) 34233 at 1004 in Newry; R.Pakistan, Islamabad **17.835** (Eng to Eur 1100-1120) 54444 at 1107 by **Chris Shorten** in Norwich; R.Bulgaria, Sofia **17.585** (Eng to Eur 1100-1200) 55555 at 1145 in Liverpool.

During the afternoon the BBC via Ascension Is **17.830** (Eng to W/C.Africa 0730-2100) was rated 54554 at 1305 by **Bill Griffith** in Flic-en-Flac, W.Mauritius & 33333 at 2040 in Stalbridge; BBC via Skelton & Woofferton, UK **17.640** (Eng to E.Eur, M.East, E.Africa 0700-1500) 54434 at 1412 by **Tony Hall** in Freshwater Bay, IoW; Israel R, Jerusalem **17.535** (Eng to Eur, N.America 1400-1430) 44444 at 1415 by **Vera Brindley** in Woodhall Spa; BBC via Antigua, W.Indies **17.840** (Eng to S/C.America 1400-1700) 33333 at 1440 in Kilkeel; VOA via Morocco 17.895 (Eng to Africa 1600-1900) SIO444 at 1630 by **Tom Smyth** in Co.Fermanagh; R.Prague, Czech Rep **17.485** (Eng to Eur, E.Africa 1700-1727) 44444 at 1705 by **Vic Prier** in Colyton.

Later, R.Nederlands via Bonaire, Ned Antilles **17.605** (Eng to Africa 1830-2025) was noted as 55444 at 1952 by **Clare Pinder** in

LONG WAVE CHART

Freq (kHz)	Station	Country	Power (kW)	Listener
153	Bechar	Algeria	1000	I*
153	Donebach DLF	Germany	500	B,C,D,E,H,I*,J,K*,L*
162	Allouis	France	2000	B,C,D,E,G*,H,I,J,K*,L*
171	Nador Medi-1	Morocco	2000	I*,L*
171	B'shakovo etc	Russia	1200	B,C,E,H,I*,K*,L*
171	Lvov	Ukraine	500	E*
177	Dranienburg	Germany	750	B,C,E*,H,I*,J,K*,L*
183	Saarlouis	Germany	2000	B,C,D,E,G*,H,I,J,K*,L*
189	Gufuskalar	W.Iceland	150	F*,L*
198	Droitwich BBC	UK	500	B,D,E,H,J,K,L*
207	Munich DLF	Germany	500	B,C,D,E*,G*,H,I*,J,K*,L*
207	Azilal	Morocco	800	E*,I*,L*
216	Roumoules RMC	S.France	1400	B,C,D,E,G*,H,I,J,K*,L*
225	Raszyn Resv	Poland	?	B,E*,G*,H,I*,K*,L*
234	Beidweiler	Luxembourg	2000	B,C,D,E,G*,H,I,J,K*,L*
243	Kalundborg	Denmark	300	B,C,D,E,G*,H,I,L*
252	Tipaza	Algeria	1500	E*,I*,K*
252	Atlantic 252	S.Ireland	500	B,C,D,E*,H,I,J,K,L*
261	Burg(R.Ropa)	Germany	200	A,C,E*,F*,H,I*,L*
261	Taldom Moscow	Russia	2500	L*
270	Topolna	Czech Rep	1500	E*,H,I,L*
279	Sasnovy	Belarus	500	E*,I*,L*

Note: Entries marked * were logged during darkness. All other entries were logged during daylight or at dawn/dusk.

Listeners:-
(A) Bernard Curtis, Stalbridge.
(B) Martin Dale, Stockport.
(C) John Eaton, Woking.
(D) Simon Hockenhull, E.Bristol.
(E) Sheila Hughes, Morden.
(F) Brian Keyte, Gt.Bookham.
(G) Eddie McKeown, Newry.
(H) George Millmore, Wootton, IoW.
(I) Fred Pallant, Storrington.
(J) Tom Smyth, Co.Fermanagh.
(K) David Stevenson, Swansea.
(L) Ernie Strong, Ramsey, Cambs.

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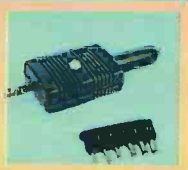

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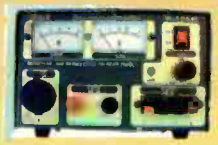

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Appleby; WYFR via Okeechobee, USA **17.555** (Eng to Eur, Africa 2000-2200) 44333 at 2030 in Morden; RCI via Sackville **17.820** (Eng to Eur, Africa 2000-2130) 35345 at 2045 in E.Bristol; RCI via Sackville **17.870** (Eng to Eur, M.East, Africa 2000-2100) 33333 at 2046 in Truro; R.New Zealand Int **17.675** (Eng to Pacific areas? 2052 [2107 Fri/Sat] - 0457) 15443 at 2108 by **Richard Reynolds** in Guildford; R.Taipei Int via WYFR **17.750** (Eng to Eur 2200-2300) 45444 at 2208 in Bridgwater; WHRI South Bend, USA **17.655** (Eng to E.USA, Eur 1500-2300) 44344 at 2210 in Woking.

Broadcasts from many areas may be heard in the **15MHz (19m)** band during the day. In the early morning they include the Voice of Nigeria via Ikorodu **15.120** (Eng 0500-0700), rated 35543 at 0630 by **David Edwardson** in Wallsend; R.Japan via Moyabi, Gabon 15.230 (Eng to M.East, N.Africa 0700-0800) 33222 at 0730 in Appleby; BBC via Masirah Is, Oman 15.310 (Eng to S.Asia 0300-0915, 1000-1400) 54555 at 0830 in W.Mauritius; R.Australia via Shepparton 15.415 (Eng to Asia 0100-0400, 0600-0900) 44433 at 0835 by **Stan Evans** in Herstmonceux; R.Norway Int 15.175 (Norw to Australia, S.America 0900-0930) 34333 at 0917 in Oxted.

During the afternoon the BBC via Antigua, W.Indies 15.220 (Eng to C/N.America 1100-1400) was 54554 at 1200 in Allentown, USA; R.Vlaanderen Int, Belguim **15.545** (Eng to N.America, Eur 1230-1255) 32232 at 1230 in Norwich; R.Romania Int **15.390** (Eng to Eur 1300-1356) 54444 at 1326 by **Tom Winzor** in Plymouth; RCI via Sines, Portugal **15.325** (Eng to Eur, M.East, Africa 1330-1400) 22222 at 1330 in Truro; BBC via Cyprus **15.575** (Eng to M.East, E.Eur 0900-1500) 43333 at 1423 in Woking; VOA via Morocco **15.410** (Eng to Africa 1600-2000) 42323 at 1600 by **Gerald Guest** in Dudley; VOIRI Tehran, Iran **15.084** (Home Sce relay) 54454 at 1620 in Liverpool; VOA via Botswana **15.445** (Eng to Africa 1600-1800) 44334 at 1635 in Freshwater Bay; VOA via Greenville? **15.135** (Eng to Eur, N.Africa 1700-1800) 43243 at 1710 in Colyton.

Later, Vatican R, Italy **15.570** (Eng to Africa 1730-1800) was 44444 at 1748 in Woodhall Spa; Channel Africa via Meyerton **15.240** (Eng to W.Africa 1800-1830) 44333 at 1805 in Bridgwater; RNB Brazil **15.265** (Port, Eng, Ger to Eur 1630-2020) 24312 at 1839 in Newry; R.Nederlands via Bonaire, Ned.Antilles **15.315** (Eng to Africa 1830-2025) 33233 at 1855 in Stalbridge; Israel R, Jerusalem **15.640** (Eng to Africa 1900-1925) SIO433 at 1900 in Co.Fermanagh; Israel R, Jerusalem **15.650** (Eng to W.Eur, M.America 1900-1925) 44444 at 1900 in Galashiels; Voice of Indonesia, Jakarta **15.150** (Eng to Eur, Africa 2000-2100) 44444 at 2000 in Scalloway; HCJB Quito, Ecuador **15.115** (Eng to Eur 1900-2200) SIO544 at 2141 by **Martin Cowin** in Kirkby Stephen; R.Taipei Int via WYFR **15.600** (Eng to Eur 2200-2300) 44333 at 2200 in Morden; RCI via Sackville **15.305** (Eng to USA, Caribbean 2300-0000) 34443 at 2325 in Kilkeel.

The broadcasters now using the **13MHz (22m)** band include DW via Sines? **13.790** (Eng to W.Africa 0600-0650), rated 54444 at 0636 in Norwich; R.Australia via Shepparton **13.605** (Eng to Pacific areas 0000-0800), received at 0730 in St.Mary's, IoS; R.Austria Int via Moosbrunn **13.730** (Eng to Eur 0730-0800) rated SIO444 at 0742 by **Francis Hearne** in N.Bristol; SRI via Sottens? **13.685** (Eng, It, Ger, Fr to Australasia 0830-1030) 45544 at 0830 in Dudley; R.Austria Int via Moosbrunn **13.730** (Eng to Eur 1230-1300) 55455 at 1230 in Newry; ISBS Reykjavik **13.860** (Ic [u.s.b.+ p.c] to Eur 1215-1300) SIO233 at 1233 in Woking; R.Sweden via Horby **13.740** (Eng to Asia, Pacific 1330-1400) 33333 at 1330 in Truro; R.Prague via Litomysl **13.580** (Fr to W.Africa 1430-1457) 44444 at 1430 in Freshwater Bay; UAER, Dubai **13.630** (Eng to Eur 1600-1640) 43553 at 1631 in Bridgwater; Vatican R, Italy **13.765** (Eng to Africa 1730-1800) 44444 at 1745 in Woodhall Spa; R.Ukraine Int, Kiev **13.590** (Various [WS]) 45534 at 1800 in Colyton; DW via Wertachtal **13.780** (Ger to S.Eur 0600-2000) 54454 at 1820 in Liverpool; WHRI South Bend, USA **13.760** (Eng to E.USA, Eur 1500-2100) 54444 at 1954 in Plymouth; RCI via Sackville **13.650** (Eng, Fr to Eur, Africa 2000-2200) 44443 at 2007 in Oxted; R.Havana Cuba **13.605** (Eng [u.s.b.] to Eur 2030-2130) 33333 at 2030 in Storrington; R.Havana Cuba **13.715** (Eng to Eur 2030-2130) 33222 at 2030 in Appleby & 54554 at 2030 in Allentown, USA; RCI via Sackville **13.670** (Eng to Eur, Africa 2000-2130) 45444 at 2110 in E.Bristol; Christian Science SWB via WSHB Cyprus Creek, USA **13.770** (Eng to Eur, W.Africa 2000-0000) 44444 at 2320 in Kilkeel.

In the **11MHz (25m)** band R.New Zealand's broadcast to Pacific areas on **11.905** (Eng 0459-0758) has been reaching the UK. In E.Bristol it rated 23222 at 0705. Also heard during the morning were HCJB Quito **11.960** (Eng to Eur 0700-0900) - a potent 44444 at 0700 in Dudley; VOA via Philippines **12.010** (Chin to E.Asia 0900-1100) SIO111 at 0923 in Macclesfield; R.Prague, Czech Rep **11.640** (Eng to Eur 1030-1057) 44444 at 1030 in Morden; R.Korea Int via Sackville, Canada **11.715** (Eng to S.America 1030-1100) 42244 at 1030 in Morpeth; REE via Noblejas **12.035** (Sp to Eur 0700-1700) 55555 at 1112 in Plymouth.

During the afternoon the Voice of Vietnam, Hanoi **12.020** (Eng to F.East 1330-1400) was 21211 at 1330 in Truro; RCI via Skelton, UK **11.935** (Eng to Eur 1330-1400) 34333 at 1349 in Freshwater Bay, IoW; R.Jordan via Al Karanah **11.690** (Eng to W.Eur, E.USA 1100-1730) 55533 at 1350 in Herstmonceux; Voice of Russia **11.655** (WS) 44444 at 1520 in Woodhall Spa; R.Australia via Shepparton **11.660** (Eng to Asia 1330-1700) 42233 at 1530 in Liverpool; Israel R, Jerusalem **11.605** (Eng to C.Eur 1545-1600) 44444 at 1545 in Appleby; R.Pakistan, Islamabad **11.570** (Eng to M.East 1600-1630) heard at 1615 in St.Mary's, IoS; BSKSA via Riyadh **11.715** (Ar to M.East, N.Africa, W.Eur 1700-1800) SIO323 at 1702 in Woking.

Later, R.Kuwait via Kabd **11.990** (Eng to Eur, N.America 1800-2100) was 45554 at 1810 in Wallsend; BBC via Skelton & Woofferton, UK **12.095** (Eng to Eur, N/W.Africa 0400-2000) 54554 at 1810 in W.Mauritius; Israel R, Jerusalem **11.585** (Heb [Home Sce relay] to W.Eur, N.America 1800-0300) 45534 at 1820 in Colyton; China R.Int

LOCAL RADIO CHART

Freq (kHz)	Station	ILR BBC	e.m.r.p (kW)	Listener
558	Spectrum, London	I	0.80	C,J,K
585	R.Solway	B	2.00	A
603	Cheltenham R.	I	0.10	A,C,G,J,K,M
603	Capital G,Litt'brne	I	0.10	J,K
630	R.Bedfordshire(3CR)	B	0.20	A,C,D,G,J,K
630	R.Cornwall	B	2.00	A,J,K,M,N
657	R.Clwyd	B	2.00	A,J,K,L
657	R.Cornwall	B	0.50	A,D,J,K,M
666	Gemini AM, Exeter	I	0.34	H,J,K,M
666	R.York	B	0.80	A,C,F*,H,J
729	BBC Essex	B	0.20	J,K
738	Hereford/Worcester	B	0.037	A,C,D,H,J,K
756	R.Cumbria	B	1.00	A,J
756	R.Maldwyn, Powys	I	0.63	C,E,I*,J,K
765	BBC Essex	B	0.50	A,D,J,K
774	R.Kent	B	0.70	D,J,K
774	R.Leeds	B	0.50	A,C,F
774	Cl.Gold 774, Glos	I	0.14	E,J,K,M
792	Cl.Gold 792,Bedford	I	0.27	J,K
792	R.Foyle	B	1.00	A,L
801	R.Devon & Dorset	B	2.00	A,E,G,H,J,K,M
828	Cl.Gold 828, Luton	I	0.20	E,G,J
828	Magic 828, Leeds	I	0.12	C,F
828	Asian Netwk Sedgley	B	0.20	C
828	2CR CG, Bournemouth	I	0.27	K,M
828	Townland R, Ulster	I	0.80	A,L
837	R.Cumbria/Furness	B	1.50	A
837	Asian Netwk Leics	B	0.45	A,C,D,E,J,K
855	R.Devon & Dorset	B	1.00	A,K
855	R.Lancashire	B	1.50	A,C
855	R.Norfolk, Postwick	B	1.50	D,H,J
855	Sunshine 855,Ludlow	I	0.15	G,E,H,J,M
873	R.Norfolk, W.Lynn	B	0.30	C,D,H,J,K
936	Brunel CG, W.Wilts	I	0.18	E,J,K,M
936	Yks Dales R, Howes	I	1.00	A,J
945	Cl.Gold GEM, Derby	I	0.20	A,C,J
945	S.Coast R, Bexhill	I	0.75	J,K
954	Gemini AM, Torquay	I	0.32	J,K,M
954	Cl.Gold 954, H'ford	I	0.16	C,E,J
963	Asian Sd,Manchester	I	0.80	A,C
963	Liberty R, Hackney	I	1.00	G,J,K
972	Liberty R, Southall	I	1.00	G,J
990	R.Devon & Dorset	B	1.00	A,H,J,K,M
990	Big Easy Magic AM	I	0.25	C,F*,J
990	WABC, Wolverhampton	I	0.09	C,E,H,J
999	C.Gold GEM Nott'ham	I	0.25	C,J
999	Red Rose 9-99 P'stn	I	0.80	A,C
999	R.Solent	B	1.00	H,J,K
999	Valleys R, Aberdare	I	0.300	J,M
1017	WABC, Shrewsbury	I	0.70	A,C,H,I*,J,M*
1026	R.Cambridgeshire	B	0.50	J
1026	Downtown, Belfast	I	1.70	A,L
1026	R.Jersey	B	1.00	J,K,M
1035	RTL Country 1035	I	1.00	C*,I*,J,K
1035	R.Sheffield	B	1.00	A,C
1035	N.Sound 2, Aberdeen	I	0.78	A,J*
1116	R.Derby	B	1.20	A,C,J
1116	R.Guernsey	B	0.50	H,J,K,M
1116	Valleys R,Ebbw Vale	I	0.50	E,G,M
1152	LBC 1E AM	I	23.50	J,K
1152	Pic'ly 1E,Manch'r	I	1.50	A,C
1152	PlymSnd AM,Plymouth	I	0.32	J
1152	Xtra-AM, Birmingham	I	3.00	E
1161	R.Bedfordshire(3CR)	B	0.10	J
1161	Brunel CG, Swindon	I	0.16	A,E,J,K
1161	Southern Counties R	B	1.00	J,K
1170	GNR, Stockton	I	0.32	A
1170	SCR, Portsmouth	I	0.50	J,K
1170	Signal 2,Stoke-on-T	I	0.20	C
1170	Swansea Snd,Swansea	I	0.58	A,E,M
1170	1170AM,High Wycombe	I	0.25	J
1242	Capital G,Maidstone	I	0.32	J
1242	IoW Radio, Wootton	I	0.50	G,K
1251	Amber SGR,Bury StEd	I	0.76	A,J
1260	Brunel CG, Bristol	I	1.60	M
1260	Marcher G, Wrexham	I	0.64	C,I*
1260	SabrasSnd,Leicester	I	0.29	C
1260	R.York	B	0.50	A
1296	Radio XL,Birmingham	I	5.00	A,C,G,H*,I*,J,K
1305	Big Easy Magic AM	I	0.15	A,C
1305	Premier via ?	I	0.50	J,K
1305	Touch AM, Newport	I	0.20	E,K
1323	S.Coast R,Southwick	I	0.50	J,K
1323	SomersetSnd,Bristol	B	0.63	A,C,E
1332	Premier, Battersea	I	1.00	J,K
1332	Cl.Gold 1332,Pt'bo	I	0.60	A,C
1332	Wiltshire Sound	B	0.30	K
1359	The Breeze,Chelms'd	I	0.28	J
1359	R.Solent	B	0.85	J,K
1359	Touch AM, Cardiff	I	0.20	E,M
1368	Southern Counties R	B	0.50	H*,J,K
1368	Wiltshire Sound	B	0.10	E,K
1377	Asian Sd, Rochdale	I	0.10	C,H*
1413	R.Gloucester via ?	B	?	G
1413	R.Gloucester,B'kley	B	?	B
1413	R.Gloucester,Bo'ton	B	?	B
1413	Premier via ?	I	0.50	J,K
1413	Yks Dales R,Skipton	I	0.10	A
1431	The Breeze,Southend	I	0.35	J,K
1431	Cl.Gold, Reading	I	0.14	J,K
1449	R.Peterboro/Cambs	B	0.15	A,K*
1458	R.Cumbria	B	0.50	A
1458	R.Devon & Dorset	B	2.00	A,K,M
1458	1458 Lite AM Manch'	I	5.00	C
1458	Sunrise, London	I	50.00	C*,J,K
1458	Asian Netwk Langley	B	5.00	I*
1476	CountySnd,Guildford	I	0.50	A,J,K
1485	Cl.Gold, Newbury	I	1.00	G,J
1485	R.Humberside (Hull)	B	1.00	F*
1485	R.Merseyside	B	1.20	A,C,H*,K,L
1485	Southern Counties R	B	1.00	J,K
1503	R.Stoke-on-Trent	B	1.00	A,C,I*,J,K
1521	R.E1 Craigavon,NI	I	0.50	A,L
1521	Fame E1, Reigate	I	0.64	I*,J,K
1530	R.Essex	B	0.15	J,K
1530	Cl.Gold W.Yorks	I	0.74	A,C
1530	Cl.Gold Worcester	I	0.52	J,K
1548	R.Bristol	B	5.00	K,M
1548	Capital G, London	I	97.50	J,K
1548	Magic 1548 Liverp'l	I	4.40	A,C,I*,L
1548	Forth AM, Edinburgh	I	2.20	I*
1557	R.Lancashire	B	0.25	A,C
1557	Mellow, Clacton	I	0.125	J
1557	Cl.Gold 1557,N.hant	I	0.76	J
1557	S.Coast R, So'ton	I	0.50	J,K
1584	KCBC, Kettering	I	0.04	J
1584	London Turkish R	I	0.20	J,K
1584	R.Nottingham	B	1.00	H,J
1584	R.Shropshire	B	0.50	A,J,K
1602	R.Kent	B	0.25	J,K

Note: Entries marked * were logged during darkness. All other entries were logged during daylight or at dawn/dusk.

Listeners:-

(A) Robert Connolly, Kilkeel.
(B) Bernard Curtis, Stalbridge.
(C) Martin Dale, Stockport.
(D) John Eaton, Woking.
(E) Francis Hearne, N.Bristol.
(F) Francis Hearne, while in York.
(G) Simon Hockenhull, E.Bristol.
(H) Sheila Hughes, Morden.
(I) Stephen & Michelle Jones, Oswestry.
(J) Brian Keyte, Bookham.
(K) George Millmore, Wootton, IoW.
(L) Tom Smyth, Co.Fermanagh.
(M) David Stevenson, Swansea.
(N) Tom Winzor, Plymouth.

via ? **11.840** (Eng to Eur, N.Africa 1900-1955) 22432 at 1900 in Galashiels; Voice of Vietnam, Hanoi **12.020** (Eng to Eur 1900-1930) SIO434 at 1900 in Co.Fermanagh; R.Bulgaria, Sofia **11.720** (Eng to Eur 1900-2000) 54544 at 1950 in Bridgwater; RCI via Sackville **11.690** (Eng to Eur, Africa 2000-2130) 43443 at 2006 in Oxted; AIR via Bangalore **11.620** (Eng, Hi to Eur 1745-2230) 44344 at 2105 in Newry; R.Gaulba, Porto Alegre, Brazil **11.785** (Port 0800-0400) 44433 at 2109 in Guildford; R.Budapest, Hungary **11.700** (Eng to ? 2100-2130) 11111 at 2126 by **Martin Dale** in Stockport; R.Prague, Czech Rep **11.600** (Eng to N.America 2230-2257) 42232 at 2235 in Norwich; BBC via Kranji, Singapore **11.955** (Eng to S.Asia 2200-0000) 32332 at 2305 in Kilkeel.

R.New Zealand's broadcast to Pacific areas in the **9MHz (31m)** band has also been reaching the UK. Their transmission on **9.795** (Eng 0759-1207) rated 22222 at 0802 in Truro. Also received during the morning were HCJB Quito, Ecuador **9.745** (Eng to N.America 0000-0700), rated 42244 at 0604 in Morpeth; R.Prague via Litomysl **9.505** (Eng to Eur 0700-0727) 54444 at 0710 in Norwich; R.Vlaanderen Int, Belgium **9.940** (Eng to Australia 0730-0755) SIO444 at 0730 in Co.Fermanagh; R.Nederlands via Bonaire, Ned.Antilles **9.720** (Eng to Pacific 0730-0925) SIO444 at 0809 in N.Bristol; ORTM Bamako, Mali **9.635** (Fr, Ar? to W.Africa 0758-1757) 25542 at 0825 in Wallsend; Christian Science SWB via WSHB Cypress Creek, USA **9.845** (Eng to Eur 0800-0900) 33333 at 0840 in Stalbridge; SRI via Sottens? **9.885** (Eng, It, Ger, Fr to Australasia 0830-1030) 24232 at 0931 in Oxted; R.Vlaanderen Int, Belgium **9.925** (Eng to Eur, M.East 1030-1055) 44243 at 1030 in Newry; R.Nederlands via Wertachtal **9.860** (Eng to Eur 1030-1225) 55555 at 1150 in Herstmonceux.

During the evening the Voice of Vietnam, Hanoi **9.840** (Eng to Eur 1800-1830) was 32342 at 1815 in Bridgwater; Africa No.1, Gabon **9.580** (Fr to C.Africa 0500-2300) heard at 1900 in St.Mary's, IoS; Israel R, Jerusalem **9.435** (Eng to Eur, N.America 1900-1930) 43344 at 1930 in Liverpool; R.Australia via Shepparton **9.500** (Eng to Asia, Pacific 1430-2200) 43333 at 1930 in Appleby; R.Bulgaria, Sofia **9.700** (Eng to Eur

MEDIUM WAVE CHART

Freq (kHz)	Station	Country	Power (kW)	Listener
520	Hof-Saale (BR)	Germany	0.2	K
531	Ain Beida	Algeria	600/300	G*,K*
531	Torshavn	Faeroe Is.	100	F
531	Berg	Germany	20	A*,E*,G*,H*,K*
531	RNE5 via ?	Spain	?	H
531	Beromunster	Switzerland	500	A*,H,L
540	Wavre	Belgium	150/50	A,D*,E*,G*,H,J*,K*,L
540	Sidi Bennour	Morocco	600	A*
549	Les Trembles	Algeria	600	A*,D*,E*,H*,K*
549	Thurnau (DLF)	Germany	200	A*,D*,H,K*,L
558	Espoo	Finland	100	A*,E*
558	RNE5 via ?	Spain	?	A*,H*,K*
567	Tullamore(RTE1)	Ireland (S)	500	A,B,C,D,E*,F,H,J,K*,L,N
567	RNE5 via ?	Spain	?	A*
576	Muhlacker(SDR)	Germany	500	A*,E*,G*,H*,L
576	Riga	Latvia	500	H*
576	Barcelona(RNE5)	Spain	50	A*,H*,K*
585	Paris(FIP)	France	8	H,L
585	Madrid(RNE1)	Spain	200	A*,E*,G*,H*,K*
585	Gafsa	Tunisia	350	H*
585	Dumfries(BBCScot)	UK	2	G*
594	Frankfurt(HR)	Germany	1000/400	A*,E*,G*,H*,L
594	Muge	Portugal	100	A*,G*,H*
603	Lyon	France	300	K*
603	Sevilla(RNE5)	Spain	50	A*,G*,K*
603	Newcastle(BBC)	UK	2	A*,F,G*,J
612	Athlone(RTE2)	Ireland (S)	100	A,D,E*,F,H,J,K,L
612	RNE1 via ?	Spain	10	A*,H*,K*
621	Wavre	Belgium	80	A,D,H,L
621	RNE1 via ?	Spain	10	A*,E*,G*,K*
621	Barcelona(OCR)	Spain	50	E*,H*
630	Dannenberg(NDR)	Germany	100	A*
630	Vigra	Norway	100	A*,E*,G*
630	Tunis-Djedeida	Tunisia	600	A*,H*
639	Praha(Liblice)	Czech	1500	A*,G*,H*
639	RNE1 via ?	Spain	?	A*,E*,G*,H*,L
648	RNE1 via ?	Spain	10	A*,G*,K*
648	Orfordness(BBC)	UK	500	A,E*,F,H,J,L
657	Neubrandenburg(NDR)	Germany	250	H*
657	Madrid(RNE5)	Spain	20	A*,G*,H*,K*
657	Wrexham(BBCWales)	UK	2	A,F,L
666	MesskirchRohrd(SWF)	Germany	150	A*,E*,G*,H*
666	Sitkunai(R.Vilnius)	Lithuania	500	G*
666	Lisboa	Portugal	135	A*,G*
666	Barcelona(SER)	Spain	50	A*
675	Lopic(R10 Gold)	Holland	120	A,C,D,E*,G*,H,L
684	Sevilla(RNE1)	Spain	500	A*,E*,G*,H*
684	Avala(Beograd-1)	Yugoslavia	2000	A*,H*
693	Tortosa(RNE1)	Spain	2	A*,G*
693	Droitwich(BBC5)	UK	150	A,E*,H,K,L
693	Enniskillen(BBC5)	UK	1	J
702	Flensburg(NDR)	Germany	5	A*,G*
702	Monte Carlo	Monaco	40	L
702	Zamora(RNE1)	Spain	10	A*
711	Rennes 1	France	300	A*,C,D,G*,H,K*,L
711	Laayoune	Morocco	600	H*
711	Murcia(COPE)	Spain	5	A*
720	Norte	Portugal	100	A*,G*
720	Lots Rd,Ldn(BBC4)	UK	0.5	A,F,H,J,K,L
729	Cork(RTE1)	Ireland (S)	10	A,F,G*,H,J
729	RNE1 via ?	Spain	?	A*,G*,H
738	Paris	France	4	D,H
738	Barcelona(RNE1)	Spain	500	A*,E*,G*,H*
747	Las Palmas	Gran Canaria	20	A*
747	Flevo(Hilv2)	Holland	400	A,E*,G*,H,L
756	Braunschweig(DLF)	Germany	800/200	A*,E*,G*,K
756	Bilbao(EI)	Spain	5	A*,E*
756	Redruth(BBC)	UK	2	F,G*,H,J,K
765	Sottens	Switzerland	500	A*,G*,H*
774	Enniskillen(BBC)	Ireland (N)	1	G*,J
774	RNE1 via ?	Spain	?	A*,E*,G*,H*
774	Plymouth(BBC)	UK	1	K
783	Leipzig(MDR)	Germany	100	A*,E*,G*,H*
783	Miramar(R.Porto)	Portugal	100	A*,H*
792	Limoges	France	300	A*,G*,H,K
792	Lingen(NDR)	Germany	5	G*
792	Sevilla(SER)	Spain	20	A*,H*,K*
792	Londonderry(BBC)	UK	1	J
801	Munchen-Ismaning	Germany	300	A*,E*,G*
801	RNE1 via ?	Spain	?	A*,H*
810	Volgograd	Russia	150	H*
810	Madrid(SER)	Spain	20	A*,G*,H*
810	Westerglen(BBCScot)	UK	100	A,E*,F,H*,J,K*
819	Batra	Egypt	450	H*
819	Toulouse	France	50	G*
819	Warsaw	Poland	300	A*,H*
819	S.Sebastian(EI)	Spain	5	E*
828	Hannover(NDR)	Germany	100/5	A*
828	Rotterdam	Holland	20	G*
828	Barcelona(SER)	Spain	50	A*
837	Nancy	France	200	A*,G*,J*
837	COPE via ?	Spain	?	A*,E*,G*,H*,K
846	Rome	Italy	540	A*,E*,H*
855	Berlin	Germany	100	A*,G*
855	RNE1 via ?	Spain	?	A*,G*,H*,K*
864	Santah	Egypt	500	H*
864	Paris	France	300	A*,C,H,L
864	Socuellamos(RNE1)	Spain	2	H*
873	Frankfurt(AFN)	Germany	150	E*,G*,H*
873	Zaragoza(SER)	Spain	20	A*,G*
873	Enniskillen(R.UI)	UK	1	G*
882	COPE via ?	Spain	?	A*,G*,H*
882	Washford(BBCWales)	UK	100	A,E*,F,G*,H,J,K,L,N
891	Algiers	Algeria	600/300	A*,E*,H*
891	Huisberg	Netherlands	20	G*,H*
900	Brno(CRo2)	Czech Rep	25	G*
900	Milan	Italy	600	A*,E*
900	COPE via ?	Spain	?	G*
909	B'mans Pk(BBC5)	UK	140	E*,H,J,L
909	Clevedon(BBC5)	UK	50	K
909	M'side Edge(BBC5)	UK	200	A
918	Domzale	Slovenia	600/100	A*,H*
918	Madrid(R.Int)	Spain	20	A*,K*
927	Wolvertem	Belgium	300	A,E*,G*,H,K*,L
936	Bremen	Germany	100	A*,E*,G*,H*
945	Toulouse	France	300	A*,L
954	Brno (CRo2)	Czech Rep.	200	A*,H*
954	Madrid(CI)	Spain	20	A*,E*,G*,L
963	Pori	Finland	600	E*,G*,H*
963	Tir Chonaill	Ireland (S)	10	H*,J*,K*
972	Hamburg(NDR)	Germany	300	A*,E*,G*,H*,K
981	Alger	Algeria	600/300	A*,H*,L
990	Berlin	Germany	300	A*,E*,G*,H*
990	R.Bilbao(SER)	Spain	10	A*,H*,L
990	Redmoss(BBC)	UK	1	G*
990	Tywyn(BBC)	UK	1	F,J,K*
999	Schwerin (RIAS)	Germany	20	G*,K
999	Madrid(COPE)	Spain	50	A*,L*
1008	SER via ?	Canaries/Spain	?	A*
1008	Flevo(Hilv-5)	Holland	400	A,H,K,L
1017	Rheinsender(SWF)	Germany	600	A*,G*,H*,K*
1017	RNE5 via ?	Spain	?	H*
1026	SER via ?	Spain	?	A*
1035	Tallinn	Estonia	500	H*
1035	Lisbon(Prog3)	Portugal	120	A*,G*,H*,K*
1044	Dresden(MDR)	Germany	20	A*,G*,K*
1044	S.Sebastian(SER)	Spain	10	A*,H*,L*
1053	Zarogoza(COPE)	Spain	10	A*,G*,K*
1053	Talk R.UK via ?	UK	?	A,E*,H,K,L*
1062	Kalundborg	Denmark	250	A*,G*,H*
1062	R.Uno via ?	Italy	?	H*
1071	R.France via ?	France	?	A*,G*
1071	Brest	France	20	H*
1071	Bilbao(EI)	Spain	5	A*,G*
1071	Talk Radio UK via ?	UK	?	A,L*
1080	Katowice	Poland	1500	A*
1080	SER via ?	Spain	?	A*,H*,L*
1089	Talk Radio UK via ?	UK	?	A,E*,H,K,L*
1098	Nitra(Jarok)	Slovakia	1500	A*,G*,H*,L*
1098	RNE5 via ?	Spain	?	A*,H*
1107	AFN via ?	Germany	10	A*,G*
1107	RNE5 via ?	Spain	?	A*
1107	Talk R.UK via ?	UK	?	A*,H,K*,L
1107	Fareham(Talk)	UK	1	C
1125	La Louviere	Belgium	20	A*,G*,H*
1125	RNE5 via ?	Spain	?	H*
1125	Llandrindod Wells	UK	1	F,G*,K
1134	Murmansk & Saransk	Russia	75 & 30	E*
1134	COPE via ?	Spain	2	A*,H*
1134	Zadar(Croatian R)	Yugoslavia	600/1200	A*,G*,H*
1143	AFN via ?	Germany	1	G*
1143	COPE via ?	Spain	2	A*,H*
1152	RNE5 via ?	Spain	10	A*
1161	Strasbourg(Flnt)	France	200	A*
1179	SER via ?	Spain	?	A*
1179	Solvesborg	Sweden	600	A,G*,H*,L,M*
1188	Kuurne	Belgium	5	G*,H*,L
1188	Reichenbach(MDR)	Germany	5	A*
1197	Munich(VOA)	Germany	300	E*,G*
1197	Virgin via ?	UK	?	A,C,E*,H,K*,L
1206	Wroclaw	Poland	200	A*
1215	Virgin via ?	UK	?	A,E*,H,J,K,L
1224	Lelystad	Holland	50	A*,G*,L
1224	COPE via ?	Spain	?	A*
1233	Liege	Belgium	5	A*,G*
1233	Virgin via ?	UK	?	A,C,L
1242	Marseille	France	150	G*
1242	Virgin via ?	UK	?	A,E*,L
1251	Marcali	Hungary	500	A*,G*
1251	Huisberg	Netherlands	10	A*,G*
1260	SER via ?	Spain	?	K*
1260	Guildford (V)	UK	0.5	J
1269	Neumunster(DLF)	Germany	600	A,G*,H*,K,L*
1269	COPE via ?	Spain	?	A*
1278	Dublin/Cork(RTE2)	Ireland (S)	10	A,C,F,G*,H*,J,K,L
1287	RFE via ?	Czech Rep	400	H*
1287	Lerida(SER)	Spain	10	H*,L*
1296	Valencia(COPE)	Spain	10	A*,E*,G*,K*,L*
1296	Orfordness(BBC)	UK	500	G*,L
1305	Rzeszow	Poland	100	A*,G*
1305	RNE5 via ?	Spain	?	H*
1314	Kvitsoy	Norway	1200	A,D*,E*,G*,H*,L
1323	W'brunn (V.Russia)	Germany	1000/150	A*,G*,I,L
1332	Bome	Italy	300	G*,H*
1341	Lisnagarvey(BBC)	Ireland (N)	100	A,D*,E*,F,H*,J,K,L
1341	Tarrasa(SER)	Spain	2	H*,L*
1359	Madrid(RNE)	Spain	600	A*,E*,K*
1368	Foxdale(Manx R)	I.O.M.	20	A,D*,F*,H,J,M*
1377	Lille	France	300	H,K
1386	Bolshakovo	Russia	2500	H*,L*
1395	Fllake	Albania	1000	L*
1395	TWR via Fllake	Albania	500	G*
1395	Lopic	Netherlands	120/40	D*,E*,G*,H,K*
1404	Brest	France	20	G*,H,L*
1413	RNE5 via ?	Spain	?	G*,K*
1422	Heusweiler(DLF)	Germany	1200/600	A,E*,G*,H*,L*
1431	Kopani	Ukraine	500	G*
1440	Marnach(RTL)	Luxembourg	1200	A,G*,H,J,K,L*
1449	Redmoss(BBC)	UK	2	C*
1467	Monte Carlo(TWR)	Monaco	1000/400	D*,G*,H*,K*
1476	Wien-Bisamberg	Austria	600	L*
1485	SER via ?	Spain	?	A*,D*,L*
1494	Clermont-Ferrand	France	20	A*,H
1494	St.Petersburg	Russia	1000	G*,H*,L*
1503	Stargard	Poland	300	A*,G*
1503	RNE5 via ?	Spain	?	L*
1512	Wolvertem	Belgium	300	A,D*,G*,H,I*,K*,L*
1521	Kosice(Cizatice)	Slovakia	600	A*,H*
1521	Duba	Saudi Arabia	2000	L*
1530	Vatican R	Italy	150/450	D*,G*,H*,L*
1539	Mainflingen(ERF)	Germany	350(700)	A*,G*,H*,K
1548	?(VOA)	Kuwait	600	F*
1557	Nice	France	300	J
1566	Sarnen	Switzerland	300	A*
1575	Genova	Italy	50	L*
1575	SER via ?	Spain	5	H*,K*
1584	SER via ?	Spain	2	H*
1593	Holzkirchen(VOA)	Germany	150	G*,H*,L*
1602	SER via ?	Spain	?	H*,K*
1602	Vitoria(EI)	Spain	10	E*,H*,K*
1602	R.Beograd	Yugoslavia	1	K*
1611	Vatican R	Italy	15	L*

Note: Entries marked * were logged during darkness. All other entries were logged during daylight or at dawn/dusk.

Listeners:-

(A) Martin Dale, Stockport.
(B) Francis Hearne, while in York.
(C) Simon Hockenhull, E.Bristol.
(D) Sheila Hughes, Morden.
(E) Stephen & Michelle Jones, Oswestry.
(F) Brian Keyte, Gt.Bookham.
(G) Eddie McKeown, Newry.
(H) George Millmore, Wootton IoW.
(I) Clare Pinder, while in Appleby.
(J) Tom Smyth, Co.Fermanagh
(K) David Stevenson, Swansea.
(L) Ernie Strong, Ramsey, Cambs.
(M) Thomas Williams, Truro.
(N) Tom Winzor, Plymouth.

TROPICAL BANDS CHART

Freq (MHz)	Station	Country	UTC	DXer
3.200	TWR Manzini	Swaziland	1730	D
3.210	REE via Costa Rica	Costa Rica	0148	E,R
3.220	R.Kara, Lome	Togo	2200	A
3.240	TWR Shona	Swaziland	1830	D,J
3.255	BBC via Meyerton	S.Africa	2013	D,E,K,N,O,P
3.270	SWABC 1, Namibia	S.W.Africa	1849	A,E,K,P
3.287	R.Malagasy	Madagascar	0300	D,S
3.290	Namibian BC,Windhoek	S.W.Africa	0421	A,P
3.300	R.Cultural	Guatemala	0441	E,O
3.306	ZBC Prog 2	Zimbabwe	1801	D,K,P
3.316	SLBS Goderich	Sierra Leone	1826	K,O
3.320	SABC (RSG) Meyerton	S.Africa	1900	A,D,E,O,P
3.345	AIR Jaipur	India	1610	L
3.365	GBC R-2	Ghana	1918	A,K,N,O,P
3.365	AIR Delhi	India	1732	L,P
3.380	NBC Blantyre	Malawi	1907	K,P
3.390	BBC via Meyerton	S.Africa	1730	D
3.915	BBC via Kranji	Singapore	2155	A,F,J,O,Q,R
3.955	BBC via Skelton	England	0550	H,J
3.955	Nexus, Milan	Italy	2000	J
3.960	Xinjiang PBS, Urumqi	China	2330	A,H
3.965	RFI Paris	France	2105	H,J
3.970	R.Korea via Skelton	England	2107	J,R
3.975	R.Budapest	Hungary	1930	I,J,M
3.985	Nexus, Milan	Italy	1905	H,I,J,N,R
3.985	China R via SRI	Switzerland	2200	J,Q
3.985	SRI Beromunster	Switzerland	1930	M
3.995	DW via Julich	Germany	2004	A,J,R
4.005	Vatican R.	Italy	1943	I,R
4.500	Xinjiang BS, Urumqi	China	2320	A
4.735	Xinjiang, Urumqi	China	0100	A
4.754	R.Maranhao	Brazil	0238	E
4.755	R.Educ CP Grande	Brazil	2355	A,P
4.760	Yunnan PBS,Kunming	China	2340	A
4.760	AIR Port Blair	India	1540	L,P
4.765	R.Integracao	Brazil	0308	E
4.770	FRCN Kaduna	Nigeria	2016	A,E,H,J,K,N,O,P,R
4.775	AIR Imphal	India	1505	D
4.777	R.Gabon, Libreville	Gabon	2029	A,J,K,N,O,P,R
4.783	RTM Bamako	Mali	2027	A,C,E,J,K,N,O,P,R
4.790	Azad Kashmir R.	Pakistan	1600	L,P
4.800	AIR Hyderabad	India	1545	L
4.800	LNBS Maseru	Lesotho	2037	D,J
4.815	R.diff TV Burkina	Ouagadougou	1917	A,B,J,K,O
4.820	R.Botswana, Gaberone	Botswana	2030	E,I,J,K,O,P,R
4.820	Xizang, Lhasa	Tibet	2340	A
4.822	R.Mauritanie	Mauritius	2129	O
4.828	ZBC R-4	Zimbabwe	1929	K,O,P,R
4.830	R.Tachira	Venezuela	0254	A,C,E,J
4.832	R.Reloj	Costa Rica	0452	E,P
4.835	R.Tezulutlan, Coban	Guatemala	0315	E
4.835	RTM Bamako	Mali	1927	A,F,J,K,O
4.840	AIR Bombay	India	0121	R
4.845	RTM Kuala Lumpur	Malaysia	1830	P
4.845	ORTM Nouakchott	Mauritania	2220	A,J,R
4.850	R.Yaounde	Cameroon	2029	A,I,J,K,O,P
4.850	AIR Kohima	India	1655	P,R
4.860	AIR Delhi	India	1926	E,K,L,P,R
4.865	PBS Lanzhou	China	2235	A,L
4.870	R.Cotonou	Benin	1925	A,J,K,O,P,R
4.885	R.Clube do Para	Brazil	0256	A,J
4.885	KBC East Sce Nairobi	Kenya	1925	K,P
4.890	RFI Paris	via Gabon	0404	E,J,P
4.890	R.Port Moresby	New Guinea	2014	K
4.900	SLBC Colombo	Sri Lanka	2340	P
4.915	R.Anhanguera	Brazil	0000	O,P
4.915	GBC-1, Accra	Ghana	1922	A,E,F,H,J,K,O,P
4.915	KBC Cent Sce Nairobi	Kenya	1817	K
4.920	R.Quito, Quito	Ecuador	0444	E,O,P
4.920	AIR Chennai	India	0108	R
4.925	R.Difusora, Taubate	Brazil	0010	A
4.935	R.Capixaba, Vitoria	Brazil	0500	P
4.935	KBC Gen Sce Nairobi	Kenya	1852	D,E,J,K,P,R
4.940	AIR Guwahati	India	0106	R
4.945	R.Illimani, La Paz	Bolivia	2340	A
4.950	AIR Srinagar	India	1650	F,P
4.950	VOA via Sao Tome	Sao Tome	2023	G,K,M,P,R
4.960	VOA via Sao Tome	Sao Tome	0302	J
4.960	Hanoi 2	Vietnam	1925	K
4.965	Christian Voice	Zambia	1824	D,K,P
4.975	R.Uganda, Kampala	Uganda	1852	E,H,J,K,P,R
4.980	Ecos del Torbes	Venezuela	2112	A,C,K,R
4.985	R.Brazil Central	Brazil	2355	A,P,R
4.990	R.Ancash, Huaraz	Peru	0447	E
5.005	R.Nacional, Bata	Eq.Guinea	1923	K,P
5.005	R.Nepal, Kathmandu	Nepal	2143	D,J,P
5.009	R.TV Malagasy	Madagascar	1430	D
5.011	R.Zimbabwe (R-2)	Zimbabwe	1530	S
5.020	La V du Sahel,Niamey	Niger	2031	K,O,P
5.025	R.Parakou	Benin	2005	A,E,J,R
5.025	R.Rebelde, Habana	Cuba	0615	A,E,H,O,P
5.025	R.Pakistan, Quetta	Pakistan	0057	D,R
5.025	R.Uganda, Kampala	Uganda	1920	K,P
5.030	AWR Latin America	Costa Rica	0235	E,P,R
5.030	RTM Kuching	Sarawak	2012	K
5.035	R.Educacao Rural	Brazil	2350	A
5.035	R.Bangui	C.Africa	2048	K
5.045	R.Cultura do Para	Brazil	2142	O
5.047	R.Togo, Lome	Togo	2025	A,J,K,O,P
5.050	R.Tanzania	Tanzania	1805	D,K,P
5.055	RFO Cayenne(Matoury)	French Guiana	0502	A,O,P
5.060	PBS Xinjiang, Urumqi	China	0016	H,P,R
5.075	Caracol Bogata	Colombia	0500	A,H,O,P,R
5.100	R.Liberia, Totota	Liberia	2048	H,K,O,P,R

DXers:-

(A) Robert Connolly, Kilkeel.
(B) John Eaton, Woking.
(C) David Edwardson, Wallsend.
(D) Bill Griffith, while in W.Mauritius.
(E) David Hall, Morpeth.
(F) Simon Hockenhull, E.Bristol.
(G) Robert Hughes, Liverpool.
(H) Sheila Hughes, Morden.
(I) Rhoderick Illman, Oxted.
(J) Eddie McKeown, Newry.
(K) Fred Pallant, Storrington.
(L) John Parry, Lamaca, Cyprus.
(M) Clare Pinder, while in Appleby.
(N) Vic Prier, Colyton.
(O) Richard Reynolds, Guildford.
(P) John Slater, Scalloway.
(Q) Tom Smyth, Co.Fermanagh.
(R) Ernie Strong, Ramsey, Cambs.
(S) Mahendra Vaghjee, Rose Hill, Mauritius.

1900-2000) 54444 at 1958 in Plymouth; VOIRI Tehran, Iran **9.022** (Eng to Eur 1930-2030) 45534 at 2000 in Colyton; Voice of Greece, Athens **9.425** (Gr to Eur 1800?-2050) 34444 at 2042 in Stockport; BBC via Skelton, UK **9.410** (Eng to Eur, N/C.Africa 0300-0830, 1130-2230) 54444 at 2044 in Kirkby Stephen; R.Ukraine Int, Kiev **9.550** (Eng to Eur 2100-2200) 44344 at 2100 in Woodhall Spa; R.Romania Int, Bucharest **9.690** (Eng to Eur 2100-2156) 34433 at 2100 in Galashiels.

Later, WEWN Birmingham, USA **9.975** (Eng to Eur 2200-0000) was 34333 at 2200 in Morden; AIR via Aligarh? **9.950** (Hi, Eng 1745-2230) 54323 at 2226 in Woking; VOA via Thailand **9.705** (Eng to S.Asia 2200-0000) 32322 at 2325 in Kilkeel; RCI via Sackville **9.755** (Eng [CBC progs] to USA, Caribbean 2200-0300) 35434 at 2350 in E.Bristol.

Logged in the **7MHz (41m)** band during the morning were VOA via Woofferton, UK **7.170** (Eng to Eur, N.Africa 0400-0700), rated SIO322 at 0600 in Co.Fermanagh; WJCR Upton, USA **7.490** (Eng to E.USA 24hrs) 24322 at 0610 in Galashiels; R.Japan via Woofferton, UK **7.230** (Jap, Eng to E.Eur 0500-0700) 44444 at 0655 in Herstmonceux; R.Prague, Czech Rep **7.345** (Eng to Eur 0700-0727) SIO333 at 0722 in N.Bristol; R.Vlaanderen Int, Belgium **7.290** (Eng to Eur, Australia, S.America 0730-0755) 33233 at 0735 in Appleby; RFPI Costa Rica **7.385** (Eng 24hrs) 35433 at 0807 in Guildford; KTBN via Salt Lake City **7.510** (Eng to N.America 0000-1600) 32222 at 0835 in Stalbridge; AWR via Forli, Italy **7.230** (Eng to Eur 0900-1000) 54444 at 0944 in Plymouth; Sudwestfunk via Rohrdorf **7.265** (Ger to Eur 24hrs) SIO333 at 1155 in Woking.

After mid-day, R.Vlaanderen Int, Belgium **7.290** (Eng to Eur 1630-1655) was 45444 at 1634 in Bridgwater; R.Nederlands via Madagascar **7.120** (Eng to S/E/W.Africa 1730-2025) 44434 at 1750 in Colyton; R.Thailand via Udon Thani **7.210** (Eng to Eur 1900-1958) 32322 at 1903 in Morpeth; VOA via Selebi-Phikwe, Botswana **7.415** (Eng to Africa 1800-2230) 33232 at 2000 in Liverpool; BBC via Skelton **7.325** (Eng to Eur 2000-2230) 55555 at 2004 in Kirkby Stephen; Voice of Nigeria, Ikorodu **7.255** (Eng to W.Africa 1900-2100) 33453 at 2015 in Storrington; RCI via Skelton, UK **7.235** (Eng to Eur, Africa 2000-2130) 45444 at 2025 in Woodhall Spa; VOIRI Tehran **7.260** (Eng to Eur, M.East 1930-2028) 22222 at 2028 in Truro; Voice of Greece, Athens **7.450** (Gr to Eur 1800-2050) 33333 at 2042 in Stockport; R.Ukraine Int, Kiev **7.180** (Eng to Eur 2100-2200) 44333 at 2100 in Morden; Voice of Turkey, Ankara **7.190** (Eng to Eur, USA 2200-2300) 55334 at 2210 in E.Bristol; R.Corp of Singapore **7.170** (Tam to Asia 2100-1800) 33322 at 2245 in Kilkeel.

Many of the broadcasts in the **6MHz (49m)** band are intended for European listeners. Some come from R.Japan via Skelton, UK **5.975** (Eng 0600-0700) 55555 at 0655 in Herstmonceux; R.Austria Int via Moosbrunn **6.155** (Eng 0730-0800) SIO444 at 0733 in N.Bristol; WEWN Birmingham, USA **5.825** (Eng 0000-1000, also to USA) 55555 at 0805 in NE.Bedford; SRI via Lenk **6.165** (Eng, Fr, Ger, It 0400-1930) 34443 at 1000 in Dudley; R.Nederlands via Julich **6.045** (Eng 1030-1225) 33333 at 1118 in Plymouth; Deutschland R. Berlin **6.005** (Ger to Eur 24hrs) 54323 at 1350 in Woking; R.Prague, Czech Rep. **5.930** (Eng 1700-1727, also to M.East, N.Africa) SIO444 at 1700 in Co.Fermanagh; R.Slovakia Int **6.055** (Eng 1830-1857) 44444 at 1830 in Scalloway; Bayerischer Rundfunk, Germany **6.085** (Ger 24hrs) 54444 at 1945 in Liverpool; Polish R, Warsaw **6.095** (Eng 1930-2030) 43333 at 1950 in Morden; R.Finland via Pori **6.135** (Eng 2000-2030) 54444 at 2000 in Galashiels; RCI via Skelton, UK **5.995** (Fr, Eng 1900-2100, also to M.East, N.Africa) 44444 at 2005 in Oxted; China R.Int via Russia ? **6.950** (Ger, Eng 1900-2157) 54444 at 2110 in Norwich; R.Pyongyang, Korea **6.575** (Eng 2100-2155) heard at 2130 in St.Mary's, IoS; R.Sweden via Horby **6.065** (Eng 2130-2158) 33333 at 2140 in Truro; R.Austria Int via Moosbrunn **5.945** (Eng 2100-2130) 44444 at 2145 in Stockport.

LIST OF EQUIPMENT USED LM&S $May, #June, *July'98

\# Tim Allison, Middlesborough: Lowe HF-225 + r.w.
$* Darren Beasley, Bridgwater: Yaesu FRG-100 + a.t.u. + 15m wire.
$* Vera Brindley, Woodhall Spa: Sangean ATS-803A + r.w.
Gordon Cleator, Douglas, IoM: Tatung portable.
$* Robert Connolly, Kilkeel: JRC NRD-525 + Datong AD370 or Sangean ATS-803A.
#* Martin Cowin, Kirkby Stephen: Hitachi TRK-5854E + built-in whip.
$* Bernard Curtis, Stalbridge: Grundig Satellit-2100 or Grundig Ocean Boy + r.w.
#* Martin Dale, Stockport: Grundig Satellit 3000 or Sangean ATS-803A + a.t.u. + r.w.
Jaques d'Avignon, while at camp site in Ontario, Canada: Three receivers + 350m long Beverage antenna.
$* John Eaton, Woking: JRC NRD-345 + Datong AD270 or a.t.u. + r.w.
$* David Edwardson, Wallsend: Trio R-600 + 2.5m X 2.5m fixed loop or 22m long trap dipole.
$* Stan Evans, Herstmonceux: Kenwood R-2000 + Balun + 11m wire in loft.
* Martin Goodey, St.Mary's, Isles of Scilly: AOR AR7030 + 25m wire.
$ Bill Griffith, W.London: JRC NRD-535 + 25m wire.
#* Bill Griffith, while in abroad: Sony ICF-SW55 + 5m wire.
$* Gerald Guest, Dudley: Roberts RC818 + r.w.
$* David Hall, Morpeth: AOR AR7030 + 13m wire.
$* Tony Hall, Freshwater Bay, IoW: Yaesu FRG-7 + 13m wire or RF845
$ Ted Harris, Manchester: Roberts RC818.
$* Francis Hearne, N.Bristol: Sharp WQT370 + r.w.
* Francis Hearne, while in York: Yoko portable
$# Brian Heath, Stapleton: JRC NRD-535 + Balun + 23m wire.
$* Simon Hockenhull, E.Bristol: Roberts R817 or ITT Colt, Bush TR130, HMV 1124 (circa 1952) + r.w.
$* Robert Hughes, Liverpool: Lowe HF-225 Europa + PR-150 or AOR AR7030 + 15m indoor wire or Drake R8E + RF Systems MTA on roof.
$* Sheila Hughes, Morden: Sony ICF-7600DS + loop or Panasonic DR48 + 15m invert.L.
$# Rhoderick Illman, Oxted: Kenwood R-5000 + r.w. or AN-1, Sony ICF-7600DS.
* Stephen & Michelle Jones, Oswestry: A small m.w. radio.
$#* Brian Keyte, Bookham: AOR AR7030 + loop or r.w.
$#* Ross Lockley, Galashiels: Realistic DX-300 + a.t.u. + 40m wire or Sangean ATS-803A.
#* Eddie McKeown, Newry: Tatung TMR 7602.
$#* George Millmore, Wootton, IoW: Sangean ATS-803A + loop or Racal RA17L + v.l.f. converter + loop.
$#* Fred Pallant, Storrington: Trio R-2000 + Howes CTU8 a.t.u. + r.w.
$#* John Parry, Lamaca, Cyprus: Realistic DX-394 + r.w.
$#* Clair Pinder, while in Appleby: JRC NRD-525 + a.t.u. + r.w.
$# Peter Pollard, Rugby: Sony ICF-2001D + r.w.
$#* Vic Prier, Colyton: Racal RA17L or RCA AR88LF + a.t.u. + 20m horizontal loop in loft or Redifon R551N + active vertical in loft or Sanyo RP9880 portable.
$#* Philip Rambaut, Macclesfield: Int.Marine Radio R.700M + r.w.
#* Richard Reynolds, Guildford: Sangean ATS-803A + 60m band dipole or a.t.u. + r.w. or loop in loft.
#* Harry Richards, Barton-on-Humber: Grundig Satellit 700 + AD270 or r.w. or Grundig Yacht Boy 400 or Matsui MR4099.
$ Alan Roberts, Quebec, Canada: Lowe HF-225 + 11m vertical dipole.
$#* Chris Shorten, Norwich: Matsui MR4099 + 10m wire.
$#* John Slater, Scalloway, Shetland: Lowe HF-150 + a.t.u. + 20m wire.
$#* Tom Smyth, Co.Fermanagh: Sangean ATS-803A or Morphy Richards R191.
$#* David Stevenson, Swansea: Steepletone MBR-7 or Yaesu FRG-100 + r.w.
$#* Ernie Strong, Ramsey (Cambs): AKD HF3 + Watson Balun or Cirkit a.t.u. + 31m wire.
Phil Townsend, London: Lowe HF-225 + preselector + r.w. or loop.
* Mahendra Vaghjee, Mauritius: Sony 2010 + r.w.
$#* Ernest Wiles, NE.Bedford: AKD Target HF3 + a.t.u. + Windom.
$#* Thomas Williams, Truro: Gundig Yacht Boy 206 or Sharp 5454 + r.w.
$#* Tom Winzor, Plymouth: Kenwood R-1000 or Trio 9R59D or Trio 9R59DS + Miller ant.

■ ANDY CADIER, 28 ROMNEY AVENUE, FOLKSTONE, KENT CT20 3QJ

Off The Record

Over the past few months I have received many comments on the monotonous unadventurous programming offered by most British local commercial radio stations. The link between most of these sound-alike stations falls into two categories.

Firstly many of the major radio companies have shares in several stations so that the outlets they operate are as you would expect a High Street chain store to be. The second factor is hidden behind the computer systems they now use.

Gone are the turntables, cartridge machines, and tape recorders, even CD players have been relegated for use only in relative emergencies. Powerful computer systems like Selector will choose the music depending on the criteria fed into it by the programme manager.

While another computer system, the one I was introduced to, was called Enco-DAD, provides the selected music in pristine quality to an Alice Air 2000 mixing desk. This is in essence a fully automatic radio station that can run totally unattended.

News or announcements can all be digitally recorded, and as with the advertisements can be programmed automatically or may be recalled by simply touching the computer screen. For production purposes, this system is quite brilliant, no more recording and splicing tape, just the ability to save any digitally recorded material.

The audio has cut and paste facilities, like a word processor, so electronic editing can take place. If you happen to make a hash of it, a touch of a button takes you back to the original, so you can do it again. It is also possible to do instant requests, providing the listener chooses one of the 3000 songs that have been captured in the computers hard drive system.

The commercial advantages of this system are colossal, with substantial savings on staff and record library space. The disadvantages appear to be due to the restricted selection of music and the inability of presenters to build a show around their personality and area of expertise.

Because the system is so time orientated, many aspects of which are outside the presenters control, the DJ is required to literally fill gaps of a various predetermined lengths with his or her voice. Most stations choose their staff from persons qualified in Media Studies, the ability to entertain is not a quality that is sought after. It is no small wonder why any degree of spontaneous fun and entertainment has been lost.

Commercial stations are also prevented from experimenting with their output due to their promise of performance contained in their licence conditions. Basically they are obliged to stick exactly to the format they put in their licence application, even if another local station comes on air playing exactly the same music.

I am old enough to remember the 'good old days' (cue: violin solo!) when all radio was scripted, the broadcasters knew best...or thought they did. It took Radio Caroline and the pirates of the 60s to sink the Palm Court Orchestra.

In 1984 Laser 558, a ship-board pirate, caused near panic among commercial station operators in the south-east who watched their listeners deserting them in droves for the new happy buccaneer anchored in the North Sea.

BBC Broadcast Caroline!

Merlin Communications, formerly the BBC's External Services Transmission Department, celebrated their first anniversary as an independent company. A special broadcast took place on 28 March 98 to mark this occasion, Merlin Network One as it was called ran for 24 hours.

This programme went out on satellite and short wave. The Radio Caroline segment of the broadcast was headed by *The Global Johnny Walker Breakfast Show* 0600-0900UTC. Merlin Communications provided an overall two megawatts of terrestrial power to create this first ever global interactive audio festival.

Merlin are now running an experimental service for six months on Wednesday evenings commencing at 1700UTC with Radio Caroline's *Johnny Reece Show* on 15.200MHz. Further details and a full list of frequencies can be obtained directly from **Merlin Communications, Bush House, PO Box 76, The Strand, London WC2 4PH** or E-mail: **mno@cix.co.uk** or try their web site at: **www.merlincommunications.com**

Your Reports

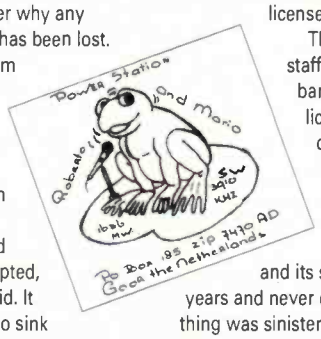
Fred Collin, E-mailing from Japan via our Editorial Offices, comments on last quarters mention of Radio Mario. He apparently heard them while on holiday in south of France on 3.910MHz. He says he was impressed with the quality of the transmission received on his Sony ICF-SW55 but found the programme content uninteresting. Fred received a QSL letter and some stickers depicting a frog in front of a microphone, yes I have one too.

Paul Beckett of Madeley in Cheshire says he listens on an old Yaesu FRG-7 which he picked up for £50 and uses a temporary indoor antenna. He has received Laser Hot Hits and is awaiting their QSL that comes from Canada. He has also received an interesting QSL letter from Union Radio in Holland.

Briefly, the station operator is Jack, he started by listening to the Dutch m.w. pirates. He built his own s.w. transmitter using good old 807 valves with a separate modulator/p.a. using 4 x 813s. He says the rig is capable of 600W but usually runs at 150W.

River Pirates

It has been revealed that an experimental (RSL) radio service, based at Gravesend in Kent, was targeted by an illegal malicious radio operator who attempted to jam the local station. The pirate using the callsign 'West and North Kent Extreme Radio' broadcast foul language, threats and abuse on "The River's" licensed frequency of 107.1MHz.



This abuse was directed at the station and its staff, even suggesting the involvement of 'drug barons' being behind the station, that they had no licence and that their studios should be destroyed. The River's Managing Director, and former BBC Radio Kent presenter, Ian McGregor said "This was no ordinary pirate station, but a very deliberate attempt to block our transmissions and abuse The River and its staff. I have worked in the radio industry for ten years and never experienced anything quite like this. The whole thing was sinister and at times quite frightening".

Ian McGregor also paid tribute to the assistance given by the Radiocommunications Agency, also his station's presenters, sponsors and advertisers who remained totally supportive during these difficulties. Despite the problems, the entire team at The River will continue with their plans to campaign for a full time local radio licence for the Gravesham area.

During their 28 day restricted service licence they say they made radio history by broadcasting a private wedding live from its studio and ran a pub quiz challenge and raised almost £1,000 for a local hospice. You can contact The River c/o **Management Suite, St. George's Shopping Centre, Gravesend, Kent DA11 0TA**.

Britain's Better Music

I seem to recall the original Britain's Better Music Station operating on 1358kHz during November 1966, prior to this, BBMS had been known as Radio Essex. Programmes came from an old naval artillery platform in the middle of the Thames estuary, which was originally called His Majesty's Fort Knock John.

The first short wave broadcasts from the new land-based hobby pirate BBMS took place on 17 November 1975. There was a break in their activities between 1982 and 1987 but since then has been active in both the 48 and 42 metre bands.

The studio appears little changed over the years and still boasts Garrard SP25 turntables, however, a new CD player has been added to keep up with technology. The stations maximum output is said to be about 25W, recent broadcasts are relayed by Ozone Radio International giving a clear and well modulated signal.

The 42 metre band frequency of 7.400MHz is to be dropped in favour of 75 metres on Saturday nights and 48 metres on Sunday mornings. Principal presenters are Pam and Gary Stevens, Lee Allen and Jonny West with his programme in German. BBMS does QSL via their mail drop at: **55d Chester Road, London N19 5DF**, please include return postage.

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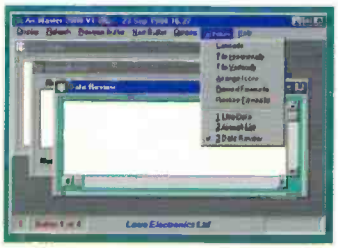

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AIRMASTER 2000 is Lowe's ACARS Windows based decoding system. Hardware and software is supplied consisting of a small demodulator built into a 25 way D-type plug and the decoding software. The plug connects and derives its power from a COM port on the PC. The software is installed on the PC hard disk drive. The receiver or scanner is connected to the other demodulator connection.

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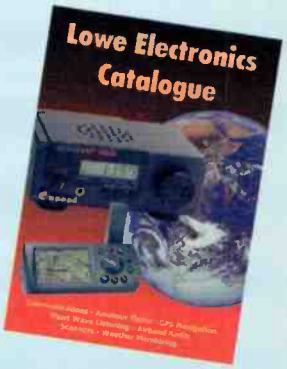

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AM I disappointed?

The JRC NRD-545 Receiver

After a bureaucracy induced delay we've finally got the new NRD-545 on the 'guru's' test bench. Here JW passes on the benefit of his numerous decades of experience with h.f. receivers to all those prospective buyers and casual observers alike.

As some of you will have noted from my comments in earlier reviews, I had been looking forward with great anticipation to the arrival of the NRD-545 at my test lab. Having been associated with JRC equipment for over 20 years, I have a high regard for the inherent quality which comes with the JRC badge, and I have seldom been disappointed. The first receiver which we brought into the UK was the NRD-505 back in the mid 70s, and this was one of the first general coverage receivers to offer phase locked loop technology allowing full h.f. coverage with excellent stability and resettability (in other words if you went off to some other frequency, you could return to the original and expect to be there with no loss of accuracy). What a receiver!

Built to last forever, and I'm sure that every one we sold is still giving perfect service today. Not that we sold many, the price at the time was staggering, about half the price of a house, and if you added the matching transmitter and power supply it would have cost more than a house. In this context, today's JRC prices are incredibly low, and the NRD-545 outstandingly so. Incidentally, Bob Ellis is lying when he says that I am old enough to remember the first JRC equipment from 1915. As a collector I only wish I had some examples from then to go with my 1915 "Transmitter W/T No. 1" from the Soho Wireless Works. Sorry - reminiscing again.

Landmark for the Millennium?

Why was I waiting so eagerly for the NRD-545? because I had the pleasure of reviewing the baby

"I frankly wanted the NRD-545 to be another 'landmark' receiver for the turn of the millennium."

brother NRD-345, and I could sense that JRC would produce something outstanding in the '545. But most of all I was waiting to see what facilities JRC would provide by their inclusion of Digital Signal Processing (d.s.p.) to handle all the variable bandwidth/passband shift/notch filtering and so on which had up to now been provided by clever use of conventional i.f. filters (the R-820 for example). I had investigated other d.s.p. systems in receivers such as the Watkins-Johnson HF 1000 and the amateur radio transceivers from the 'Big Three', and just whilst providing excellent results by measurement, the end audible result was often slightly unsatisfactory because of low level "Urgly-Gurgly" noises as the adaptive filtering tried to get to grips with signals close to the noise floor of the receiver and strange effects when tuning in towards a strong modulated signal. I hoped that the NRD-545 would prove to be better in these respects and make everyone else sit up and take notice. I frankly wanted the NRD-545 to be another 'landmark' receiver for the turn of the millennium.

Looks The Part

It certainly looks the part and seemed almost familiar when I first put it on the bench. Styling clues were already evident in the NRD-345 and the JST 145/245 transceivers, and the distinctive sweep of the front panel line across the top of the main tuning knob is very attractive. Interesting to note that Icom have used the identical styling feature in their latest transceivers, as have Yaesu in their FT-920. Mercedes have of course been doing it for years with their car dashboards. The control layout will seem even more familiar to owners of the NRD-535, as will the display because they are virtually identical apart from the change from green/blue frequency digits on the NRD-535 to yellow on black in the '545. This makes the '545 easier to read, and I'm a bit amused that I had previously stated my preference to be black digits on a yellow background only to see JRC reverse it to such good effect. Comparison of the r.f. performance figures of the two receivers reveals that they are quoted as identical, with even the same brochure wording to describe the dynamic range/3rd order intercept point and the JRC tuneable front-end filtering system - a good example perhaps of the "if it ain't broke, don't fix it" approach, the r.f. performance of the '535 being very good.

Another previously stated JRC design aim, that of not using dual concentric controls, is continued in the '545 except for three dual function controls (apart from the tuning knob), two of which require the presence of a '2nd function' button the keypad in place of the 'Memo' button of the '535, whilst the third had individual selection of a.g.c. time and variable bandwidth. The panel layout could hardly be bettered for operating convenience and every control seems to be exactly where you need it and all in a logical pattern. Some will argue about the vertical keypad, and my own preference is for this to be presented as a flat on the desk facility, rather like a computer mouse, but the keys operate easily provided you don't have fingernails like the bride of the vampire. I actually found it very comfortable to rest the fingers of my right hand on the top corner of the receiver and used my thumb to operate the keypad buttons - but I'm right handed and I don't know how the technique would work for someone who is naturally left handed - but at least the tuning knob is smack in the middle of the panel and convenient for any user.

Prod Left or Right

The buttons grouped around the main tuning knob (which seems perfectly weighted) start with a pair of left and right arrow keys which step the tuning in the same tuning increments as the tuning knob. If you are using the finest resolution of the tuning system and you prod the left or right button, you may be misled into thinking that nothing is happening, because there are ten tuning steps to each increment shown on the frequency display, but by use of the 'Step' button you can change the increments by factors of ten, in other words, change to 10Hz, 100Hz, 1kHz and back to 1Hz. The system does not end here, because a dig through the operating manual tells you that JRC have provided facilities to set up the receiver to your own specification, and that includes the options of 1, 5, 6.25 and 9kHz which neatly covers medium wave, short wave and CB channel steps. Very clever and very thoughtful. Having mentioned the user set-up options, I will just say that there is a list of optional settings on page 23 of the manual which should cover everything that an owner would need to customise the NRD-545, covering even obscure items such as bypassing the front-end filters, changing the RTTY shift and best of all, turning **off** the annoying 'bleep' which accompanies every key press.

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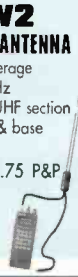

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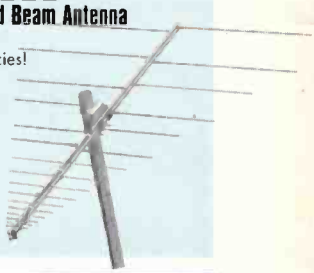

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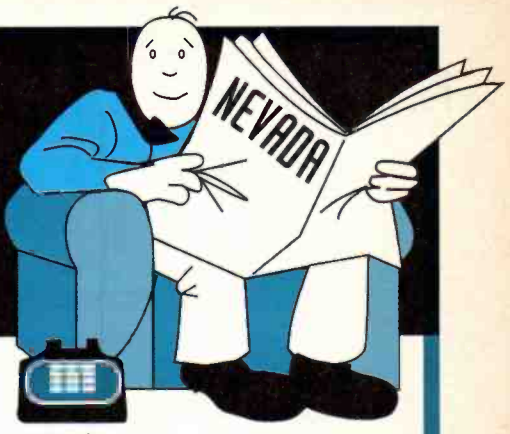

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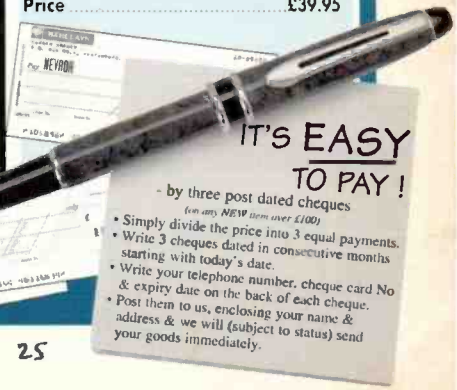

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"...the sweep rate can indeed be changed to almost anything you want, hurtling across the short wave spectrum like a tiger unleashed."

I apologise to those who like bleeps with everything, but I prefer a dignified silence. Rolls Royce don't (yet) have bleeps. Oh yes, I also like the peak-hold facility on the signal strength meter which is succinctly described as "User function 9(2)". Remember that!

Like A Tiger Unleashed

The button marked 'Sweep' looked inviting so I pressed it and entered start and stop frequencies (easy) followed by a poke at the 'Run' button. The sweep started but at such a P-E-D-E-S-T-R-I-A-N rate that I started to yawn. I thought that this couldn't be true and reading the manual was directed through a tortuous series of cross references to find that the sweep rate can indeed be changed to almost anything you want, hurtling across the short wave spectrum like a tiger unleashed. The provision of a sensitive all mode squelch system makes the sweep function very useful, and as it is running right now, I find it tempting to go and listen to each signal the receiver encounters, but the Editor is waiting for this review...*Yes, so what else did you discover Mr Wilson? - Ed.*

Other buttons around the tuning knob cater for comprehensive and easy to use scan facilities and the memory channel scrolling. There are 1000 memories available, each one storing frequency, mode, i.f. filter bandwidth, a.g.c. setting, r.f. attenuator on/off setting and tuning steps. Not as comprehensive as at least one other h.f. receiver on the market, but more than adequate. From any of these functions a simple press of the 'Freq' button restores the tuning knob as the controller (as it should be in a real receiver). Mode selection is by a horizontal row of buttons under the 'S' meter, each button having a dual toggle action selection, f.m./f.m.w. on the first, a.m./a.m.s. (synchronous a.m.) on the second, u.s.b./l.s.b. on the third and c.w./RTTY on the fourth. An interesting feature is that whatever i.f. bandwidth you chose for any particular mode is remembered by the mode selection, so you might find that switching from u.s.b. to l.s.b. calls up a different filter bandwidth. Initially disconcerting, this is a really good idea and one to be commended.

Rotary controls to the right of the main tuning knob are labelled 'AGC 'T/BWC', 'PBS', 'AF Gain' and 'Tone'. The last two are obvious, but the first two are part of what makes the NRD-545 so interesting. 'AGC T/BWC' is a rotary digital encoder which allows you to set the a.g.c. to decay time from 40ms to 5.1s, but sadly not in the a.m., synchronous a.m. or either f.m. mode, set the i.f. d.s.p. bandwidth from a surely usable 10Hz to a very respectable 9.9kHz in 10Hz or 100Hz steps with the bandwidth shown on the main display screen, but again sadly not in the synchronous a.m. mode or either f.m. mode (Why not?). Not so clearly stated is the use of this rotary control to quick step (or slow fox-trot) through the memory channels, a piece of information cunningly concealed in the fine print of the handbook. Must mention that although the display shows the i.f. bandwidth when the bandwidth control is in use, the information is not displayed if you are using the 'Wide', 'Inter' and 'Narrow' push buttons to select the default bandwidths and you have to remember to turn on the 'BWC' if you want to know what the default bandwidth are. I suppose in fact that most users would leave the 'BWC' on at all times, but it's a curious anomaly.

Returned To Normal

PBS is easily decoded as Pass Band Shift, and this enables you to effectively slide the i.f. filter across the frequency to which the receiver is tuned, thereby dropping unwanted signals and interference off the edge of the filter passband. Filter shift is a respectable ±2.3kHz in all modes except f.m. and the exact amount of shift relative to centre frequency is shown on the main display. In case your flying fingers get lost with the PBS control, there is a very positive mechanical central detent at the mid-position, at which the shift display banks out to tell you that you have returned to normal centred i.f. Nice little touch on the part of the designer.

A corresponding group of four knobs on the left hand side of the tuning control are for r.f. gain, which operated as an a.g.c. pedestal (see an earlier article on mine for explanation), and also incidentally shows the effect of the variable a.g.c. decay time on the 'S' meter if you whang it smartly counterclockwise and then clockwise again, the all mode squelch control, the noise blanker threshold setting, with two noise blanker time constants to play with (surely not the dear old Russian Woodpecker - hasn't anyone mentioned that it stopped pecking some years ago?) and finally the Notch control. This is a most impressively engineered notch which chops down interfering signals like a Canadian lumberjack in a redwood forest and leaves them lying on the ground. Not only that, once you have manually twiddled the notch to down the interfering signal you can select auto tracking and let the d.s.p. take care of it automatically. A delicate touch is needed initially, and sandpapering the fingertips is recommended, but once you have the hang of it, the facility is one you won't want to be without. There - I've mentioned d.s.p., which is the reason for the NRD-545's existence and also the reason for my desire to do this review.

On the face of it, d.s.p. technology should be capable of providing every possible operating feature which a receiver user could demand, at least in the i.f. selectivity department. As configured in the NRD-545, the incoming r.f. signals are first converted to a high i.f. of 70.455MHz (as in all previous JRC receivers since the NRD-505) then down to 455kHz and finally to 20.2kHz where the digital bit occurs. There seems little point in diving off into technical explanations of d.s.p. because I'm no expert and you dear reader are probably less interested in the technicalities than in how the receiver behaves in digging out signals of interest,

and that's where my experience comes into best use. On the face of it, the d.s.p. system in the NRD-545 should fulfil everyone's dream of having fully variable bandwidth, programmable for any mode, adaptive noise filtering, automatic 'seek and destroy' notch for single and multiple signals, infinitely variable passband shift in any mode, digital demodulation of all modes and so on. What a combination.

Faster Than An F-16 At Top Gun

Does it do all of this? Well the somewhat insignificant little button marked 'NR/BC' and tucked away by the 'clock' button can work miracles with noisy signals, bringing voices up from the vasty deep and making them stand out in the clear, and the 'BC' or Beat Cancel function can seek and destroy single and multiple heterodynes faster than an F-16 at Top Gun, although the manual notch takes some beating. At the end of the i.f. chain, the NRD-545 d.s.p. works well, but of course the signals arrive from the antenna at the other end of the receiver where r.f. performance is all important.

How does the '545 compare in r.f. performance to other receivers in the market place. Well, whilst its behaviour under my normal testing regime was good enough to put it into the 'A' stream, there were no areas in which it advanced much beyond the NRD-535, but of course the '535 was a good performer in the r.f. department. Using the default 'INTER' filter settings of the d.s.p. i.f., which were 2.4kHz for s.s.b. and 4.5kHz for a.m., the sensitivity came out at -123dBm on s.s.b. and -105dBm for a.m., both for 12dB SINAD. This is quite in line with current receivers but as I have explained before, I like to normalise my dynamic range testing to a sensitivity of around -117dBm so that the intercept point measurements can be directly compared, and having done that the NRD-545 delivered a +19.5dBm 3rd order intercept point and a dynamic range of 96dB on s.s.b. at 20kHz signal spacing, and using my test for 2nd order performance with input signals of 6.5MHz and 7MHz whilst measuring the product at 13.5MHz (you will recall that this is to show up any problems with strong signals from two broadcast bands producing spurious signals due to a lack of front-end preselection) I obtained a 2nd order intercept point of +82dBm and a dynamic range of 204dB. This is a good result and shows the beneficial effects of having front-end preselection, but it still ain't as good as a Collins 51S-1.

"...on s.s.b. or c.w., the NRD-545 behaves impeccably..."

The reciprocal mixing performance was good and this is a reflection of the cleanliness of the synthesised local oscillator. The figures are given in **Table 1**.

Table 1

Signal spacing (kHz)	Level of interfering signal to degrade wanted signal SINAD by 3dB (dBm)	Reciprocal mixing ratio (dB)
5	-62	69
10	-45	86
20	-40	91
50	-32	99
100	-23	108

These figures place the NRD-545 high on the totem pole, but the result at 5kHz spacing was difficult to determine because of a plethora of audio tones generated within the receiver at close signal spacing. I can only deduce that the d.s.p. system was being slightly confused by what was going on, because I have not experienced this effect on other, more traditional receivers. The

Very similar to the predecessor to this radio the NRD-535.

"Brave man that I am, I connected a real antenna (eight metres of wire) and had a twiddle round the medium wave."

measurements were taken, as in all my reviews, in the u.s.b. mode with 2.4kHz i.f. bandwidth.

Peculiar Effect

It was when I was measuring the a.m. sensitivity that I realised that something didn't sound quite right and decided to do some careful tuning around. I discovered that tuning through my a.m. test signal, modulated to a depth of 60% at 1kHz, resulted in a most peculiar effect.

The signal sounded perfectly normal when tuned spot-on, but at around 400Hz off-centre, which is still well within the nominal 4.5kHz bandwidth of the receiver, the audio became distorted. Tuning further revealed a dead spot at which the recovered audio disappeared completely, only to reappear as I carried on tuning, but with increasing distortion evident. As tuning continued and the signal fell outside the nominal filter passband, the 'S' meter continued to read at a lower level until at about 8kHz from the nominal centre frequency when it suddenly 'stepped' down and vanished. This effect was identical on each side of the nominal frequency, and was exactly the same when the test was carried out at several r.f. frequencies within the tuning range of the '545. Just in case the modulation depth was causing a problem, I repeated the test at 30% modulation but the strange effects remained.

Brave man that I am, I connected a real antenna (eight metres of wire) and had a twiddle round the medium wave. On 909kHz there was the BBC loud and clear at 30dB over S9. However, at ±400Hz off-tune, the poor old announcer sounded like he was being strangled, and after passing through the dead zone where the modulation disappeared, I found that the signal remained at S3 outside the filter passband but sounded just like s.s.b. when received on an a.m. receiver. The "monkey chatter" carried on for about 7 to 8kHz on either side from 909kHz when it vanished. The problem with this effect is that the monkey chatter overlaps into the chatter from the adjacent station and trying out the receiver on 9.5MHz there was a continuous S3 to S5 'monkey chatter' between every single short wave station (remember the 5kHz spacing on short wave), making the receiver useless for checking out weak signals.

Now I have seen comments in another review that the NRD-545 was the finest amateur receiver ever to have been in the shack, and searching the Web sites came up with other comments that on 40m it was the best amateur receiver ever tested. Well, it's a fact that on s.s.b. or c.w., the NRD-545 behaves impeccably, with no sign of the a.m. problems, but I have been taught to be careful when checking equipment and whilst it is always tempting to have a twiddle around the 80 metre amateur band, it's also essential to remember that these receivers are going to be used by keen broadcast listeners and they are not going to be happy with the a.m. on the NRD-545.

A Worthy 'landmark' In Due Course

I was sufficiently alarmed to feel that I should ask for comment on this finding so JRC were contacted regarding the problem. This all came as a great disappointment because in every other respect, the NRD-545 was performing perfectly, with the d.s.p. functions providing everything that a utility or amateur radio listener would want. The ECSS works well, as does the synchronous a.m., the styling and presentation of the receiver is just about perfect, and with the optional v.h.f. converter fitted it should be a desirable radio. It is, I have to say, close to my ideal h.f. receiver and should be a worthy 'landmark' in due course, but for the moment I'll stick to old fashioned crystal or mechanical filters for determining the i.f. bandwidth of my receivers and wait for something to be done to the a.m. department of the NRD-545. If a.m. is not your particular field of interest, then the NRD-545 is very attractive and you should take a listen to it - in fact that's the best advice for anyone - go along to your nearest supplier and take a listen. *Quel dommage*. My thanks to Richard Mclachlan at **Lowe Electronics Ltd., Chesterfield Road, Matlock Derbyshire DE4 5LE, Tel: (01629) 580800**, for suppling the review radio.

The Reponse from Japan

We put John's findings to JRC in Japan, the following is their response.

"Thank you very much for your review article in amateur radio magazine. We would like to comment against your review article as follows :

1. Distortion of AM detection
We have found that there was a problem of AM detection algorithm by DSP at the last step of its development. So, the initial several sample units have not been modified. Our mass production sets have been already modified. If you have a chance, we would like you to evaluate our mass production set again. Or, please try to replace the ROM which we shall send you.

2. Monkey chatter
The digital IF filter is normally with sharp attenuation. So, the monkey chatter might be caused occurred at outside the filter passband. It is not easy to correct this phenomenon.
Please adjust the bandwidth by BWC and tune it, and you may search even weak signal.
This NRD-545 is the model in which we JRC have our confidence. We are sure that NRD-545 will be the best selling one quite soon.

Best regards"

JRC Design Department - Japan

Please note that this reply is direct from Japan with no editing. So please, only those fluent in Japanese, need criticise the language!

So there we have it. JRC are going to send us a new ROM with the revised algorithms. Watch next month for John's findings. ***SWM***

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Comments from John Griffiths

I have to say that I'm not a fan of indoor antennas like this as earlier desk mounted antennas tended to look like a mad scientist invention. However, I was suprised by the quality of constuction of this piece of equipment and it appears to be up to the job it is designed to do. Without getting technical, the Apollo 2000 claims to be able to cover 0-1650MHz. I used it between 108-400MHz approx and was surprised by what it was able to do. It produced clean copy and there was good reproduction with very little breakthrough.

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A high performance wideband antenna offering superb performance from 25-2000MHz. Transmit range:- 6m, 2m, 70cm, 32cm & 23cm (power handling 200W). Fitted with low loss 'N' type connector. Supplied with mounting brackets.

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Comments from John Griffiths

Putting the DC-2000 up gave me a tremendous boost to all signals with the ancient AR-2000 coming alive! Signals were well received and I found that I wandered out of airband - my usual haunt - into all manner of areas that previously have been less than good here due to my location!

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Comments from John Griffiths

I mounted this on my AR-2000 and was well pleased with the results on HF. Verdict? A clear winner and well worth the reasonable outlay.

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Comments from John Griffiths

Results were able to be looked at in terms of a cheap, low cost ATU and I can report that it is certainly good! At under £50, it must be the cheapest on the market and would suit an enthusiast looking at putting an ATU on a capable scanner.

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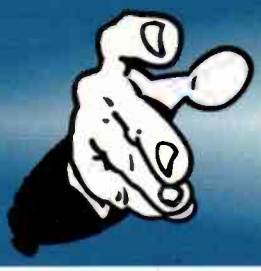

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Comments from John Griffiths

In rounding up, the intruder performed better than I expected and with little fuss in mounting and connecting up. It appears rugged enough to live out of doors and will also fit nicely on the wall - perhaps an outside wall being the ideal though I have to admit having no problems with my inside one. I found it a pleasing addition to my set-up - with cable correctly mounted and run - it should look professional and very much a part of the kit in the shack. I would suggest that this is the antenna many of us have long been looking for and therefore have no hesitation at all in saying it is definitly the business.

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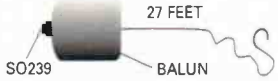

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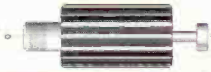

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'PRO-50

Peter Julian G7PRO tells of how he went about customising his Tandy PRO-50 scanner. His labours yielded a much improved radio.

When I saw Tandy selling the PRO-50 scanner for £49.99 in the January sales, I couldn't resist the offer. For some time I had been considering buying a simple, uncomplicated radio. With the PRO-50 I was pleasantly surprised. This type of design has a tuned front-end unlike the ultra-wideband scanning receivers which use a high first intermediate frequency and band pass filters. The sensitivity was satisfactory, especially on u.h.f. and despite the number of frequencies listed in the manual, on my set I could only find two major birdies in each of the v.h.f. bands and none in the u.h.f. band. (I class major as ones which open the squelch even without the rubber duck antenna connected.) Even these did not totally 'lock-up' the receiver when used with an external antenna.

However, to get this result on u.h.f., I must admit to changing the rubber duck antenna supplied with the set to the type used on the AR1000 with no loss of sensitivity. When using the supplied antenna there were five birdies which stopped the radio's progress during search but with the other antenna, none. Not that the Tandy antenna isn't any good, it's fine, but for some reason it does appear to resonate too easily with some of the internal signals.

The Modifications

Protection

The first internal modification I made was to fit back-to-back protection diodes across the antenna socket. As a licensed radio amateur, I didn't want to cause any damage by accidentally squirting too much r.f. into the receiver's front-end when doing various tests and experiments in the shack. It's a simple job to solder two 1N4148 diodes (as in **Fig. 1**) across the BNC socket from the centre to the earth solder tag, keeping the wires as short as possible.

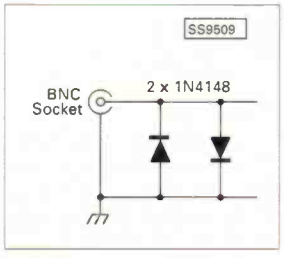


Fig. 1: First the high level r.f. protection.

Putting It On Hold

I sometimes find it useful to punch in a frequency and monitor without entering it into memory. With the PRO-50 you can enter a frequency and then in order to listen, you press one of the search buttons.

However, immediately a search button is pressed, the scanner shoots off in search mode, away from the entered frequency. In order to make it stay put, you first have to open the squelch, enter the frequency, press search and then press monitor before again closing the squelch.

To move along each frequency step manually, the squelch has to be open. When the set stops in search mode, if you then wish to stay on that channel after the transmission has stopped, the monitor button has to be pressed. This action enters the frequency into the monitor memory. I decided that a hold switch would be useful which enabled a frequency to be entered and the search button pressed without having to open the squelch or use the monitor memory. This then was my next modification.

Micro Control

The microprocessor within the PRO-50 controls both scan and squelch from the same input line. There is no apparent reason why the microprocessor has to control squelch and so I proceeded to separate the operation.

To get started the case needs removing. This is accomplished as follows. To open the case the battery should be removed and the four screws on the rear removed. The back can then be gently pulled off. Note that with the battery removed there is only about an hour before memory information is lost.

Moving on to the p.c.b.s now. First of all two tracks on the top board have to be cut, the one carrying the squelch/scan stop information to the microprocessor and the other carrying the squelch mute control from the lower digital board. No boards have to be removed from the set to do this and **Fig. 3** shows the actual tracks to cut while **Fig. 2** shows the circuit modifications and additions for this and a tape control modification.

Solder Pads

On the squelch/scan track there are two little solder pads. On my set, I cut between these pads.

MODS

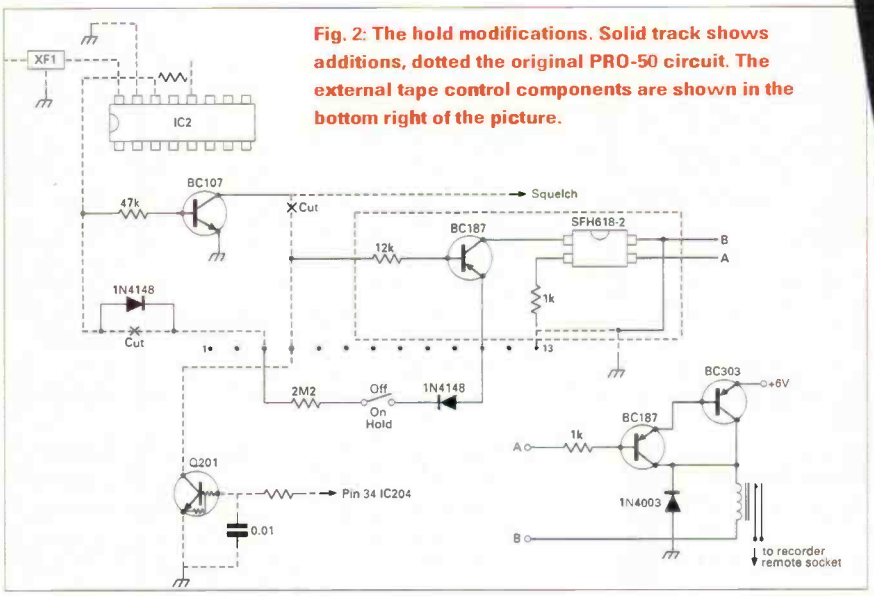


Fig. 2: The hold modifications. Solid track shows additions, dotted the original PRO-50 circuit. The external tape control components are shown in the bottom right of the picture.

From the radio side, a diode was soldered across to pin 3 of the board interconnecting plug. If you have a surface mount diode then the other pad could be used instead of pin 3. On the squelch mute control track use was also made of a tiny solder pad to anchor the collector of a small signal switching transistor. The emitter was soldered to a land on the earth track.

A 47kΩ resistor was then connected between the base of the transistor and the radio side of the diode. This allows direct control of the squelch by the scan line from the r.f. amplifier

The starting point the standard trim PRO-50.

Some signs of activity having taken place!

'PRO-50 MODS

Peter Julian Customises his Tandy PRO-50 Scanner

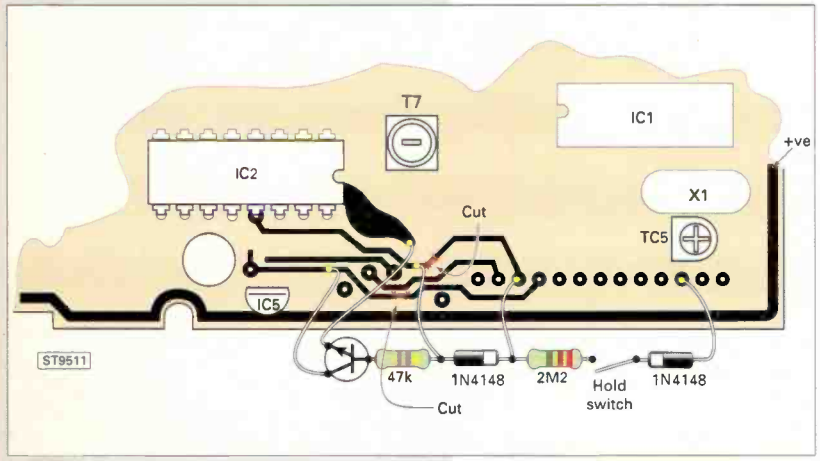


Fig. 3: The tracks to cut and where to fit the additional connections.

and demodulator integrated circuit (IC2).

Then a 2.2MΩ resistor was soldered to pin 3 and connected to a switch and another diode from the switch to pin 11 of the interconnecting plug. Now closing the switch will stop scan or search but will not open the squelch.

The solution seems to work well but does appear to have introduced a fractionally longer delay time between the end of the squelch closing and scan starting. I think this has something to do with a small time constant being added onto the scan line with the additional components.

A slightly more elaborate electronic switch with a higher impedance input than the combined single transistor and 47kΩ would probably overcome this, but in practice I didn't find it worth the extra bother. In fact, I personally find the extra delay time quite useful.

Some Suggestions

When carrying out this modification I would make the following suggestions:-

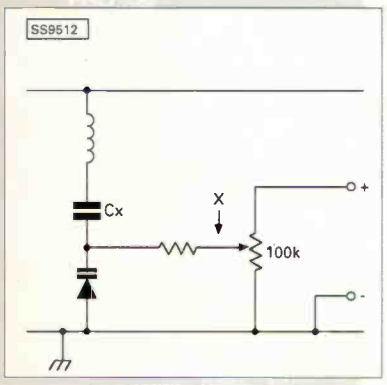
1) Use a fine tipped bit on the soldering iron.

2) Fold a piece of card over the side of the case to protect it from damage should the soldering iron accidentally touch it.

3) When drilling into the case to fit a switch, cover the spot to be drilled with Sellotape or masking tape, mark it out carefully, making sure that the hole is not too low down, i.e. there's enough clearance between the switch and the 13-pin board interconnecting array.

4) Hold the case gently but firmly in a vice with card to protect it from being scratched by the jaws and drill **slowly** using a hand drill. A rectangular slot can be easily formed from filing two holes drilled side by side. A suitable needle file should be used.

Fig.4: The set-up circuit for the notch filter.



Tape Control

The modification to the hold circuitry made redundant the PRO-50's original transistor switch (Q201) used to open and close the squelch. This seemed a bit wasteful, so I decided to use it to provide a facility to switch a tape recorder on and off. I prefer not to connect external devices directly to the scanner. So I decided that using an opto-isolator was the answer. This allows an external interface to be plugged into the scanner which through the opto-isolator will enable the interface to switch a relay.

One set of relay contacts can then be connected to the tape recorder's remote socket. The circuit of the tape control add-on is shown in **Fig. 2**. Please note that switching to hold will automatically activate the tape recorder but the system will also work in all other modes. I find that manual or monitor modes are probably the preferred method of use.

Using a 2.5mm socket is a good way of connecting the scanner to the interface. The components are not critical. Apart from the opto-isolator, all the components came from my 'junk box' and both the external interface and the opto-isolator circuit were assembled onto pieces of Veroboard. My unit features all p.n.p. type transistors in the tape control add-on.

Depending very much on the type of tape recorder being used, it might be possible to fit the relay board internally within the machine. Obviously if you are using a micro-style note taker then I guess you're left with having a trailing lead set-up.

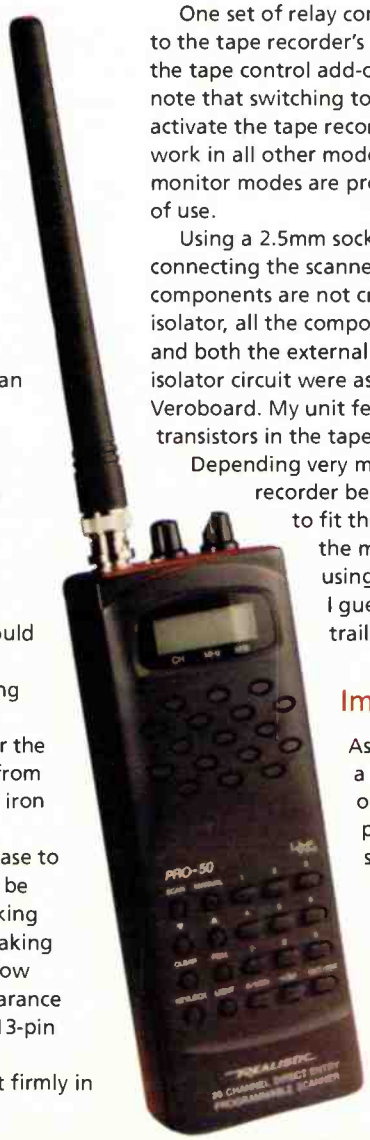


Image Problems

As might be expected with such a cheap radio, image problems on the mid-band v.h.f. proved a problem with f.m. broadcast signals breaking through quite strongly.

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"The design problem with this type of filter is choosing the right value of components so that the filter actually tracks in step with the received frequency."

their high first intermediate frequency which renders them fairly immune to image signal reception. The PRO-50 is only dual-conversion and has a first i.f. of 10.7MHz and therefore is prone on mid-band v.h.f. signals to images from 21.4MHz above and on high-band v.h.f. and u.h.f. 21.4MHz below the actual tuned frequency. Notch filters are a good way of eliminating or at least considerably reducing the problem.

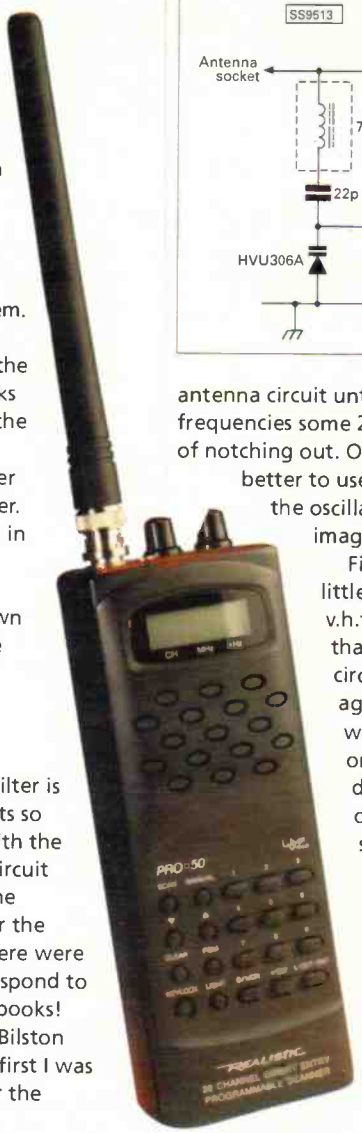
This solution is fine if the set is left monitoring one frequency, but when the radio is scanning or searching and looks at frequencies near the one to which the notch is tuned, the signals will be attenuated. My solution is a notch filter which will tune in step with the scanner.

The circuit for such a filter is shown in **Fig. 4**, here using a potentiometer to tune manually. The variable voltage produced by the scanner to tune its own front-end can also be used to tune the filter so it tracks automatically.

Correct Values

The design problem with this type of filter is choosing the right value of components so that the filter actually tracks in step with the received frequency. Reference to the circuit diagram of the PRO-50 provided me the resistor and capacitor values, but as for the inductor values and Varicap diodes, there were only part numbers which did not correspond to any numbers I could find in reference books!

However, all was not lost. Tandy at Bilston Road can provide the components. At first I was going to use the component values for the antenna circuit until I realised that these were for frequencies some 21MHz away from those in need of notching out. On reflection, I decided it would be better to use the local oscillator values since the oscillator runs 10.7MHz nearer to the image frequency.



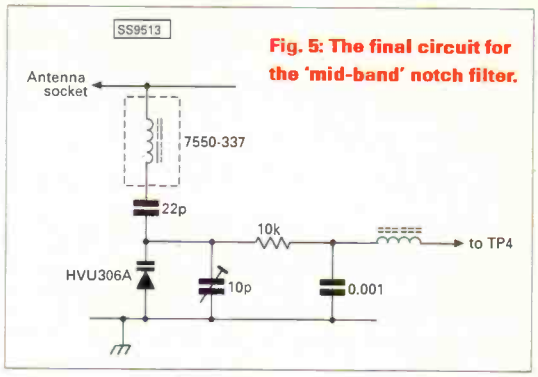
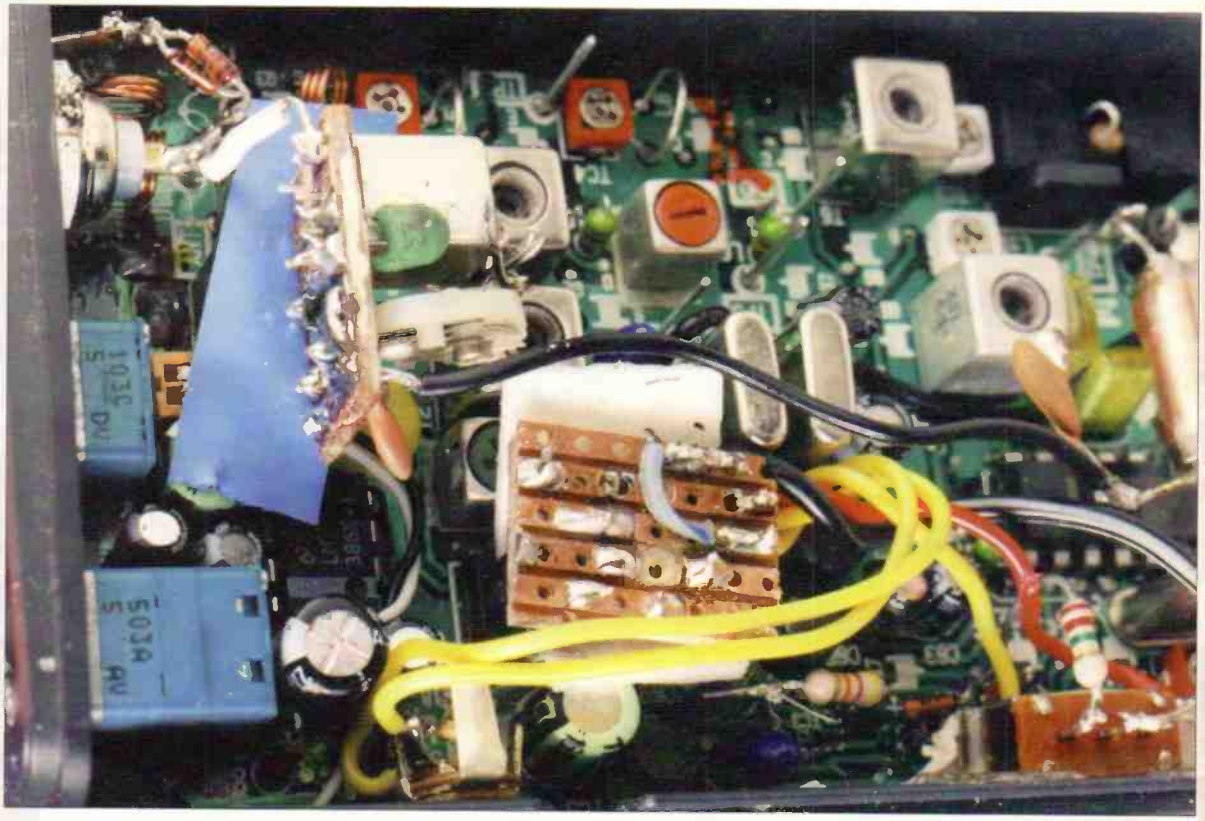
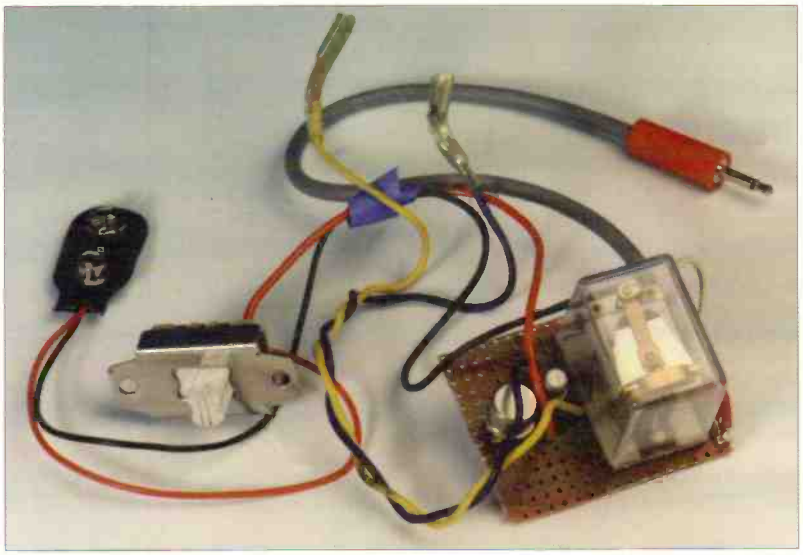


Fig. 5: The final circuit for the 'mid-band' notch filter.

Finding the value of Cx needed a little experimentation. For mid-band v.h.f. it would need to be slightly less than the value used in the oscillator circuit. The circuit was made up, again, on a tiny piece of Veroboard with all the components mounted on the top side except the Varicap diode which was soldered across on the track side. (You need a steady hand and possibly a watch maker's eye glass to do this). A short length of coaxial cable with a BNC plug on one end was connected to an antenna socket and the filter was wired across this. A temporary control for the Varicap was set up as in **Fig. 4**. An antenna and the scanner were duly connected.



Tucked in tight, the new switch and hold circuitry can be seen at the lower edge of the picture. The tuneable notch filter and back-to-back diodes can be seen on the left hand upper side. Note the insulation under each assembly.



The prototype tape control unit.

I tuned the PRO-50 to a broadcast image between 69 and 70MHz and the control voltage for that frequency was measured at test point TP4 which is located by the power socket.

The filter was then tuned using the Varicap until the signal disappeared or was degraded as much as possible and the voltage at point X noted. The tuning slug could also be adjusted slightly but the trimmer was best left mid position. If the voltage on the test set-up was much higher than that measured at TP4, then the capacitor value needed to be reduced. When the two voltage measurements were virtually the same.

Setting Up

I fitted the filter into the radio and connected the voltage control line to TP4. Input and earth leads must be kept as short as possible. A stout piece of stiff wire connecting the top of the filter to the BNC socket and another piece soldered from earth to the nearest transformer can, kept the filter firmly fixed. Final adjustments were then made to the trimmer and transformer core using images of Radio 2 and Classic FM. The easiest way to do this is enter one frequency in a memory (Radio 2 Fx - 21.4MHz), then switch-on hold (assuming that this mod has been done of course) then press manual, enter the second frequency (Classic FM Fx - 21.4MHz), press either the up or down scan button and press monitor.

Then by pressing either manual or monitor the radio can be toggled quickly between the two frequencies as adjustments are made. Tune the filter by adjusting the transformer core on the lower frequency and the trimmer on the higher one. I found that when the filter was connected to TP4, some of the birdies increased in intensity. Connecting a choke in line as close to TP4 as possible cured the problem completely.

The final circuit for the mid-band v.h.f. notch filter is shown in **Fig. 5**. In use the filter gives some effective reduction of image break through of the broadcast signals when the scanner is used with a helical or whip antenna but, if a base station antenna is used, although there is still some reduction, it is often not sufficient to allow the squelch to remain completely closed. Obviously, results will vary according to how close the scanner is to the broadcast transmitters. In areas of very high signal level, the filter on its own will be insufficient to give a lot of improvement but at the very least it should reduce the bandwidth covered by the image signal with negligible insertion loss to other signals.

Images From The Other Side

It should be possible to make a similar filter for high band v.h.f. remembering that on this band the local oscillator runs 10.7MHz below the received signal. However, for me, image breakthrough on this band was not a real problem and, anyway, inserting a second filter would probably have meant extra band switching to take the filters in and out of circuit in order to prevent unwanted interaction between them. If anyone has any further development of this modification, I'm sure *SWM* would be interested to hear from you.

Indeed we would. If you have any modifications that you have successfully carried out to your scanner or any other piece of monitoring equipment that has improved its performance, let me know. You can E-mail me or drop me a line at the Editorial Offices. We may be able to publish your mods. - Ed. SWM

"...image breakthrough on high band v.h.f. was not a real problem..."

You Will Need

Hold Switch

Resistor
47kΩ 1off
2.2MΩ 1off

Diode
1N4148 2off

Transistor
BC107 or similar n.p.n. switching transistor

Miscellaneous
Slide switch, micro miniature 2-way.

Tape Control

Resistor
1kΩ 2off
10kΩ 1off

Diode
1N4003

Transistors
BC303 1off
BC187 2off

Opto-isolator
SFH618-2 1off
(CY94 Maplin)

Miscellaneous
6V relay; 2.5mm socket; 2.5mm plug.

Other plugs and sockets as required to connect to tape recorder.

Notch Filter

Resistor
10kΩ 1off

Capacitors
22pF 1off
1nF 1off

Trimmer
10pF 1off
(WL69 Maplin)

Inductors
RFC

The following items obtained were from directly from Tandy at: **InterTAN UK Ltd., Bilston Road, Wednesbury, West Midlands, WS10 7JN**. Tel: **(01922) 433000**.

Service Manual Ref. no.
Tandy part number
HVU306A silicon Varicap diode
DI0941
7SSO-337 transformer
CO4509

The PRO-50 service manual was, at the time of writing, available from any Tandy dealer.

The Long & The Lat Of It

Godfrey Manning G4GLM

"It's easy," I said to Graham Tanner, our 'SSB Utilities' columnist, "to find the location of an air base. Just look up the latitude and longitude as stated in one of the published *Supplements*!"

He wasn't that impressed. What if there were readers who didn't know about latitude (lat) and longitude (long)? We'd confuse them. Fair point. After my crash course in this subject, you'll be able to navigate yourself anywhere in the world! Here goes.

Going Round In Circles

Before getting complicated about lat and long, let's start with the familiar, humble, circle. Actually, they are full of surprises, being the shape which maximises area while minimising circumference. A circular field contains the most grass yet needs the shortest run of fence to enclose it.

Then, the ratio of circumference to diameter (i.e. divide circumference by diameter for any circle) is always a fixed amount what we call pi. Also, we find that our number system can't write pi (unless we use up an infinite quantity of decimal places), yet pi is real enough and even comes into all sorts of radio and electronics calculations.

Enough of the magic of the circle (as distinct from Magic Circle, a club for magicians). I've described the circumference as the actual thing you draw to make a circle on paper, or the fence enclosing a circular field.

The centre of the circle is smack bang in the middle, like the bull's eye on a darts board. Any straight line that starts at the edge of the circle, goes through the centre and stops when it meets the edge opposite to where it started, is a diameter.

The centre is the point through which all diameters pass. If you start at the centre and go along half a diameter to the edge of the circle, this is called a radius.

Now, you'll need a protractor. One of those circular (or half-moon shaped) plastic things with angles marked on it, as sold in stationery shops. (I don't know why they 're called that, they're also stationary - well have you ever seen one on the move?).

The full circle type is best. Around the edge are marked 360 equally-spaced notches. Each lies, of course, at the place where one of the diameters meets the circumference.

If you draw the radius from one notch to the centre, then draw another radius from the adjacent notch (also to the centre), you get two radius lines that are so closely spaced, they're hard to tell apart. The angle between them, measured where they meet at the centre, is one degree (1°). Nothing to do with the degrees proof of JW's wine, although all this geometry could drive you to drink (or chocolate in my case!).

It takes 360° to go round a full circle. Interestingly, 90° gives the immediately-recognisable perpendicular right-angle. Half-way round a circle, then, is 180°.

Here Is The News - I Mean NESW

On ordinary maps, it's conventional that the top edge faces the North Pole. Where's that? Now you need a globe, the sort that looks like a football with a map of the world painted on it and able to spin round.

The earth really does spin and in exactly the way shown by the globes that you can be in stationary (or moving) stationers. It does it without being held up by a pair of spindles or even the mythical Mr. Atlas. But, it behaves as if those supporting spindles were there.

Look at the globe again. One spindle, the one nearest to the British Isles, is attached at the top, i.e. at the North Pole. So, the other spindle, at the bottom, near Australia, is at the South Pole.

Now back to a map. The top points to the North Pole and the bottom to the South Pole. Start with a pristine map, just off the press, and fold it in two so that it looks like the way a newspaper is folded. Open it out. Do you agree that the fold runs from top to bottom, north to south?

Now, make a fold at right-angles to the first one. Open out the map, north at the top. The second fold runs from west (over to your left) to east on the right). If a protractor is laid on the centre of the map with the northwards fold running through the 0° mark, then east would be at 90°, south at 180° and west at 270°, which is the basis of steering a compass heading. Hence, North-East-South-West, NESW, running clockwise round the protractor or map.

Go Globular

The planet earth is a sphere, like a cricket ball. Just like the ball that Wallace hit for six onto the roof of the stands, it's actually slightly flattened. I'll ignore

It takes 360° to go round a full circle. Interestingly, 90° gives the immediately-recognisable perpendicular right-angle. Half-way round a circle, then, is 180°.

NEW AR8200 *The Superior Concept*

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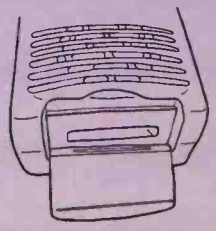
The AR8200 is a beacon representing a new approach, new features and forward thinking. This certain recipe for success builds on the popularity of the AR8000, adds technology originally developed for the award winning high performance AR5000 base receiver, ideas from listening to the needs of enthusiasts and a 'touch' of AOR design & innovative magic.

The AR8200 is a totally new design rather than simply an updated model. The all important **8.33 kHz airband channel step** is ***correctly implemented*** (eight-and-one-third, 33, 66, 00). Channel steps are provided in a menu and may be programmed in multiples of 50 Hz in any mode (i.e. 5 kHz, 12.5 kHz or even 1.25 kHz). Extensive step-adjust and frequency offset facilities are also provided (as per AR5000) to ensure tracking of the most obscure band plans, AFC is included for spot on tuning ensuring that nothing is missed. A wide frequency coverage is available from 530 kHz to 2040 MHz (no gaps) with actual minimum acceptable frequency of 100 kHz. The RF front-end is preselected around VHF to ensure the highest levels of adjacent channel rejection with software spurii cancellation. The short wave bands are converted directly to an IF of 45 MHz to remove compromise and the AR8200 is supplied with a **detachable plug in medium wave bar aerial** for localised monitoring with a negative feedback circuit employed.

The **side keypad provides four arrow keys presented as a single 'rocker'** resulting in more natural and intuitive navigation through the on-screen menus. Tuning is accomplished via a variety of controls including a side panel indented main tuning dial, arrow keys and keypad. A larger than average back lit LCD with contrast control provides operational data with the ability to add **12 character text comments** to each memory channel and search bank, a text search feature simplifies identification and recall of stored information. A high resolution signal meter and **multi-function band scope** is provided with adjustable width and **save trace functions**. The scratch resistant "military green" cabinet has a quality feel.

Flexible dynamic memory bank layout is provided (memory banks may be varied in size between 10 and 90 channels each *i.e. bank 'A' 80 channels / bank 'a' 20 channels with bank 'B' 40 channels / bank 'b' 60 channels etc).* 1,000 memories, 20 memory banks, 40 search banks, select scan list, priority and lockout facilities are included. It is also possible to edit and delete individual memories, swap, copy, move and delete whole banks including dumping all data.

Computer control is available via a metallic side mounted robust connector and optional lead, an extensive RS232 command list is supported. A software package is under development which will be made available as an internet free download over the coming months. This connector also supports clone of data between two AR8200 along with tape output, detector output, mute and AGC.



As if this was not enough, **optional internal SLOT CARDS** (which fit into the AR8200 base) extend the AR8200 capability even further: ***Memory slot card*** (increase storage to 4,000 memories, 160 search banks). ***CTCSS slot card*** squelch & search. ***Record chip slot card*** (records up to 20 seconds of audio). ***Tone eliminator slot card, Voice inverter card.***

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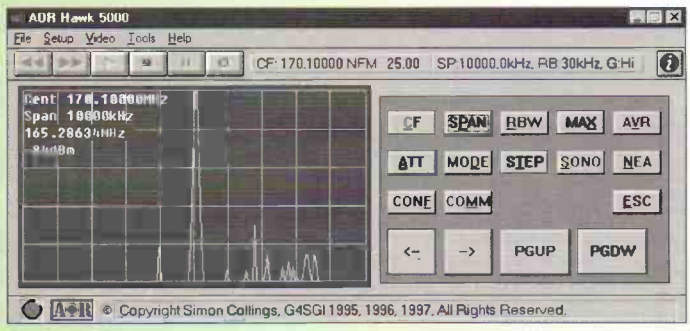

HAWK5000 is a PC Windows based software package for control of the SDU5000. A virtual display is provided with AVI recording to disk and many more features. Receivers supported by the SDU5000 will interface, this includes the AR5000, AR3000A, ICR9000, ICR8500, ICR7100 & ICR7000. ***£49***

AR3000A Evolution at its very best. Wide band all mode receiver, high performance, respected best seller. ***£699***

AR8000 wide band all mode receiver 500 kHz - 1900 MHz with alpha-tag and computer control (via CU8232). Many facilities. ***£299***

AR5000 True high performance, voted best wide band receiver by readers of the German "funk" magazine in 1997. Frequency coverage 10 kHz - 2600 MHz all mode with standard IF bandwidths of 220 kHz, 110 kHz, 30 kHz, 15 kHz, 6 kHz, 3.0 kHz. ***£1345***
The enhanced **AR5000+3** includes AFC, Synchronous AM and noise blanker. ***£1574***

AR7030 High dynamic range, short wave receiver, awarded table-top receiver of the year 1996/97 by WRTH and 5-star editor's choice by Passport to World Band Radio 1997 & 98. Supplied with mains power unit, infrared hand control & comprehensive operating manual. **£799**

AR7030 PLUS Enhanced version, fitted with narrow AM filter, optical encoder, features CPU with 400 memory channels with alpha-tag, optimised components for highest performance. **£949**

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Jaycee, Fife 01592 756962
NSC, Carlisle 01228 590011
Lowe Electronics, Matlock 01629 580800
+ others

The Long & The Lat Of It

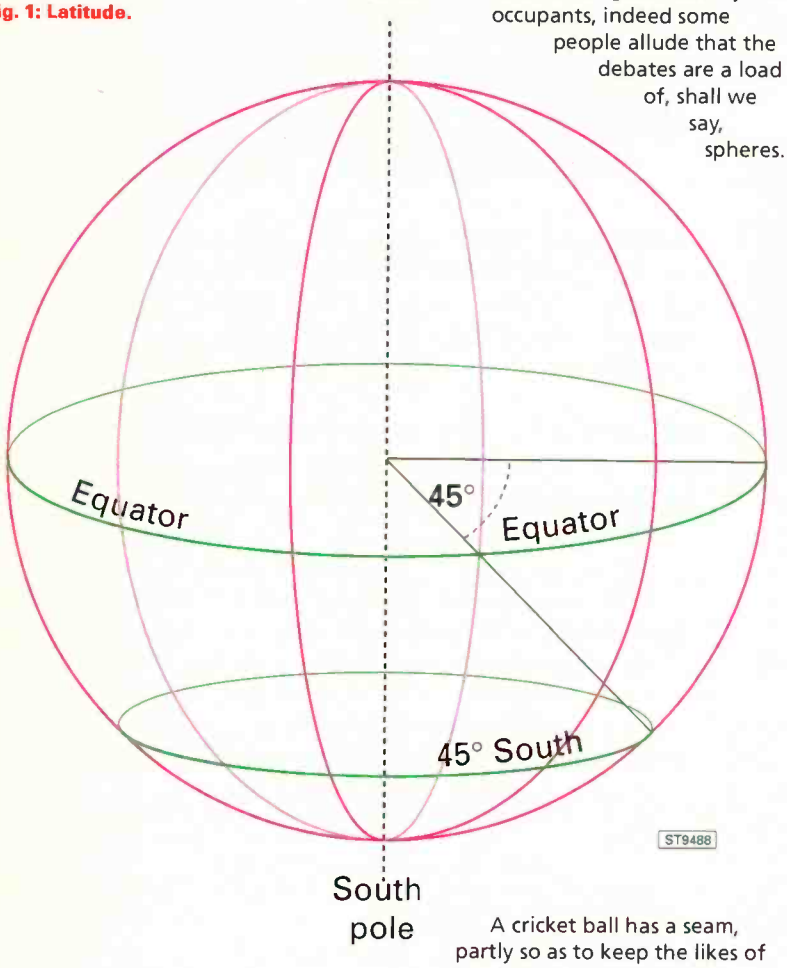
that and pretend it really is a sphere. We also call a sphere a globe, hence the name of the object you find at the stationer's

When big companies become multi-national, they say that they've become 'global'. A spherical company just doesn't sound the same.

A sphere also has a centre and of course diameters and radii. The earth's average diameter is 12742 kilometres ('average' because it's not a perfect sphere, but a flattened one). There are more magical properties, as spheres enclose the greatest volume in the smallest surface area.

If you wanted a tank of hot air, make it spherical as this gives the least chance of the heat being lost through the surface material. The Houses of Parliament are rectangular so as to allow easy escape of all the hot air generated by the occupants, indeed some people allude that the debates are a load of, shall we say, spheres.

Fig. 1: Latitude.



A cricket ball has a seam, partly so as to keep the likes of Dominc Cork in business, but more because they couldn't stitch it together any other way. Some cheap globes are made in two halves and have a seam in the same place. The earth has no such seam, but I'd like you to pretend that it has; call it the Equator.

Latitude

In **Fig. 1** I've shown our earth as if it's a glass sphere. So, you can see its centre. The axis on which it rotates, that's to say the diameter that joins the poles, is also shown.

A radius goes from the centre out to the equator and this radius line is perpendicular to the axis of rotation. Actually, you could draw any number of radii from the centre to the equator, depending on which country they emerges in at the surface. In **Fig. 1**, I've just shown one example.

The equator is an example of a line of latitude. Let's have another one, also in Fig. 1. Another radius is at 45° to the first one. The idea is to make a mark on the surface of the globe where this radius ends. Then, draw all possible radial lines at 45° to the first set of lines.

This is just an imaginary exercise, there are lots of them. An infinite number, in fact. They'd all lie on the surface of a cone.

Anyway, where they pass through the surface of the sphere, they mark out another line of latitude. It's parallel to the equator, 45° from it and below (south) of it. So, it's the 45° South line of latitude (and you can see why these lines are also called 'parallels', this is the 45th parallel in the southern half of the globe).

The only latitude line that goes round the middle is the equator. If you had a light tennis ball and gently popped it into a perfectly still jar of heavy ink, it would come to rest floating with most of the ball above the ink's surface. Remove the ball. The 'tide mark' around the top of the ink stain is the shape of a line of latitude. It does not go through a pole.

Longitude

Lines of longitude are shaped differently. In **Fig. 2** I've taken half a glass sphere, looking like a stationery shop globe before they join the two halves together at the seam (I mean equator, I mean 0° latitude line). I've still shown the rotation axis; the South Pole is there, but I've cut off the North Pole. You'll just have to use your imagination.

This time, I've drawn out a radius but a whole diameter line that's perpendicular to the rotation axis. I've drawn a line of longitude from one place where the diameter emerges at the surface of the sphere, my line of longitude then goes through the South Pole and back round to the other end of the diameter. Although not shown, it carries onto the North Pole and finishes back where it started.

Moving 15° round, I've drawn another diameter line and its corresponding line of longitude. Notice that all lines of longitude go through both Poles. They are not parallel.

The line that goes through Greenwich has been chosen as the 0° longitude line. These lines are also called meridians, so this is the Greenwich meridian There's nothing special about Greenwich (I don't mean to offend readers who live there), they could have chosen Paris or New York to mark the central meridian. But, no fighting please, Greenwich won.

If you look at a map, West is to your left. If the map shows Greenwich, then anywhere left of that town is west of it and anywhere to its right is east of it. Likewise with lines of longitude. In **Fig. 2** I've shown a line 15° west of the Greenwich meridian.

What's Time Got To Do With It?

Imagine watching the earth rotating from a fixed point in space (the Sun will do) and waiting until some town like Greenwich came into view. When Greenwich directly faces the sun, it's mid-day there. Obviously, it takes 24 hours for Greenwich to come round again.

Meantime, it's gone right round through 360° in 24 hours. How far in one hour? It's 360/24 = 15° per hour. Every 15° round the earth is a time zone difference of one hour.

What they did in the days of sailing ships was to set an accurate clock (such as a Harrison's Chronometer) to Greenwich time. Many days into the voyage, the ship's navigator waited for local mid-day when the sun was at its highest point. The chronometer was now read. If it showed, say, 2pm for Greenwich time, then the ship must be 2 x 15 = 30° back from Greenwich which is on the 30° west line of longitude.

Note that this doesn't fix the ship's position. It could be anywhere on the line. To find the exact position requires knowing the latitude too. Where the lat/long lines cross, that's **you!** These days, chronometers are confined to museums.

For a fraction of the price, you can buy a Global Positioning System (GPS) receiver that fixes your location by satellite. It still tells you lat/long as the answer, though!

In fact, GPS is so accurate that the earth's flat points become important. Much of the original surveying and mapping of the earth is very slightly inaccurate, partly for this reason, and only GPS is accurate enough to show this problem.

A more precise charting of the earth's surface is to the World Geodetic System of 1984 (WGS84), that's what your GPS tells you, it's also why aeronautical charts are being updated for greater accuracy.

How Much Further?

I haven't finished yet! Since you brought up the subject, latitude can measure distances. The lines are parallel, that is to say, spaced the same distance apart, wherever they are on the earth's surface. Right? Wrong! The earth is flattened, not a perfect sphere, so there will be small errors when measuring in this way.

Ignoring this, for now, each degree of latitude is a line drawn round the earth, as we've seen. A degree on a protractor seems tiny but, on the earth's surface, it's huge. It needs sub-dividing.

Just like an hour is divided into 60 minutes, so a degree is split into 60 equal parts - also called minutes. You'll believe me that a minute can be further split, 60 equal ways again, and we call these seconds.

So, a latitude line might be at N50°35'6" (fifty degrees, thirty-five minutes and six seconds North). You'll see this abbreviated (e.g. to WGS84 standard) as N503506. Watch out, though, as most older aeronautical charts show degrees and minutes only, with the minutes as a decimal fraction number (the example above is N50°35.1' or even N5035.1 in abbreviated form).

As for distance, they decided that one minute of latitude was a convenient size and called it a nautical mile (nm). Wrong, of course! The flattening of the earth's sphere leads to small errors and eventually navigators gave up this idea. Instead, the International Nautical Mile has been re-defined as 1852 metres. Precisely.

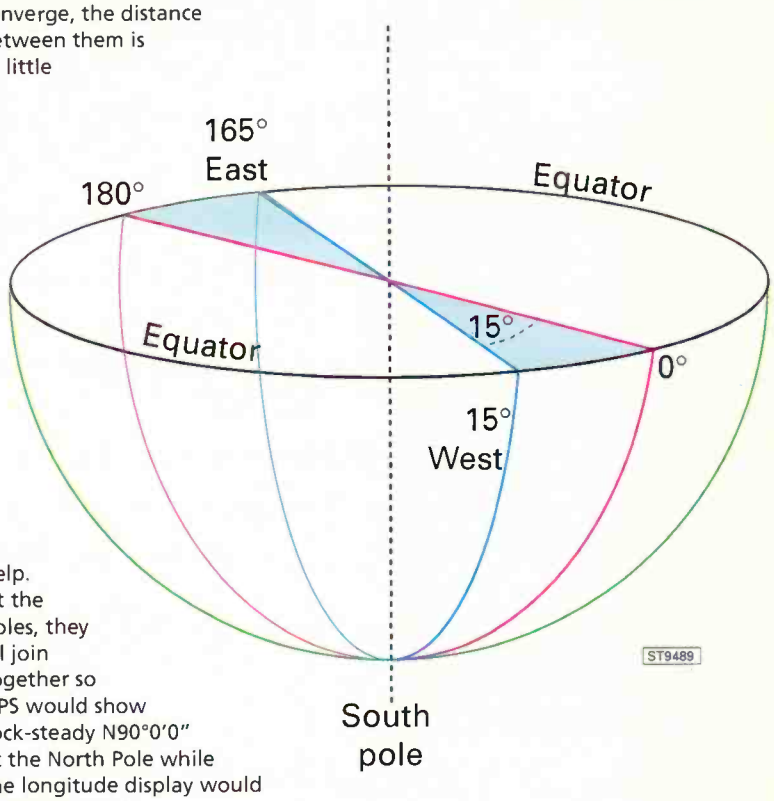
Don't forget that longitude is also subdivided into degrees, minutes and seconds (or minutes as a decimal fraction number). Latitude runs from S90° (South Pole) via 00° (the Equator) through to N90° (North Pole). As for longitude, though, it starts at the Greenwich Meridian 000° and goes half way round the world, in degrees east, until it reaches 180° or, instead, goes the other way round from 000° and reaches 180° via degrees west.

An example longitude could be E030°9'3" or, abbreviated, E0300903 or, with decimal minutes instead of seconds, E030°9.05 which can also be abbreviated to E03009.05. So, watch out and don't let these different formats confuse you.

A closer look at **Fig. 2** shows what happens when a longitude line passes over a pole. It's reached the 'back half' of the sphere. Half-way round a circle is 180° round, you remember. So, our longitude lines are suddenly re-numbered at the poles, all changing by 180°. The 0° line becomes 180° 'seen from behind', likewise 15° West becomes 180 - 15 = 165° East.

As longitude lines converge, the distance between them is of little help. At the poles, they all join together so GPS would show rock-steady N90°0'0" at the North Pole while the longitude display would fluctuate wildly.

Fig. 2: Longitude.



Standing at the North Pole, whichever way you face, you'll be looking along a longitude line. All these lines travel round the earth and meet up again at the South Pole. So, whichever way you face - you can only look southwards!

Watch Out For OSGB

The Ordnance Survey of Great Britain (OSGB), nothing to do with ordiance - that's nasty things like guns - have their own grid for drawing horizontal and vertical lines all over their maps. Very useful they are too, in a parochial way. There's one grid for Great Britain and a different one for Ireland.

Unfortunately, relating the OSGB National Grid (nothing to do with electrical power distribution, although I suppose National Grid PLC mark their cable on OSGB maps!) to lat/long isn't easy. If you must plot a lat/long co-ordinate on an OS map, then lat/long markers are helpfully placed round the map's edges but not on the body of the map itself. You can put them there with a pencil, but you'll need a long straight-edged object so as to join the corresponding marks on opposite edges of the map.

Have you understood all that? Right, plot N51°37.07' W000°16.35' and see where it is. Yes, it's me - the co-ordinates of my house. If you want to know where that it, see the heading on my 'Airband' column in this magazine!

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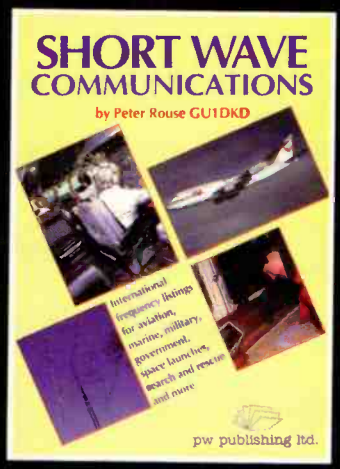

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Vertical

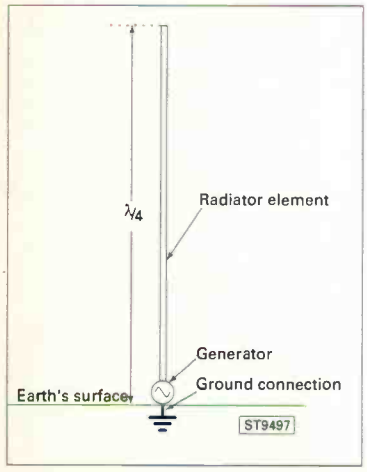
Why doesn't the vertical antenna get more respect? Joe Carr K4IPV explains.

The vertical antenna has a certain charm for people who lack space in which to erect an antenna. People with small gardens can still wring a fair amount of performance out of a simple vertical. Yet verticals - especially ground mounted verticals - have a bad reputation in many quarters. Let's take a look at these issues and see how they can be solved.

I first heard about verticals being 'worthless' from some older amateur radio operators, all of whom had 15 to 30m towers topped off with rotatable Yagi or cubical quad antennas. Yet, my mentor, Mac Parker W4II has a Hygain trap vertical for 40 through 10m mounted on the ground, and a special coil to adapt it to 75/80m. And it worked fine on his smallish hillside site. Mac's transmitter was a Johnson *Viking Ranger* that put out about 65W a.m. and 90W c.w.

I also met a young fellow in the Potomac Valley Radio Club, one of the most competitive 'contesting' clubs in the USA, who used a vertical. He lived in an apartment flat in Washington, DC that didn't have a small yard, but rather it had none at all. He used the same vertical as W4II, but mounted on the building's flat roof. A set of radials all around the antenna acted as a ground plane. This young man turned in impressive scores on every contest, and had worked nearly 280 countries with his amateur radio set-up. And what kind of transmitter did he have? Was it a kilowatt blowtorch? No, it was more like a soggy match than a blowtorch. He owned a Heathkit DX-20 with the outboard VF-1 variable frequency oscillator. I don't recall the actual power level of the DX-20, but I don't believe it was around 50W or so.

Fig. 1: The quarter wavelength vertical antenna.



Vertical Antenna Designs

A look at **Fig. 1** shows the basic design of a vertical antenna. In its ground mounted version it consists of a radiator element connected to the output of a generator, which might be either a signal source or signal sink. In the case of a transmitter, the signal source is the transmitter and coaxial cable between the transmitter and the antenna. In the case of a receiver the 'generator' is actually a signal sink (the receiver's antenna input circuit) and the coaxial cable.

The radiator is installed perpendicular to the ground, so will produce vertically polarized signals. When used on receive, the antenna responds best to verically polarized incoming signals, although the response to horizontally polarized signals is not zero.

The radiator can be a length of copper wire similar to the wire used in horizontal antennas such as the dipole. This material is not self-supporting, however, so requires a support at the top end. A variation on the theme is to use a length of thick-walled PVC plumbing pipe with the wire run inside of the pipe. This is the approach taken by people requiring a 'hidden' antenna. The PVC pipe is styled a 'flag pole', and who (even on the homeowners association board) can criticise a little old-fashioned flag-waving patriotism?

More commonly, perhaps, is the use of copper or aluminum tubing for the vertical radiator element. Copper works well, but is expensive and turns a rather unpleasant shade of green within a few days of installation. Aluminum

Respect

tubing is, by far, the superior material. In the USA, and probably UK as well, adjacent sizes of aluminum tubing are a 'slip-fit' to each other. For example, the inside diameter (i.d.) of 1in (16/16in) tubing is very nearly 15/16in, so will accommodate 15/16in o.d. tubing.

The problem is finding 'adjacent sizes' in the usual outlets. Most d.i.y. hardware stores carry sizes about a quarter apart. I found it necessary to locate a local metal products distributor. Snuggled in amongst the large sheets of copper plate used for roofing on old fashioned houses, was a delightful bin of tubing of all sizes manufactured! The distributor had a $50 minimum for cash purchases, so I also bought a roll of 178mm wide copper roof flashing material. It wound up being a ground plane in my amateur radio station's operating position - with plenty to spare...want to buy some?

Vertical Radiation Patterns

It is customary to publish antenna patterns in both horizontal and elevation planes, and that is how I will present the patterns for vertical antennas. But first let me remind the reader that these patterns are merely slices taken from a three dimensional solid.

The horizontal and elevation aspects of the vertical's radiation pattern are shown in **Fig. 2a** and **Fig. 2b**. The elevation pattern shown in **Fig. 2b** assumes a 'perfect' earth. To visualise the three dimensional pattern from which these are derived imagine a New York bagel. Those torous shaped blobs of bread can be sliced horizontally through the middle (as is the usual custom). Instead of spreading jam on the two halves, lay one half flat on the table. That 'half bagel' is a reasonable approximation of the vertical antenna's three dimensional radiation pattern. After you have properly visualised the radiation pattern, pick up the bagel, slather jam or marmalade all over the flat surface exposed by the cutting, and enjoy a nice snack - true bagel afficienados will reel back in horror...only cream cheese is a proper bagel topping!

I once used the doughnut as a model for radiation patterns, but found that not all countries make doughnuts in the American manner. We make them torous shaped with a hole in the centre. In some other countries they are often solid.

The horizontal (azimuthal) radiation pattern **(Fig. 2a)** is omnidirectional, i.e. it radiates or receives equally well in all directions. This pattern is either a strength or a weakness depending on the situation. On the plus side, the omnidirectional pattern means that we can transmit or receive in all directions, which is a good idea when the directivity of the desired station is not known. The down side is that radio reception is basically an exercise in signal-to-noise ratio. An omnidirectional antenna provides no directional discrimination, so all same and near frequency stations are audible at the same time. One of the principal uses of directional antennas is to attenuate unwanted natural or manmade noise sources as well as other signals. This facility is lacking in vertical antennas. I believe this is one factor in the claim that verticals are 'worthless'.

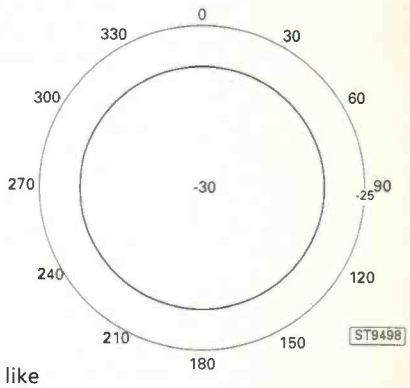


Fig. 2: a) Azimuthal pattern of vertical.

The elevation pattern is tilted upwards at an angle from the earth's surface. This angle of radiation is another reason for varying opinion about verticals. When angle of radiation is high, the length of the skip zone is shorter than when the angle is low. DXers like horizon-hugging angle of radiation whenever possible. The quarter wavelength vertical has a relatively high angle of radiation. As a result, DX performance may be compromised, and this may be still another factor in the lack of respect accorded verticals. However, if you go to a $\lambda/2$, $5\lambda/8$ or $3\lambda/4$ vertical the angle of radiation decreases substantially. Impedance matching problems are different in those verticals, but they are easily handled.

Earth Losses And The VSWR Delusion

The quarter wavelength vertical antenna is a resonant antenna fed at the base. The feedpoint impedance will be between about 2 or 3Ω to a maximum of 37Ω. When the impedance is 37Ω it makes a reasonable match to 52Ω coaxial cable. In that case, the lowest possible v.s.w.r. is 52/37 = 1.4:1. If the impedance is lower than 37Ω, the minimum possible v.s.w.r. is higher than 1.4:1 (perhaps quite a bit higher).

A lot of sweat and tears are expended trying to make the v.s.w.r. of antennas as small as possible. To get to 1:1 v.s.w.r. is something of a *holy grail* quest. But it's also sometimes misdirected. Although there are good reasons for trying to get as low a v.s.w.r. as possible, it's not always reasonable. An erroneous belief exists that there is a one-for-one improvement in antenna efficiency for decreases in v.s.w.r. It's not quite that simple. Also, in vertical antennas particularly the v.s.w.r. might be artificially low because of earth losses.

From time-to-time we hear that a particular antenna has what seems to be a far too low v.s.w.r. When you sees a 37Ω antenna fed with 52Ω coaxial cable sporting a v.s.w.r. less than 1.4:1, then there is reason for suspicion.

"A lot of sweat and tears are expended trying to make the v.s.w.r. of antennas as small as possible."

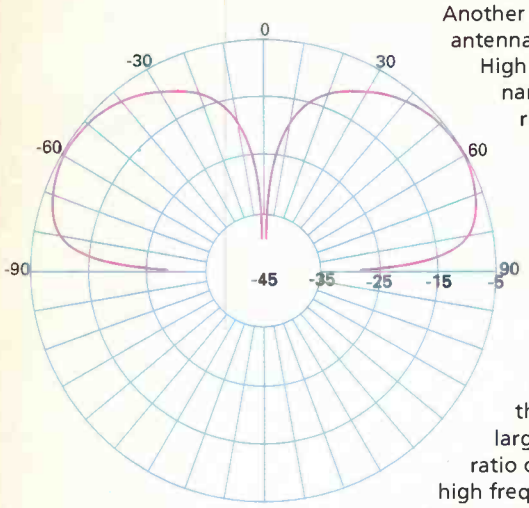


Fig 2 b) Elevation pattern of vertical over a 'perfect earth'.

Another suspicious case is the antenna that is too broad banded. High *Q* antennas are relatively narrow banded, so the v.s.w.r. rises dramatically either side of resonance. A low *Q* antenna, on the other hand, is broad banded as shown by the fact that the change of v.s.w.r. at frequencies departed from resonance is more gradual. The problem, and the reason for the suspicion, is that the *Q* of the antenna is determined largely by the length-diameter ratio of the antenna. For wires at high frequencies (h.f.) the L/D is huge, so the antennas are relatively high *Q*. You will see the v.s.w.r. change rapidly at frequencies away from resonance. Similarly with aluminum tubing antennas. The value of L/D is less than for equivalent lengths of wire, but it is still high.

One reason why a vertical antenna would show abnormally low v.s.w.r. and *Q* figures is ground losses. A quarter wavelength vertical lacks the 'other half' that is seen in the dipole, so seems to lack a place for currents to flow on the alternate half cycles. The antenna is said to have an image in the earth because of displacement currents flowing in the earth. These currents are created by the electrical fields and the capacitances between the radiator element and the earth **(Fig. 3)**. These currents return to the generator through the high resistance of the earth. Currents originating out to about 0.4 are significant in this respect. Because the pattern is omnidirectional, the 0.4λ zone is all around the antenna **(Fig. 4)**.

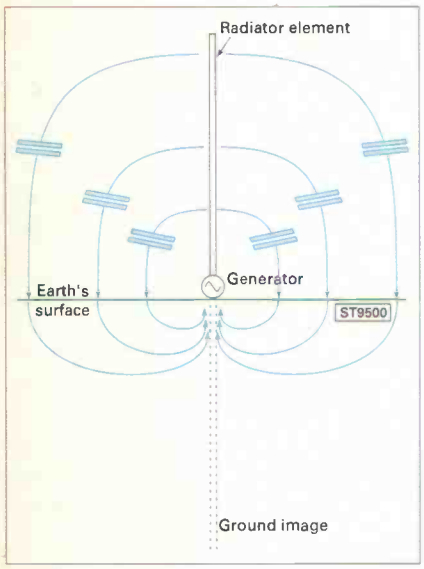
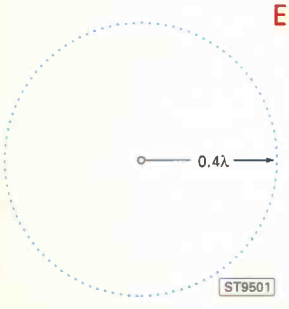


Fig. 3: Origin of ground currents around a vertical. These currents are significant out to about 0.4λ.

The reason for the depression of the v.s.w.r. and *Q* values is that these currents add a separable loss to the equation. After all, the resistances and currents are real, so by I^2R we expect that some power is dissipated heating the soil. While that might not be such a bad thing in winter time, especially for hibernating earth worms, it is not exactly good for the efficiency of the antenna. Any time an unwanted resistance is introduced to the antenna circuit, the apparent *Q* and v.s.w.r. figures are affected. The direction of v.s.w.r. change may give a warm, fuzzy but false feeling that all is well (and that **our** vertical works better than the other guy's vertical - despite being of similar design).

Fig. 4: Zone of significant earth currents around a vertical.



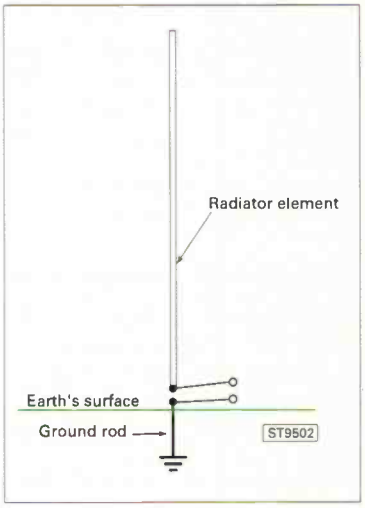
Earth System

One of the principal reasons why the vertical antenna is believed to be such a poor performance is that too many of them are built with rather poor earthing. The earth system shown in **Fig. 5** is used by many builders. The earth side of the transmission line from the receiver or transmitter is connected to a earth rod. The earth rod might be part of the mounting for the antenna, or a separate earth rod driven into the soil adjacent to the mounting. The problem is that the earth currents from out as far as 0.4λ must still flow through high resistance soil to reach its destination at the earth rod.

No matter how long the earth rod might be, it does not mitigate the effects of that long resistive path. One source that I consulted suggested that a current path for a 31m band quarter wavelength vertical, which extend out to 0.4 x 31m = 12.4m, would be on the order of 10kΩ. Of course, this figure is for a single pencil-thin piece of soil over the entire length, so when spread out over the entire circle around the antenna is considerably less. If, for example, we model or antenna so that the resistances are calculated by 0.1° around the antenna, the actual ground resistance is on the order of 10000Ω/3600 = 2.78Ω.

The solution to the problem is to lay down a pattern of radials around the antenna **(Fig. 6)**. Radials are wire conductors radiating out from the mounting point of the antenna. If the radials are mounted above ground, or in any way insulated from ground, they should be quarter wavelength long. But if the radials are in contact with the ground, either on the surface or buried (which is better from a safety perspective), then they can be any length. Currents flowing to the end of the radials can just keep on flowing into the earth, rather than being reflected as they are in above-ground or insulated radials. As a practical matter, the most effective length for buried radials is 0.4λ. On multiband systems, make the radials 0.4λ at the lowest frequency of operation. The higher frequencies are then taken care of as well.

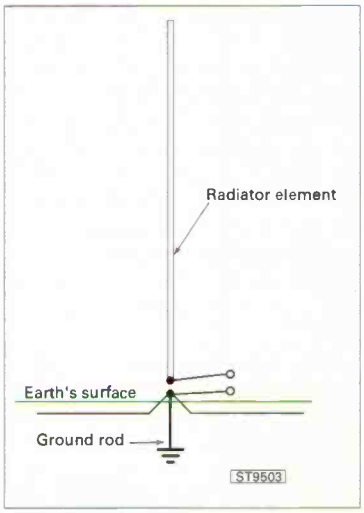
Fig. 5: Single-point earth system.



How Many Radials Are Enough?

This is one of the primary questions to ask when constructing a vertical antenna. The quick answer is "the more the better". I have substantially improved the performance of verticals by going from a ground rod to a ground rod plus two 0.25λ radials. Old timers at the local radio

Fig. 6: Earth system using radials.



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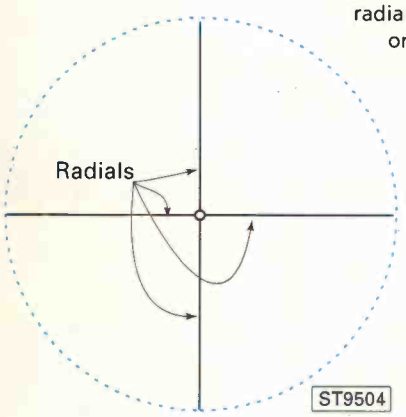
"The resistance drops very rapidly as each new radial is added from 1 to about 15 radials."

store tell us that four radials is the magic number. And indeed a four-radial vertical (**Fig. 7a**) works better than a two-radial version. The *Engineering Handbook* of the National Association of Broadcasters (USA) uses the figure 120 radials for a.m. broadcast verticals, but that is in response to an FCC regulation. Some professional and high level amateur antenna books recommend 50 to 60, or 50 to 90 radials depending on which source you select. Clearly, digging up your garden to lay down 120 (or even 50) radials is not desirable. Most amateur radio texts recommend between 14 and 16 radials (**Fig. 7b**) on earths that the return on investment above that number is diminishing.



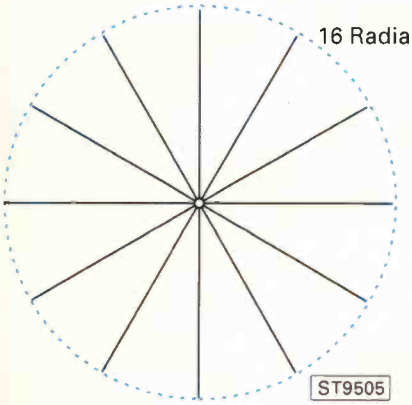


Fig. 7: a) Four-radial earth system; b) Sixteen-radial ground system.

We can do a simulation to determine the effectiveness of radials. Keep in mind that "all models are false, but some are useful". The falseness derives from the assumptions made or not made in the model.

Let's create a model in which there are 'radial resistors' of soil arranged around the antenna's 360° pattern every 0.1°. That means we will have 3600 soilistors (I didn't really say 'soilistors' did I?), each 10kΩ, arranged in parallel. The total resistance is 10000Ω/3600 = 2.78Ω. Now, let's replace the soilistors one-by-one with copper wire, 0.4λ long. A length of a certain gauge copper wire that is 0.4λ in the 31m band has a resistance of close to 1Ω. Now let's replace 10kΩ soilistors one-by-one with 1Ω copper wires and see what happens to the total ground resistance. The total radials resistance will be 1Ω/N, where N is the number of radials.

We must find the parallel combination of the total soilistor resistance and total radials resistance. I wrote a *Visual Basic* program to do this job (*Qbasic* no longer being supplied on Windows machines!). A file was created on a diskette that contained 3600 values. The first value assumed no radials, and the last assumed all radials (3600). Each step in between had one fewer soilistor and one more radial than the previous step. The data were then ported over to an *Excel* spreadsheet so they could be graphed on an X-Y scatter diagram. The total number of data points was too large to see the curve in a meaningful manner, so I plotted just the first 30 data points (**Fig. 8**).

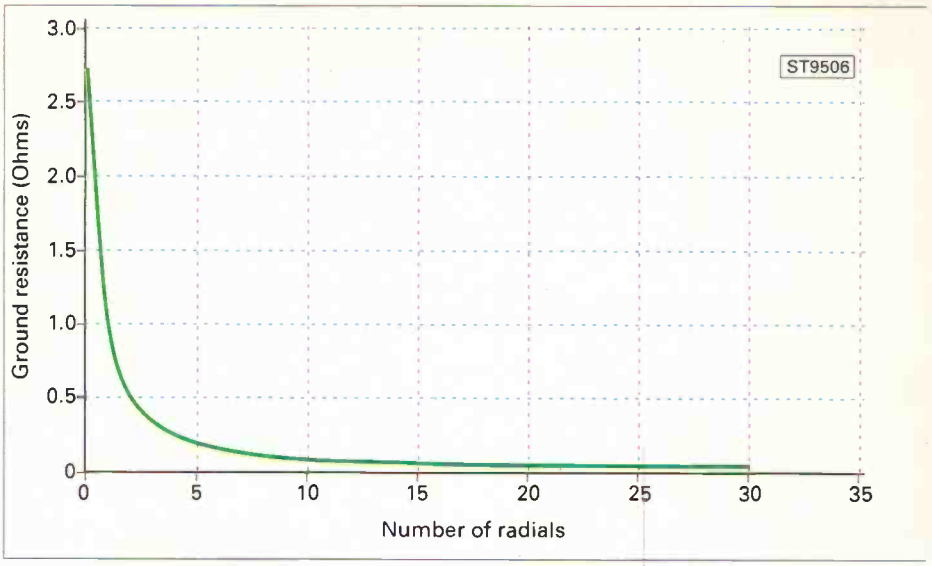


Fig. 8: Vertical antenna elevation pattern over an 'urban and industrial area' earth with no radials.

Notice the shape of **Fig. 8**. The resistance drops very rapidly as each new radial is added from 1 to about 15 radials. Above 15 radials, however, the change of resistance for each additional radial is very small, the curve being almost asymptotic. The cost and effort required to add radials after 15 is simply too great for the return on investment. As a result, I tend to accept the amateur limit of 14 to 16 radials as valid.

Keep in mind that this is a rather simple minded model, and would probably not suffice for professional antenna engineering use. However, it amply demonstrates the problem and the reasoning between setting a sixteen radial limit.

Now let's take a look at one more thing before concluding. **Figure 8** shows the elevation pattern of a quarter wavelength vertical antenna over a less than perfect earth. This particular pattern was modeled using an 'urban and industrial area' ground and no radials. Now compare it with the 'perfect earth' elevation pattern in **Fig. 2b**. Note that the poor earth raised the angle of radiation. The effect of this change is to shorten the skip zone for DX reception or transmission. As a result, people with this type of earth may moan that they "can't hear over the horizon with a vertical". A few radials would depress the angle of radiation and lengthen the DX legs of the antenna.

Conclusion

Much of the bad reputation endured by vertical antennas, especially ground mounted verticals, is due to either incorrect expectations regarding signal-to-noise ratio and angle of radiation, or poor performance arising from earth resistance. The first two are alleviated by understanding the nature of the radio propagation to and from verticals and using it to best advantage. The other problem is alleviated by installing at least four, and preferably sixteen 0.4λ radials to form an improved ground system.

Note: The antenna patterns shown in this article were modeled using *NEC-Win Basic* by Nittany-Scientific.

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Listening The Lafayette Way

Ben Nock G4BXD

explores the HE-30 and HE-80 general coverage receivers.

The Lafayette receivers may not be that well known to British short wave listeners but the company, basically a distribution company in America, imported and exported quite a few nice examples of radio sets from the mid 30s to the late 70s. A couple of them are detailed here that, if found at rallies, car boot sales and so on, could be of interest to those just starting and should not cost an arm and a leg.

The HE-30 Receiver

The HE-30, supplied under the Lafayette banner, is a single conversion, 4-band receiver covering 550kHz to 30MHz. A bandspread facility offers seven portions covering the 80 to 10m amateur bands. Available on the second-hand market for small sums, this set could make an ideal starting point in short wave listening.

This 9-valved receiver bares a close resemblance to the Trio 9R59D set, in fact when the cover is removed, the i.f. transformer cans bare the TRIO legend. The set is different though in that it offers the facility of a *Q* multiplier in place of a straight b.f.o.

Circuit Description

The r.f. amplifier employs a 6BA6, the amplified r.f. then feeding a 6BE6 operating as the mixer. A further 6BE6 is used as the main local oscillator feeding an injection signal to the mixer on the high side of the antenna frequency.

Two stages of i.f. amplification are provided, using 6BA6 valves. A 6AV6 operates as the *Q* multiplier and b.f.o. A *Q* Multiplier is a circuit designed to increase the *Q* or sharpness of a tuned circuit, in this case the i.f. transformer circuit, and thus improve selectivity and gain. As the gain of the *Q* multiplier stage is increased though, the circuit breaks into oscillation and acts as the b.f.o.

Trying to use the *Q* Multiplier does take some getting used to. In fact, I was not able to make it work as it should, and simply reverted to using it in the b.f.o. mode only.

A 6AV6 is used as detector, a.g.c., and audio pre-amp, which feeds a 6AQ5 as the audio output stage. A 5Y3/5CG4 is used as the full-wave rectifier producing the h.t. for the set.

There is no stabilised supply provided for the oscillators and this is something that could be added, a small OA2 for instance could be employed in the role. All the valves use 6.3V heaters and a pair of 6.3V dial lamps are also fitted to illuminate the scale.

Frequency Coverage

The actual coverage is as follows:

Band 1	550 - 1600kHz
Band 2	1.6 - 4.8MHz
Band 3	4.8 - 14.5MHz
Band 4	10.5 - 30.0MHz

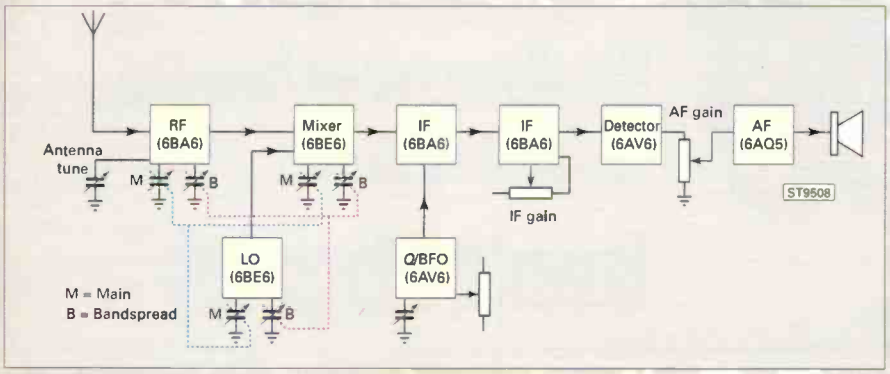


Fig. 1: Block diagram of the Lafayette HE-30 RX.

There is a bandspread function that gives seven slices which cover the 80 to 10m amateur bands, there being two slices for the 80 and 40m allocation to accommodate the US amateur bands.

Controls

Two large knobs are provided for main tuning and bandspread tuning. Large cast flywheels are attached to the rear of these controls which does help in the 'feel' of the tuning but as a cord drive is used between the controls

The HE-30 (upper) and HE-80 receivers. Band-spread scales are the lower of the two on each set.

and the tuning capacitors, the tuning lacks the ultimate smoothness of a geared drive.

A main function switch selects either OFF, ON AM, standby, or ON CW/SSB. In the s.s.b. position, h.t. is applied to the *Q* Multiplier/b.f.o. An audio gain, an i.f. gain and an antenna trim are provided along with a.v.c. ON/OFF and an audio noise limiter, which proved rather ineffective and simply distorted the audio. A bandswitch completes the control compliment for this set.

On the rear wall are terminals for antenna, earth, speaker and a pot to set the S meter zero level. It is interesting to note that the large i.f. transformer cans are stamped with 'TRIO', the obvious maker from whom Lafayette imported these sets.

The HE-80 Receiver

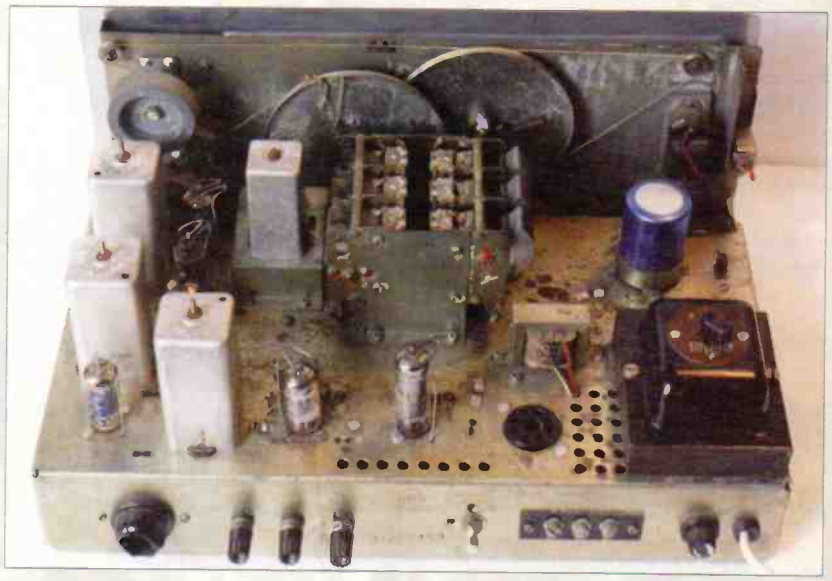
Having a very similar styling and frequency coverage to the HE-30, the HE-80 is slightly larger and has the additional coverage of the 2m band plus a 100kHz calibrator facility.

There appears to have been at least two versions of this set. The HE-80WX, marketed in the USA, had coverage of the 6m band in place of the 2m band on the UK version. The set is single conversion on the short wave bands, whilst it operates in dual conversion mode when on 2m.

The 2m coverage provided is from 142 to 148MHz, this is tuned on the receiver as 5 to 11MHz, but it has its own scale on the dial and separate antenna socket on the rear. Due to the open nature of the set's construction, there is a small amount of leakage, i.e. short wave signals being heard whilst tuning the v.h.f. band.

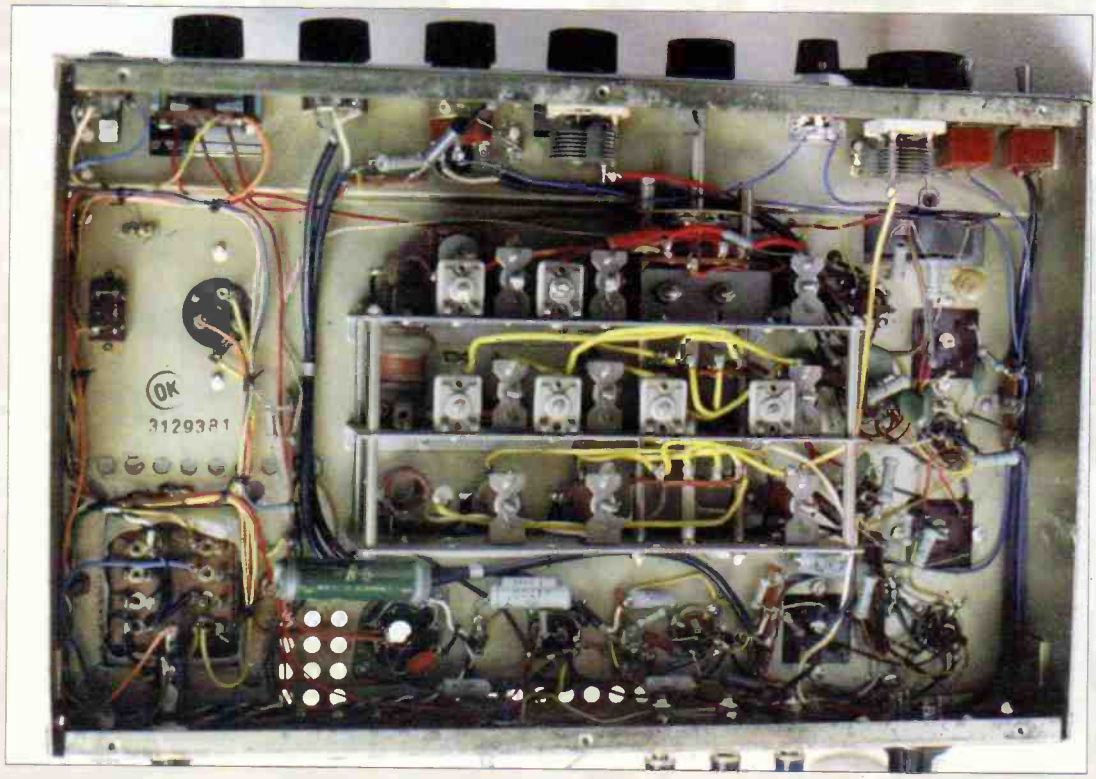
Also, due probably to poor design, there are quite a few 'birdies' to be heard, i.e. not actual received signals but mixing products giving loud blips across the tuning.

The HE-80 uses 10 valves in the main receiver, two more as the rectifier and stabiliser, and three valves in the 2m converter, i.e. 15 in all.



Interior of the HE-30 set. Sparse layout, p.s.u. on lower right, i.f. strip along left wall, a.f. output rear centre.

"Available on the second-hand market for small sums, this set could make an ideal starting point in short wave listening."



Underside of HE-30, coil bank in centre, p.s.u. components on left wall.

Interior of HE-80 with the p.s.u. on the right, i.f. along left wall, detectors and a.f. output along rear wall. Two metre converter upper right.

Close up of two metre conveter on HE-80 set.

On the HE-80, the b.f.o. and *Q* Multiplier are separate functions. The *Q* Multiplier works quite well in this set, being used on c.w. or crowded s.s.b. signals it does reduce the bandwidth and lifts the gain quite effectively.

The 100kHz calibrator is useful, but I feel it would have been more useful as a 1MHz calibrator. The crystal could be changed quite easily though. Again, as in the HE-30, the noise limiter is fairly ineffective, giving more distortion than noise limiting.

In Use

Operation of the receivers is straightforward enough, the required band is selected and then tuned as required. To set up the bandspread, the main dial pointer is first placed at the pre-marked spot on scale, these small markers are provided for each amateur band, two for the 80 and 40m sections.

Whilst not in use, the bandspread dial should be 'parked' at the right-hand end of the scale, this ensures the main dial reads accurate. With the main dial set to one of the bandspread marks, the bandspread tuning can now be used with the frequency being read off the lower bandspread markings.

The antenna peak is adjusted for best signal, very strong signals can be limited by adjusting the i.f. gain control on the HE-30 and r.f. gain on the HE-80. With the b.f.o. switched on, c.w. and s.s.b. signals can be resolved, the gain of the received signal being adjusted either with the i.f. gain pot or the antenna trimmer.

The sensitivity and selectivity of the sets are nothing to shout home about, the specifications are good enough though for general listening, ideal for those just starting out on the short wave path and not wishing to take out a second mortgage for the pleasure!

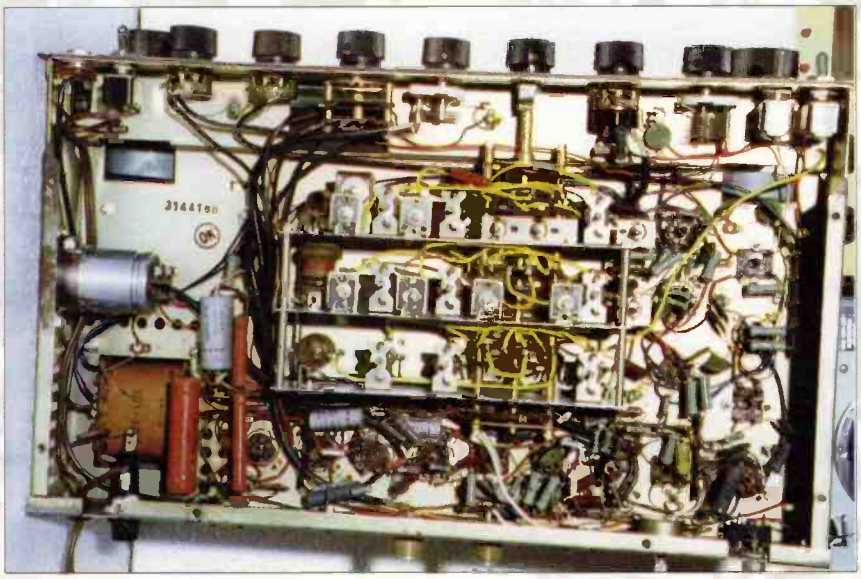
The *Q* Multiplier, on the '80, takes some getting used to. As the selectivity control is advanced, a notable increase in gain takes place. Advance the control too far and the i.f. stage bursts into oscillation.

At this point, the selectivity is backed off a touch and the tuning rotated to achieve the best signal reception. The *Q* Multiplier is useful on c.w. stations, it really narrows down the bandwidth nicely, and on s.s.b., it can be used to get rid of adjacent signals to some extent.

Using the set with a 40m long wire produced good enough results on the amateur bands with more than enough gain for the commercial bands. Eastern European stations, South Americans and Asian alike were received on the 41 and 31m bands whilst WA/KA 4, 6 and 9 where heard on 20m, 5B4, ZS and VU on 15m.

The set would suit young and old alike, as it is simple to operate and requires only the smallest of table tops. The cost of either set should be quite reasonable and even worth buying just to play with or try out a few modification ideas on. Happy listening! **SWM**

"The *Q* Multiplier, on the '80, takes some getting used to. As the selectivity control is advanced, a notable increase in gain takes place."



Underside of HE-80 receiver, showing very similar layout to HE-30.

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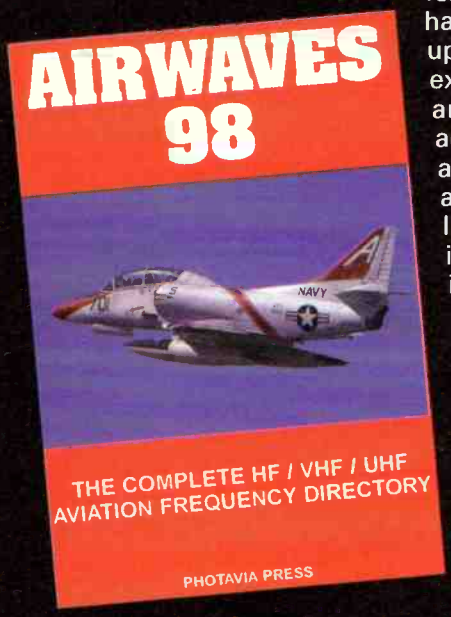

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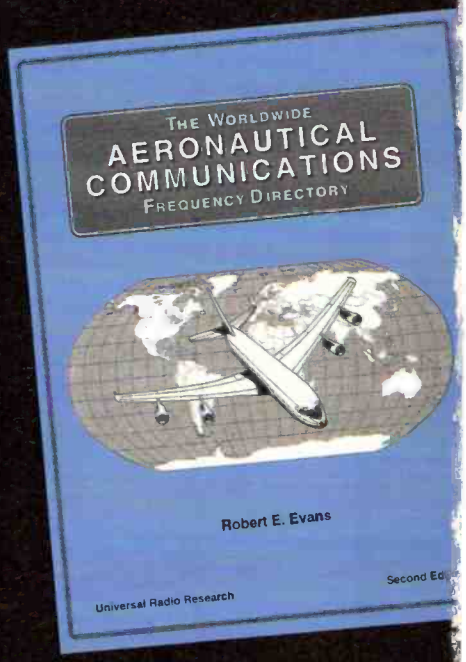

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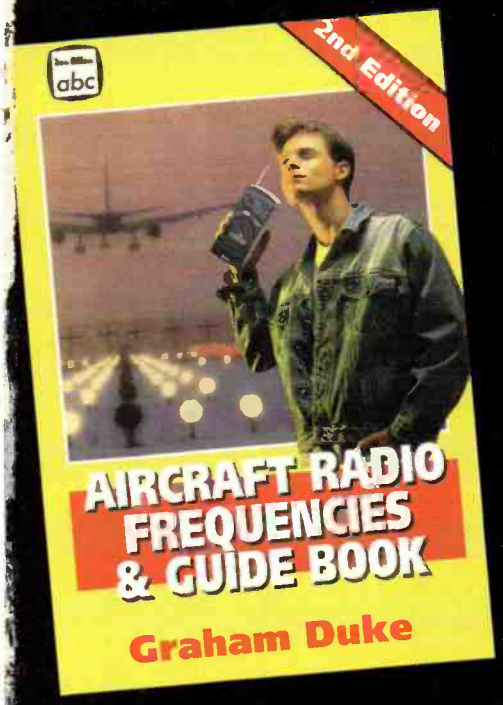

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This guide book is an invaluable and full comprehensive update on the 1995 edition. Since then, changes have swept across the airband reception field, with ever more channels and bands being utilised to cope with the increased use of UK airspace. This has resulted in the need for a clear, updated volume to aid the airband listener of 1998 and onwards.

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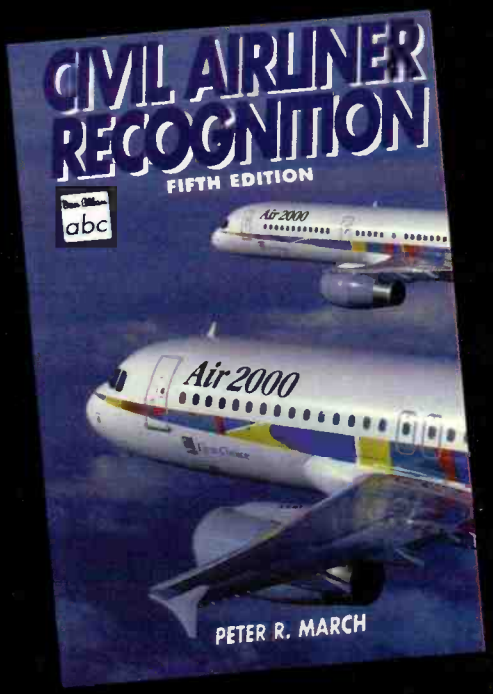

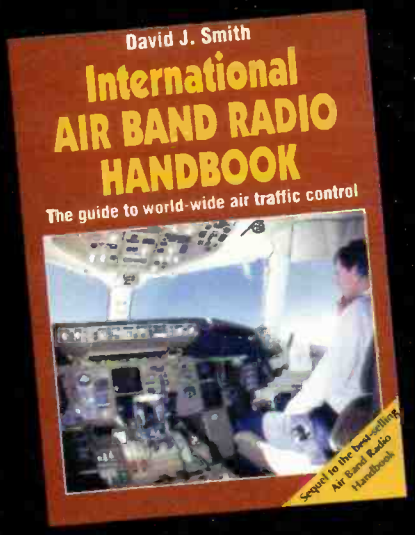

International Air Band Radio Handbook

International Air Band Radio Handbook explains how air traffic control is regulated internationally and includes brief details of each country's system, together with the radio frequencies for all major airports. The many related subjects include navigational aids, radio phraseology, flight plans, interception and emergency procedures, as well as weather reporting and an ICAO airport code letter listing.

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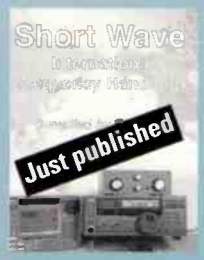

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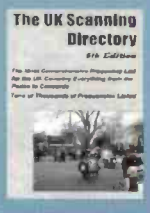

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Amateur Bands

There are two questions here - the operating position and the antenna. We live in a litigious age. When an antenna 'lets go' in a gale the ends thrash about in the wind. Make sure it can't hurt someone and make sure your insurance covers such risks anyway. Adventurous children have been known to try to climb masts too, so do something preventive.

Indoors, first check whether your home is PME (Protective Multiple Earth) wired - houses built in the last decade or so are PME, but earlier ones are not. If the wiring is older, a physical check on its condition is worthwhile.

If you use an antenna system which *requires* earth for proper operation, for example the end-fed wire, you might want to isolate the receiver from the mains earth. Make a check - connect the live side of the mains through a 13A fuse straight down to the r.f. earth for one full second. Switch off and check whether the fuse has blown - if it hasn't, your radio earth isn't good enough for safety.

If your house is pre-PME, doing the same check on the *mains* earth might justify a panic call to your local electrician! If you *must* use the traditional earth, be sure yours is connected nearer to ground than the mains earth or use a counterpoise. That way there is no common piece of wire to couple noise into the r.f. side. Finally, feed power to the station by way of an earth leakage breaker (ELCB) just in case.

E-mail

Three came in by this route. The first one was from **Maury I121171** who is the SWL Manager for ARI and has a monthly column in *Radio Rivista*. Maury says I'm dedicating too much space to readers band reports, since there are many newsletters from which to retrieve data from - the *DX News Sheet* springs to mind.

Perhaps Maury has missed a point here - in my experience only a tiny proportion of listeners subscribe to such newsletters, and anyway by the time a reader's report reaches the issue it's history anyway! For example, on May 1 I started a column to reach the Editor on May 18, ready for you to read in the July issue, which is on sale on June 25th. Personally I try to reflect in the column what appears in the mail, so the more questions the better.

The second one is from **Neil Radley**, who has tried listening to the new band - I assume Neil refers to the 73 or 136kHz - but all he can hear is 'a digital signal of some sort'. Two possibilities arise here.

Firstly it might be Morse Neil is listening to - sorry if that seems a bit obvious! - and secondly it might well be pick-up through the earth system. Any 'normal' antenna will be extremely low impedance compared to that of any normal earth system so that any earth current signals will predominate.

The answer then is to put up some sort of balanced antenna or to try some sort of counterpoise instead of a physical earth. That implies inductive loading of course, and sharp antenna tuning. One doubts if sideband will be heard anyway - just one such signal would fill the band!

Next we hear from **Karl Drage RS174461** who reports that in April he finally got his 100th country verified - naturally, since then they've *flooded* in! Karl starts with 50MHz where he noted GD4IOM and G4SEU on s.s.b. for the first signals this year.

On 28MHz sideband, various 4X stations showed up, 5B4/UR9YAB, 5B4AGC, 5B4KF, 7Q7DX, 9K2AI, 9K2JH, 9K2SQ, 9K0A, AI4R, AJ6A, AK1L, CO8ZZ, EA8AM, EA8AZY, ED8CMT, FR5BT, FR5DX, KC4SUS, KC5UKC, KI4TL, LU2DOJ, LU5FOO, NP4R, OD5PN, PJ7SRC, PT7AZ, PU8YHF, PY1SK, PY2YHF, PY7ZZ, SU8ECJ, UN7AR, V5IHK, VE1YX, VE3BI, VO1WET, VP5/KN5UG, VQ9KK, VU2KT, VU2MP, W3VVH, W4JF, WP4CTD, WP4NHM, YB1XUR, YB2PBX, YC1MW, YC9BU, ZD7WRG, ZS1FJ and ZS6BXN.

At 24MHz there were 4S7BRG, 8P6FB, 9M6CT, A41LZ, A61AS, BV5BG, HZ1AB, JR6EA, P49M, YB0BAQ, YB0JIU and ZS6BAF/C.

Down again to 21MHz for sideband from 3W6WE, 5A1A, 5B4XF, 5B4/AA0AM, 5B4/RZ3TX, 5B4/UA9MA, 6L0HG (a 'special' from HL), 9H1AA, 9K2OK, 9N1CU, BV2CH, BV98ARL, C91BL, CN8NK, D2AI, D44BS, DU1LKZ, DU1MJW, E21CJN(=HS), ED8CMT, H40AA, HL1ONF, HL2OPD, HS1CKC, HS0ZCL, JAs, KP3A, KP4AA, VP5/KN4UG, VQ9ZZ, VU3BGS, XE1YQQ, YB3ZAA, YB0BAQ, YC8UIP, YC0LBK, YC0LOG, YC0MZI and several ZSs. On RTTY, UA9WFO and YC1DYY were copied and SSTV from JA5ABK, TA1BM and WA6IEL.

Conditions

The bands are recovering from major solar flares on 2-3-4 May. On 136kHz signals went up by around 10dB, but a virtual wipe-out above 3.5MHz balanced that. A brief auroral event occurred on May 4 between 0500 and 0600UTC and enabled 6m operators to work into Scotland.

Working a distance of 2200km, VK3OT reckoned that this was the best aurora since 1989 and WA3WUL in Delaware also noted widespread aurora on 50MHz. On May 10 conditions were still decidedly 'iffy' too.

Post

Beginning with some c.w. from **Ted Trowell**. Ted has a magnetic loop, G5RV and an HF6 vertical. He finds the HF6 better than the others on 21-24-28MHz but this does seem to depend on the time of day.

Even more plaintively, Ted says the grass is growing so fast he can watch it, so every few days he has to trim it from round the base of his vertical!

A new contributor is **Martin Goodey** from Holy Vale, St Mary's, Isles of Scilly - just four days ago my XYL and I passed his front door not knowing he had written to me! Martin has an AR7030 and end-fed 25m wire antenna with which he has logged on 21MHz YV5NNC, ZD9CO, ET3AA, 9K2ZZ, YB1XUR, TJ2GI, J69MV(J6LMV disguised), LU9HG, HI3HN, D44BS, JA0QEV, PT2CC, YC6HDF, and P43A. A short burst or two on 18MHz yielded HS2SY, ZS1VX, and 4S7BRG.

Our next port of call is Oxford, and **Paul Goodhall** who had his listening time cut short when his wife was hospitalised leaving him to do the family chores. Our best wishes and hopes for you both. As with most contributors this time, Paul found openings on 28MHz, interestingly finding 4X4s on the band while 21MHz was unproductive on 14MHz Paul noted the long-path VK opening around 0730.

On Top Band, Paul noted VE3BMV/P and EA1DVY. Among Scottish islands, GM3VLB/P was on Staffa for about 25 minutes only, while GM0KJW/M was on Stronsay. GM3VLB/P re-appeared from Colonsay, GM0KJW/M from Eday, GM3VLB again from Ulva, GM0KJW from Westray, and GM3VLB back on Mull. GM0KJV/M popped up from Burray, GM3VLB from Arran, then Islay, Pladda and GB2HI was on Handa.

GM0EEY/M also operated from Arran, and GM3VLB showed up from Holy Island (The GM one that is) working GM0AXY on the island of May. GM4CHX/P was on the Isle of Ewe, and Scalpa was also represented. All these for the Islands of Scotland Award open to s.w.l.s. Details from **Dave Warburton GM0LVI, Law Vista, Errol, Perthshire, Scotland PA27QQ**.

Now we go to **Colin Dean** in Barnsley. Colin tried 7MHz for A45ZN, A61AJ, A61AQ, AP2KSD, BU0YL, BV2RS, DS5RNM, EK6CC, ET3BT, HL3VQ, assorted JAs, HW0M, JY5HX, OD5VT, SU1SK, SU3AM, YC0AN, ZL1HY, ZS6P, Z22JE, 3V8BB, 5A1A, 9K2RA and 9N1FP. At 18MHz Colin logged AP2JZB, BV5GQ, DU1KT, HL1SSG, HZ1AB, OD5NJ, VQ9KK, 4S7BRG, 5X1T and 9K2ZZ.

On 21MHz the pickings included A61AP, BV4KR, D44BS, ET3AA, HL0Y, HS0/G4UAV, HS0/K4MRH, IH9/OL5Y, JY9QJ, J28DB, J80R, P40J, SV2ASP/A, VP5E, VQ9KK, VU2MPS, V21C, assorted YC stations, 3DA5A, 4F3FVA, 5A1A, 5N1JYT, 8P9IJ and 9J2AW.

Here & There

Some to look out for, courtesy of *DX News Sheet/DX News Magazine*. CY9AA will be on from June 25 to July 15, by VE9AA, 9N1UD between 5 July and November will be K4VUD, and the hope is that a Father Moran Memorial station may be set up, using his old call. Bahamas will be activated between July 10 and August 2 by N4JQQ as C6AFP, while KS4SO hopes to be there on August 24 from Coco Cay, the C6 call not known at the time of writing.

Bill Rindone VE7SBO in *DX News Magazine* notes the deleting of Southern Sudan ST0 from the DXCC Countries list and the reasons. More important, Bill notes that he still has the logs for all the 25 DX operations he did over the years and would be pleased to help any one still lacking a card. Note that he was also WA6SBO.

During the summer, keep an eye open for the IOTA Contest on 24/25 July, and the various IOTA operations outside the contest too.

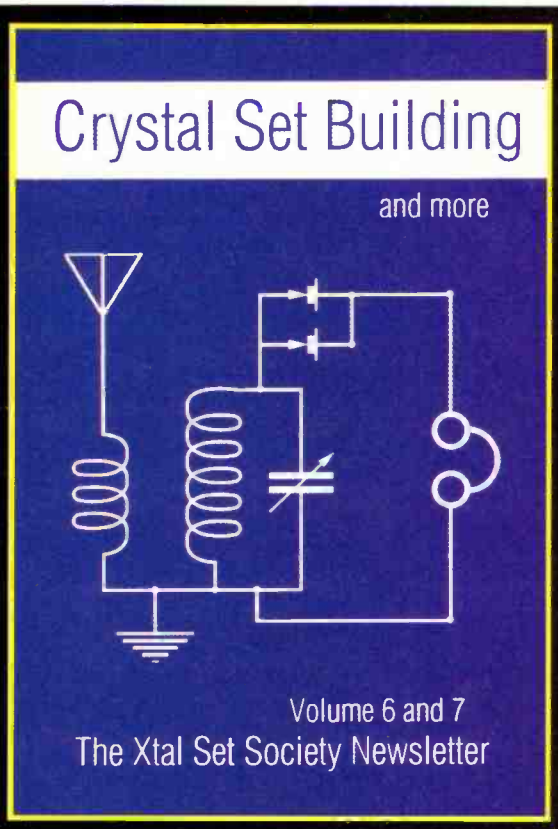
Wrap-up

That, alas, is all we have space for. Letters please to the E-mail address above or to **Box 4, Newtown, Powys SY16 1ZZ** by the first of the month as usual.

Book Reviews

Crystal Set Building and More

Volume 6 & 7 The Xtal Set Society Newsletter
Published by The Xtal Set Society, PO Box 3026, St. Louis, MO 63130, USA
ISBN 1-887736-09-3
168 pages. 229 x 152mm Soft cover
Price £10.50 from the *SWM* Bookstore.



What is amazing about this, the latest offering from The Xtal Set Society, is that not only is there a society devoted to crystal set 'technology', construction and design, but that so much can be written about so simple a concept.

You can get a lot of fun out building a crystal set. It is the ideal starting point for a youngster as there are no batteries to buy and all the components are remarkably cheap.

This book, along with the others in the series, is highly recommended.

Both books are available from the *SWM* Book Store.
PLEASE USE THE ORDER FORM ON PAGE 91

Heathkit. A Guide to the Amateur Radio Products

By Chuck Penson WA7ZZE
Published by Electric radio Press
248 pages 281 x 217mm Soft cover.
Price £21.95 from the *SWM* Bookstore.

This is the complete story of Heathkit written in a very readable manner. Heathkit somehow managed to overcome the major problem that seems to afflict a lot of kit manufacturers - it perfected the ideal instruction manual.

The bulk of the book is taken up by detailed descriptions of every model produced by the company, but the chapter on the history of the company makes compelling reading. Did you know, for instance, that the company was founded by Edward Heath around the turn of the century and that its first kit was an aeroplane in 1926? Or that, like so many hobby radio companies after the war, it got into the electronics business via war surplus equipment? It's all in this book.

■ PETER BOND c/o EDITORIAL OFFICES, BROADSTONE ■ E-MAIL: milair@pwpublishing.ltd.uk

MilAir

Four weeks of chaos at work and a recent family illness have meant that I am writing this month's column a week later than normal. As a consequence I have managed to catch some of the action on the first two days of Exercise Brilliant Foil. As a major part of the southern portion of the exercise was to be based along the Southwest Approaches, I decided to make the 225km round trip to spend some time listening up on Berry Head on the South side of Torbay and also a short time at Yeovilton.

Both St. Mawgan and Yeovilton were due to have aircraft based which were involved in the exercise, so far I have heard 11 and 25 Squadron Tornados at St. Mawgan but at the time of writing I have not confirmed any aircraft at Yeovilton. There were supposed to be Portuguese F-16's and A-7P's at Yeovilton but surprise, surprise!!! - They appear to have been cancelled.

The AWACS controlling events was 'MAGIC 90' who was working in close liaison with 'Crowbar', one of the primary frequencies in use was **378.675** (TAD 070), the AWACS was heard calling several stations including Neatishead and Staxton. The enemy forces were referred to as 'RAQIS' and involved attacks by RAF and French Air Force aircraft mainly operating from Landiviseau in Northwest France. I observed a flight of six Mirage 2000s cross Berry Head on route to some range targets and then I presume to attack St. Mawgan. They then worked London Military on **275.475** before returning to France working French Military in the form of RAKI Radar on **249.85**. MAGIC 90 also identified a flight of Entendards who were on route to intercept some Sea Harriers out of Yeovilton. The AWACS then moved frequencies to **374.85** (TAD 501) where several hostiles were intercepted on route to Pembrey and other ranges.

A full report on Brilliant Foil will appear in a future column, please send any reports of aircraft, callsigns or frequencies in use, to me a soon as possible - thanks.

Mildenhall

Mervyn from Norfolk and **Rob D**, have both written to me regarding the same subject. They have both queried whether the callsign for the 352 Special Operations Group (SOG) at Mildenhall, is Blackcat Ops or Blackhat Ops. Rob has several airband publications and he says that both callsigns are listed in different books. Personally, I was always of the opinion that the callsign was 'Blackcat'. Three years ago I was working at Mildenhall, whilst we were out on the airfield a car pulled up next to us and from the insignia it was obvious that it was the 352 SOG commanders vehicle. Painted on the door of the vehicle was a black cat so I am assuming that is the callsign. Incidentally, one reader asks why Mildenhall and Lakenheath are featured so much in the column - The answer is simple, I get more letters about these two airfields than any others, if readers want to write to me about other airfields I will be glad to include their comments.

Airband Radios

When I read through my post, probably one of the most common questions I get asked by readers is what is the best radio to use for airband listening. This is always a difficult question to answer as all radios have different facilities that each individual feels are useful. Up to now I have elected not to comment or make any recommendations on any particular radio but as a letter has reached me from **Maureen** asking about a specific radio, i.e. the Signal R-525, I will endeavour to answer. Maureen wants to buy a new radio to replace her husband's ageing hand-held, a Yupiteru MVT-7000. She has heard good reports on the R-525 and wants to try to buy a second-hand unit, consequently she asks for my comments on the radio.

To start with, it is a little awkward to use not having a numerical keypad for direct frequency input, but you soon get used to this. It only has 60 memory channels which can be a bit restrictive and the scan is quite slow compared with modern scanners - but if you want a radio that can pull in those elusive signals then this is the set for you. In my opinion, probably one of the most important considerations is the sensitivity of the radio, or in other words its ability to pull-in weak signals that cannot be heard on other sets. Even though it is over 10 years old, the R-525 can still compete on sensitivity with modern sets. I have compared a R-525 alongside an Icom R8500 and the R8500 only just out-performed the R-525 on the airbands. Not bad for a radio built in 1986 and about one fifth the cost of the R8500!

If you think that your husband places excellent sensitivity above the need for hundreds of memory channels then he will not be disappointed with the R-525. It should be noted that the R-525 is now treated almost like a collector's item, they are uncommon on the second-hand market and are usually snapped up quite quickly. Despite its age you can expect to pay between £225 and £300 for a R-525 in good condition, also if you can wait, look out for one that has had the upper frequency coverage extended from 380 to 400MHz.

This month's photograph shows a Super Entendard of the French Navy, (Aeronavale), believed to be part of the attacking forces during exercise 'Brilliant Foil'.

St. Mawgan

My thanks go to **AH** from Newquay, who has sent me some further information regarding the participants in the exercise 'Partnership for Peace', also known as 'Co-Operative Bear 98'. This exercise will take place between the 4th and 11th of September at St. Mawgan and at present boasts quite a cosmopolitan line-up of participants from both East and Western Europe. It is most likely that changes will occur, but the following list was current as of the end of April:

AN-26	Czech AF
RAF	C-130
CN-235	French AF
Romanian AF	C-130
Latvian AF	LET 410
Slovak AF	AN-26
Lithuanian AF	AN-26
Slovenian AF	LET 410
Dutch AF	C-130
Swedish AF	C-130H
Norwegian AF	C-130
Ukranian AF	IL-76
Polish AF	AN-26
Uzbek AF	AN-2

The flying element of the exercise is expected to be between the 8th and 11th September. The USAF are also expected to take part with either a C-130H or a C-141B. One thought - how long have the Romanian AF had Hercules?

Antennas

In reply to the request for information on ex military airband antennas, a reader from Streatham in South London has sent me the address and 'phone number of a military surplus store in Wimbledon. I rang the number and it was unobtainable, can you contact me again Clive. Is the firm still in business?

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Propagation Forecasts

How to use the Propagation Charts.

The charts contain three plots. The lower dashed line represents the lowest usable frequency (LUF), or ALF (Absorption Limiting Frequency). The chances of success below this frequency are very slim.

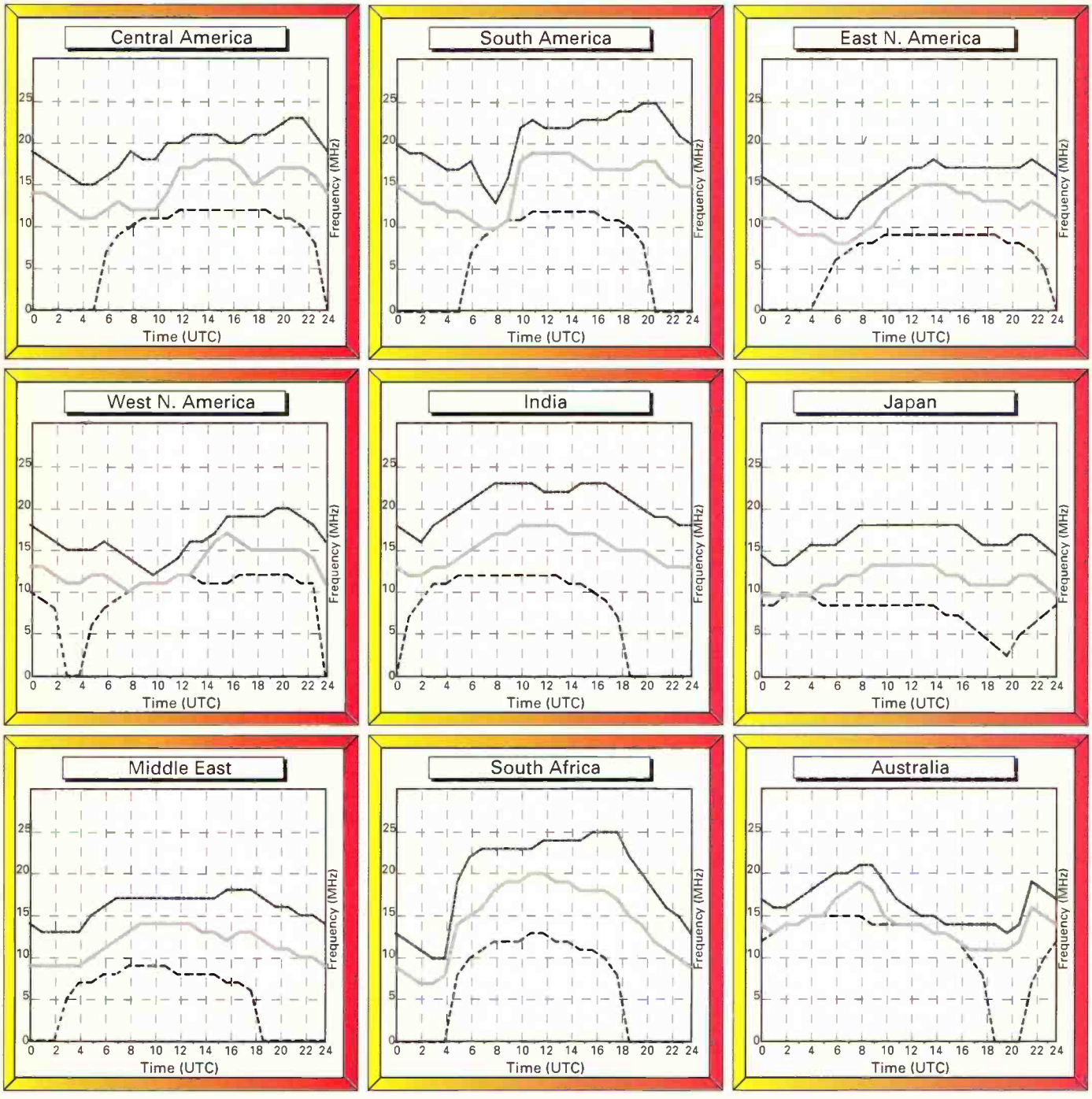
The middle line indicates the optimum working frequency (OWF) with a 90% probability of success for the particular path and time.

Lastly, the upper dashed line, represents the maximum usable frequency (MUF) a 50% probability of success for the path and time.

To make use of the charts you must select the chart most closely located to the region containing the station that you wish to hear. By selecting the time chosen for listening on the horizontal axis, the best frequencies for listening can be determined by the values of the intersections of the plots against frequency.

Good luck and happy listening.

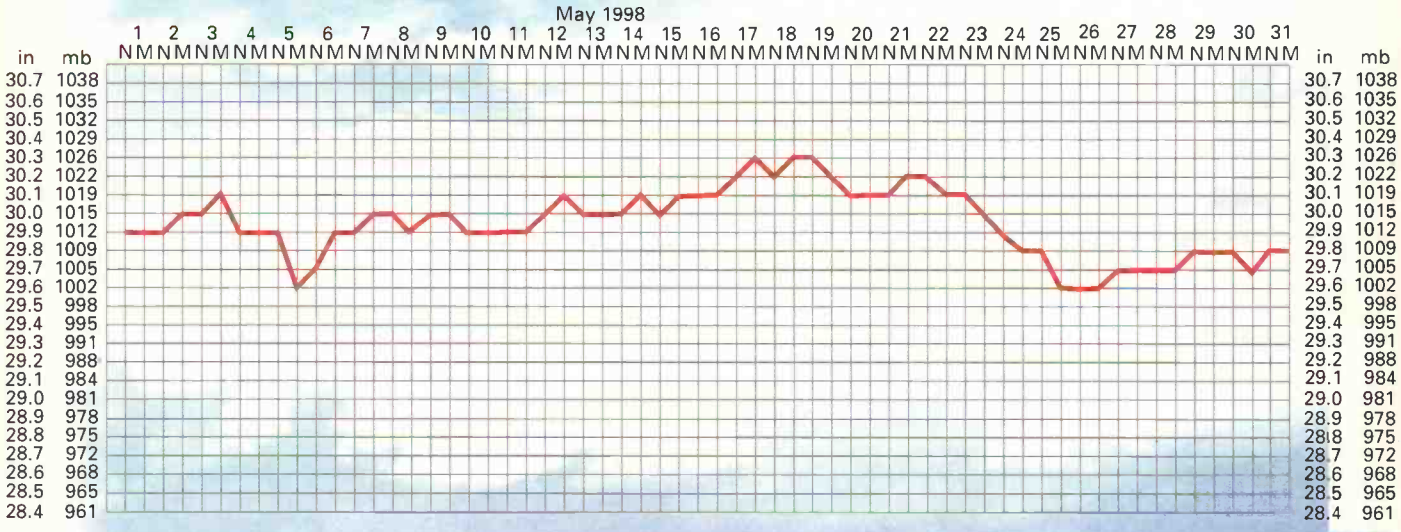
July 1998
Circuits to London

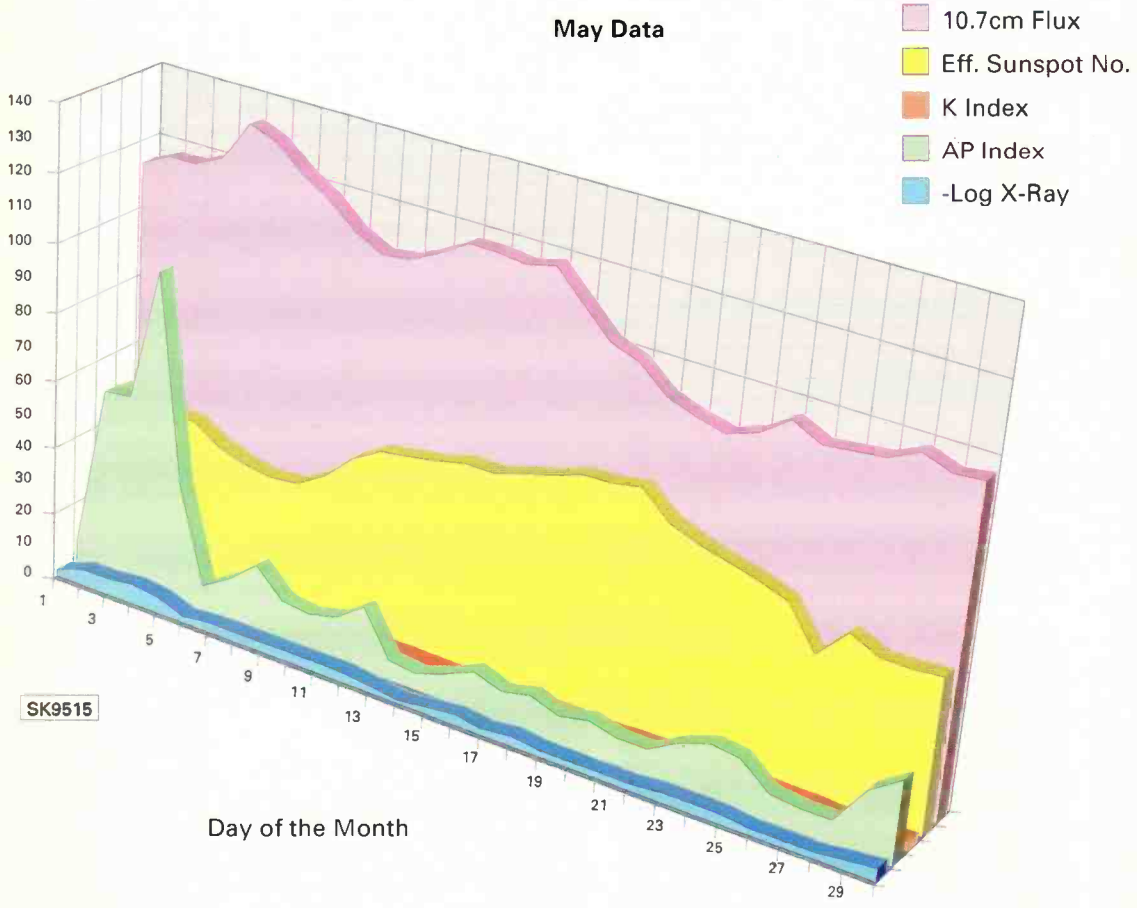


■ KEVIN NICE G7TZC, SWM EDITORIAL OFFICES, BROADSTONE ■ E-MAIL: kevin@pwpublishing.ltd.uk

Propagation Extra

Ron Ham's barometric pressure chart, taken at Storrington, W. Sussex, May 1998.





guide to the chart

The 10.7cm solar radio flux is used as an indicator of the general level of solar activity.

The K and AP indices are measures of geomagnetic activity.

The K index ranges from zero (very quiet) to nine (severely disturbed).

K values of five or greater correspond to geomagnetic storm conditions that can relate to poor propagation conditions.

The AP index ranges from 0 to 400. An AP of 30 is the threshold for geomagnetic storm conditions.

KEITH HAMER & GARRY SMITH, 17 COLLINGHAM GARDENS, DERBY DE22 4FS

DX Television

TEP Reception

Since last autumn, TEP (Trans-Equatorial Propagation) signals from south-east Asia have been encountered in Northern India by **Lt. Col. Rana Roy**. Now, via Dutch enthusiasts, we learn that a TEP path was established between Europe and Botswana last March with signals from Italy (IA) and Spain (E2) on the 14th and 15th respectively.

Of greater importance was the reception of the Egyptian ERTU-2 900W Dumyat relay on the 28th, identified by Arabic text and the Egyptian flag. This is comforting news confirming that Dumyat E2 is still operational despite rumours to the contrary (see the May 'DXTV').

In view of these latest TEP possibilities, Channel E2 should be closely monitored during Italian openings, particularly during mid to late afternoon. In the Eighties, Gwelo (Zimbabwe) on Channel E2 was identified several times by a combination of Sporadic-E and TEP. African signals to watch out for include the following countries:-

Ghana:	E2 Kisi, E3 Jamasi, E4 Accra
Nigeria:	E3 Sokoto, E4 Ibadan and E4 Kaduna
Spanish Equatorial Guinea:	E2 Malabo
Zimbabwe:	E2 Gwelo (may no longer be operational), E3 Bulawayo, E4 Harare
Kenya:	E2 Timboroa (may no longer be (operational)

Keep Writing!

Please send your DXTV and f.m. reception reports, news and information to arrive by the first of the month to:- **Garry Smith, 17 Collingham Gardens, Derby DE22 4FS.**

Months of Sporadic-E inactivity finally came to an end on April 18th with a ten minute display of RAI UNO on Channel A. The month had been generally inactive apart from noise-level Dutch NED-1 signals from Lopik on E4; this has been the only way to prove that the DXTV equipment has been working correctly!

The next Sporadic-E opening materialised on May 1st with a sustained late afternoon bullfight from Spain (TVE-1) on Channels E2 and E4.

When To Look

As you read this column, several 'goodies' should have already been logged via Sporadic-E propagation. If you have missed them, there is still plenty of time left.

Perhaps the best times to try are between 0500 and 0800UTC and from 1700 until 2000UTC for Middle East reception and late evening for Transatlantic reception. These are only approximate times and reception can occur outside these periods.

How much time is devoted to monitoring depends upon personal commitment and lifestyle. Dedicated enthusiasts have been known to plan their annual holiday around the traditionally 'best' DXing dates so as not to miss anything but usually a certain well-known law guarantees two weeks of blank screen!

Peter Barber (Coventry) is retired and monitoring begins before breakfast and ends at bedtime with each session lasting five to ten minutes with gaps of around 30-60 minutes initially, extending later in the day to around two hour gaps. If anything is heard on the scanner or seen on the TV, monitoring is continuous.

Remember, Sporadic-E openings can occur at anytime and without warning. Sometimes an opening may only affect Channel E3 and not others so it pays to check each channel frequently rather than waiting on one particular frequency.

Notch Filters

In most areas of the United Kingdom, Channel RI (49.75MHz) is virtually unusable due to the presence of baby alarms and other carriers operating around 49-50MHz. When strong, this interference may extend down to Channel E2 making this channel also difficult to DX.

In Italy, some cordless telephones are sold with a booster and external amplifier to cover distances of up to 5km, according to **David Bocca Corsico** **Piccolino**. They cause blanking on Channels E2, RI, A and E3 and although illegal, the electronic retailers continue to sell non-approved equipment.

Even when the authorities make it clear that the telephones are illegal and other people can eavesdrop, it still fails to discourage users. The 900MHz versions are still considered too expensive.

In such cases a notch filter can work wonders, although Channel RI may be attenuated somewhat. In practice, careful adjustment of the filter can reduce the interference effect on an RI picture, thus making it more watchable than without one fitted.

Simon Hockenhull (Bristol) has added such a filter in anticipation of the coming season and confirms that Channel E2 is now completely void of interference. Carefully orientating the antenna for minimum pick-up of local interference may also provide a solution provided that only an interference source is responsible.

New Graphics

Central Television have introduced new continuity graphics. Instead of the circular symbol theme the new identification features the name CENTRAL in bland lettering on a coloured background, thus following in the style of Carlton (London area) who own the station.

The graphics are themed and seem to reflect the type of programme which follows. For instance, prior to *Coronation Street* the 'N' in CENTRAL depicts a smoking chimney.

Readers' Letters

Martin Dale (Stockport) has successfully repaired his sticking rotator drive motor following storm damage. The stability of the support mast has been improved by routing it through a piece of waste pipe secured to the chimney stack. For v.h.f. DXing, a Band I dipole has been fixed to the rear of a redundant Band III antenna he discovered in his attic, thus saving mast space.

Some interesting information can be unearthed via the Internet as **Tom Crane** (Essex) recently discovered. It concerned the method by which Dutch and Belgian cable TV companies pick up terrestrial signals from the east coast of the UK for distribution via their cable networks.

Apparently they use very large antennas, including a large satellite-type dish feeding a conventional Yagi. The idea being very high gain coupled with a very narrow beamwidth, much less than a Yagi exhibits.

Gigantic dishes are being used in Cyprus by local terrestrial and cable broadcasters to pick up ET-1 and ET-2 from Greece for local distribution. The square dishes are estimated to be about 50m across! They form part of a

Fig. 1: Spanish (TVE-1) news reporter seen via Sporadic-E.

Fig. 2: Egyptian ERTU-2 news opening graphics. The same opening sequence was seen in the UK via F2 propagation in 1991 from the 900W Channel E2 relay at Dumyat.

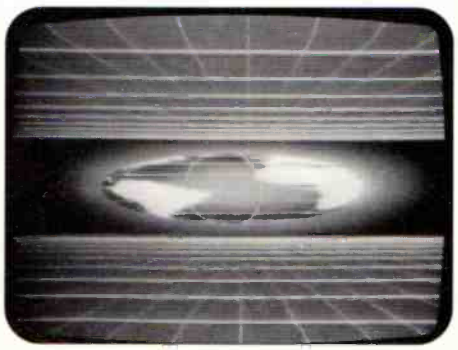


Fig. 3: 'Tros' (Netherlands) identification caption received earlier this year in Bristol by Stephen Michie.

terrestrial TV network, or possibly microwave link, and are directed towards Rhodes, a distance of around 350km.

Spy cameras are part of everyday life in the United Kingdom and few public places are without them. **L.J. Lewis** (Romford) has heard that some shopping centre security cameras transmit to a central control and monitoring department using normal u.h.f. TV frequencies.

Fig. 5: Test card from a private Italian station in Band I.

Has anyone accidentally discovered some of these transmissions while tuning through the u.h.f. band or do they use f.m. video or encryption for added security? Can anyone comment further on this topic?

FM DXing

During Sporadic-E activity, Continental stations can sometimes be received loud and clear using nothing more than a basic f.m. radio with a telescopic rod antenna. For serious DXing, a receiver with an accurate digital frequency readout is essential to enable stations to be correctly logged and hopefully identified.

Bandwidth reduction is available on certain receivers which provides improved selectivity to enable weak stations to be separated from strong adjacent channels. Although expensive, RDS receivers are even more of a bonus as these display the name of the station being received.

Fig. 6: The current BBC-1 Identification Symbol featuring a hot-air balloon floating over Canary Wharf. But there's a rumour that the balloon will be deflated and replaced later in the year. Can anyone confirm this?

Andrew Jackson (Birkenhead) uses a Sony ST-S505ES RDS receiver which has all these facilities. Receiver performance is excellent and during Sporadic-E openings, the narrow bandwidth facility and RDS display is extremely useful.

An external antenna is desirable for serious work, even if only a dipole. Multi-element arrays with eight or more elements are available for the real enthusiast although these might attract adverse comments from neighbours because of their size.

Mike Gaskin (Cornwall) is using a crossed dipole antenna system for f.m. DXing and prefers it to a Yagi. Its multi-directional response means it is particularly suited for Meteor-Shower work and it requires no rotation.

Service Information

Gösta van der Linden (Netherlands) has supplied the following news items:-

Fig. 4: German 1st Network weather caption received by Stephen Michie.

Lithuania: CET has now been adopted which means that clocks will show UTC + 2 hours this summer. The TV6 (Moscow) relay in Vilnius on Channel R26 has changed from SECAM to PAL.

Sweden: Digital TV transmissions have now commenced from the following transmitters:- Stockholm E59, Linköping E42, Göteborg E40, Uppsala E40, Malmö E22, Norrköping E36, Västerås E37 and Hörby E22. Channels E60 to E69 are to be released for digital broadcasting in the near future.

Belgium: A 16:9 version of the Philips PM5544 test card is being aired via all VRT-1 transmitters.

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Airband

Abbreviations

AIC	*Aeronautical Information Circular*
a.m.	amplitude modulation
CAA	Civil Aviation Authority
GASIL	*General Aviation Safety Information Leaflet*
kHz	kilohertz
MHz	megahertz
n.d.b.	non-directional beacon
u.h.f.	ultra high frequency
v.h.f	very high frequency
v.o.r.	very high frequency omni-directional radio range

It's time for the *Red Arrows* again! This year, I'm told, they won't make their appearance from over the crowd for safety reasons. In June (dates in parenthesis) they're expected at Bournemouth (26), Waddington (27 & 28), Plymouth (28) & Tain (30).

July: Chichester (3), Perth & Redcar (5), Marham (9), Wirral (11), Silverstone (12), Culdrose (15), Shrivenham (17), Yeovilton (18), Falmouth (18), North Coates (19), Stromness (21), Peterhead (22), Worthing (24), Fairford (25 & 26), Silverstone (26), Blackpool (27), Lyme Regis (29), Lowestoft (30) & Cranwell (31).

August: Sunderland (1 & 2), St. Mawgan (5) & Whitby (10). That'll keep 'em busy!

Source: *AIC* 52/1998 from the CAA. Changes or cancellations occur at short notice, but try the free recorded telephone message **(0500) 354802** soon after 1900 the night before.

Rescue

Spare a thought for those who routinely put themselves at risk to rescue others. Last November the media news reported that a winchman had drowned while performing a rescue. *Air Accidents Investigation Branch Bulletin* 4/98 page 65 (ref: EW/C97/11/4) details this tragic case. Airband enthusiasts will be surprised to find that the winchman had no radio link to the helicopter, a factor that made this rescue all the more difficult.

It might help readers to understand one important method of winch operations. In this case, a heaving-in line (hi-line) was employed. This is a nylon line with a weight at one end and an attachment to the helicopter's winch hook, via a weak link, at the other.

The winch operator lowers the weighted end down to the ship where the crew must take hold of it - but not tie it to anything. The line then guides the winchman into position as he is lowered. Should it snag on the ship's rigging, there is no danger of the helicopter being dragged down by any sudden movement of the ship. All that would happen is that the weak link would break.

Follow-Ups

It's surprising that the term 'range' (as in v.o.r.) doesn't have a clear origin. I made some suggestions in my article 'What Are the Airbands?' (April *SWM*).

A visitor to my Museum has suggested that early beacons were strung out in a line, reminding me of the peaks of a mountain range. Unlike a v.o.r., these were not omnidirectional. In fact, they enabled aircraft to stick to just one straight line track (per beacon).

One type of beacon was called the AN range. To one side of the track, the repeated Morse letter A (di-dah) would be heard when the beacon was tuned in by radio. The other side of the track yielded the letter N (dah-dit). Spot on track, down the middle, was the equisignal - just a continuous unbroken tone.

Jacques d'Avignon (Canada), our 'Propagation Forecasts' contributor, remembers the AN range. Directly overhead the beacon there was no signal, this area being known as the cone of silence.

Jacques has heard the nautical term "being on the range" if a ship is correctly steered in a narrow passage by lining up shore beacons. I've tried this myself at the entry to a port with shoals to either side, but I'm not aware of this term in current British usage. Could it be, again, local to North America?

Arthur Oglesby (Harrogate) actually flew the Swallow that Chris illustrated for us in May. He reports the need for full left rudder on take-off, I don't advise trying this with cross-wind from the right! Could the engine's torque reaction have exacerbated this effect, Arthur?

As a general note, the photos give ambience to the column but aren't usually the subject of discussion in the text - unless a reader enquires specially as in this case.

Douglas DC-10.
Christine Mlynek.

Radio Procedures

Although we think of air travel as fast, there are speed limits in certain types of airspace. When aircraft maintain separation by 'see-and-avoid' in visual conditions, speed must be restricted to give conflicting flights time to manoeuvre.

Another reason for speed limitation is to enable Air Traffic Control to position flights accurately, for example when lining up an arrival stream for approach to a runway. Speed also affects descent rate which, if incorrect, could cause the aircraft to crash into a tall obstacle.

When Air Traffic Control (ATC) doesn't need to co-ordinate aircraft at a particular speed, the pilot is told "No ATC Speed Restriction" and you now know why. Full details in *AIC* 35/1998.

Non-Radio Procedures

Outside controlled airspace there's no requirement for radio, as **L. Moverley** (London) has noticed. Pilots watch out for each other and give way according to the Rules of the Air, as detailed in the *Aeronautical Information Publication*, *AIP* (from the CAA, but your local flying club will have a copy). Or most teach-yourself-flying books in the local library will give some information.

The rules were originally developed from their seafaring equivalents, so pilots stay to the right of any straight-line feature (e.g. railway) that they are following, avoid oncoming aircraft by turning right, and give way to aircraft on their right. If the weather deteriorates below Visual Meteorological Conditions minima, a diversion to the nearest aerodrome is needed, or even a precautionary landing in a field.

Receiver Hardware

I hope to help **K.M.** (Nottingham) who, in the May 'MilAir,' asked about military antennas. Now, I don't know what they use on ground installations. The portable control caravan at previous Halton Airshows had separate antennas for v.h.f. and u.h.f. Not surprising, they might want to transmit (as opposed to just receive) on both channels simultaneously. I couldn't see what antennas were involved, they were hidden in radomes. The size and shape, though, was compatible with some simple vertical element.

At Duxford, I noticed discones on the control building roof. These can be persuaded to transmit as well as receive a broad range of vertically-polarised signals and are therefore well suited for both v.h.f. and u.h.f. airbands.

Then, when airborne, separate antennas are the order of the day. The ones in my Museum are a design compromise. They rely on the aircraft structure as the 'ground-plane' or lower half of the antenna.

The operative part is shaped aerodynamically and might not be optimum from the radio point of view. Then, when transmitting to ground from a great height, coverage will be good even with uninspiring antennas.

Airbus A.300. *Christine Mlynek.*

So, will something like this help? I can't predict the individual circumstances prevailing at any particular installation but it doesn't seem likely that the airborne or vertical antennas will really be that much better than an Air-44 or a discone. Some antennas will underperform unless provided with the added complication of a ground-plane.

The best advice is to mount the antenna as high as possible, away from obstructions. Waterproof all external connections. Minimise the feeder run and only use good quality cable.

What will happen when the v.h.f. airband is reduced to 8.33kHz channel spacing? At last, new equipment is starting to appear that will cope. Meanwhile, **Neil Radley** reports success with the AR5000 which he says will tune the new channels.

Please note that I haven't access to an AR5000 to try myself, but I suggest finding a busy a.m. frequency and then confirming that no signal is heard when 8.33kHz off-tune. The display might indicate 8.33kHz spacing but it's important that the filters actually achieve adjacent channel separation.

Perhaps you can update us when you try this out, Neil? Please note: E-mails from the UK take **longer** to reach me than first-class post. Someone at the Editorial Offices has to print them out and **post** them to me!

Information Sources

If you would like a list of the 'official' vendors who supply aeronautical charts and frequency lists to the public by mail order, then request my *Airband Factsheet*. It's free if you send a reply-paid, self-addressed envelope (to hold two A4 sheets) to the Editorial Offices at Broadstone (don't send to me, I've not got a photocopier!).

Included is a chart of North Atlantic supersonic routes, the only chart available to enthusiasts (as far as I know after an extensive search). For example, referring back to 'SSB Utilities' in May, route SL4 is shown (including the acceleration point at which it starts).

Frequency & Operational News

Information via the CAA from *GASIL* 2 of 1998 and **Martin Sutton** (*AIP* amendments).

Aerodromes: Guernsey gets new Standard Terminal Arrival Route 1H, Jersey's new ones are 1P, 1Q & 1R. As queried in May page 86, Luton loses Standard Instrument Departures Daventry 2B & 3C, gaining new departures Olney 1B, 1C and 1L. I've not seen the details but Olney is a village north of Milton Keynes. Manchester runways 06/24 are now 06L/24R as they hope to add a second, parallel, runway. Middle Wallop had Approach 126.7, now replaced by Wallop Tower 118.275MHz. Presumably Tower 372.625 (and NATO common 122.1MHz) are still available.

Airways: Where A2 crosses the international boundary in mid-Channel, the reporting point is now called DEVAL. New route UY90 runs TUTON to SKESO and new route Y91/UY91 is via points TINAN, LUMEK and BUKLI (UY91 starts at KURAD); both route from west of Exeter out towards the Channel Islands. UW550 no longer has a section from Southampton to Brookmans Park, this is replaced by UW551. UW550 has new point BOLTA to the east of Teeside. New route UW551 (just mentioned) runs KOMIK, KESON (south of Norwich), Brookmans Park, Southampton.

Beacons: The Stornoway n.d.b. SAY changes from 669.5 to 431kHz. Reporting points. New ones are ATWEL and FILET. I've got more details that I won't bore you with here **unless** someone writes in asking for them.

The next three deadlines (for topical information) are July 7, August 10 and September 7. Replies always appear in this column and it is regretted that **no** direct correspondence is possible.

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Great projects for home, holiday and portable use !

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73 from Dave G4KQH, Technical Manager.

■ ROGER BUNNEY, 35 GRAYLING MEAD, FISHLAKE, ROMSEY, HANTS SO51 7RU

Satellite TV News

In my wilder days of youth as a s.w.l. - circa 1960, Fort Lamy, Chad was regarded as a good radio DX catch in the 5MHz band - it always evaded me! And now 38 years later - and now eligible for Saga membership - to check out *Eutelsat II F4* @ 7°E on April 25th and see emerging out of the noise 'NEWSFORCE SNG4' on colour bars alternating with 'ALFATAH BROADCAST CHAD' (11.145GHz HOR).

The late at night signal - 2330UTC - continued for an hour interspersed with, I assume, the local TV channel output comprising a staged song and dance spectacle, based around a revolutionary theme which included the Red Flag. Anticipating trouble brewing in this South Saharan state, I checked the news and papers but nothing has developed requiring a digital SNG unit in the main town, N'Djamena.

The new digital TEST CARD M - courtesy Snell and Wilcox.

Farnham, Surrey based Newsforce pioneered digital SNG, exploiting the use of lower powers and smaller dishes compared with analogue SNG. The 7°E signal was a European distribution feed ex Geneva in analogue. Interesting that **Roy Carman** (Lake, IW) also logged 'ALFATAH BROADCASTING' on the same EBU feed some days later, again on colour bars.

Whilst talking EBU, definite news has been received from Europe concerning the move by the EBU from analogue to digital picture distribution. It's in writing that the first week of August will see the transfer into the MPEG 4:2:2 coding based on NDS with QPSK modulation. All 55 EBU stations in 48 countries by this time should have upgraded to the new technology - leaving us sat-zappers with old analogue technology and fewer signals! I'm grateful to our friend for advising the frequencies of the new EBU digital world which are duplicated nearby.

Sporting types

The past few weeks has seen a predominance of sporting type feeds, not only the London Marathon but the Boston Marathon was carried on April 20th via *Intelsat K* reports Roy Carman (Sandown, IoW). Another perhaps bizarre sport for Europe is American football which has seen a considerable rise in popularity in recent years. Roy caught them on April 18 via *PAS-3R* (43°W, 12.620GHz Ver) with Barcelona v. Amsterdam, the next day it was Scotland v. Germany (12.705GHz hor, *PAS-3R*).

Obviously a series as April 27th appeared Scotland v. England American football in the NFL - Europe League, via *PAS-3R* (12.705GHz hor again) for Sky Sports. International sound carried at 7.20MHz and the normal programme audio circuit at 6.60MHz.

Welcome at Sandown

Sandown, Isle of Wight, welcomes satellite dishes it seems as **Jim Scofield** has established his earth station just round the corner from Roy Carman. A 1m dish, dual universal l.n.b. into a Strong SRT 339 LTP analogue and Nokia 9600 digital receivers. He comments that American sports such as basketball, baseball, ice hockey, football are featured nightly on *Intelsat K* (21.5°W) but in digital - too many to mention.

One tragedy seen to unfold however was the religious gathering in Mecca, Saudi Arabia, with hundreds of thousands in attendance, a stampede and many people were killed in the stampede. This was carried Westbound into the 'States via *Intelsat K* (11.558GHz Hor digital) April 9th at 1730UTC.

Edmund Spicer is currently sitting French exams at a Surrey University, the family home is near Littlehampton and has used the *Telecom* satellites (5°W in particular) as a source for everyday French language listening - he's watched *Telecom 2B* on his 5°W fixed dish since 1993 and hopes to sail through his examinations - we hope so too!

Apart from the several 'in the clear' TV channels Edmund enjoys the numerous French radio stations available on the different audio subcarriers. On the M6 TV channel (12.522GHz vert - 7.25MHz audio subcarrier) there's been carried for years an encrypted 24-hour radio channel - a metallic sound with data bursts at regular intervals and listed as 'Mood Music 2'.

More recently, this channel went into the clear with a varied selection of music styles, completely at variance with any other French radio station. Astra (19°E) French radio channels such as RFM, Cherie FM and RTL-2 are Edmund's favourites, check out *Astra* 12.129 and 12.207GHz vertical.

Jim Scofield (above) loves sports, so does **Dean Rogers** (SE2) - I've now put them in touch incidentally! *Eutelsat* 7°E again and Dean watched the 24th April live Formula-1 racing, San Marino feeding into ORF, Austria (11.095GHz hor; audio commentary + FX 6.60; fx 7.20MHz). The main international feed

Chad TV received at midnight via 7°E.

After a 10 death coach crash near Valencia, the news feeds via *Intelsat K*..

...were followed by a series of local station test cards.

NTSC test patterns ex USA...

...source unknown, all via *Intelsat K* @ 21.5°E.

***Intelsat K* carried this Australian NINE NETWORK ident with their coverage of the Australian Grand Prix.**

was carried elsewhere on 7°E in SIS but the 'local' Austrian feed was in clear PAL, the same race meeting was carried on ITV + commercial breaks, the 'local' feed into ORF was continuous and uninterrupted. The ITV feed for this event was carried via *PAS-3R* @ 43°W.

Dean is keen on golf and is considering a digital receiver purchase to access the European Tour Golf feeds this Summer (feeds are SkySports; The Golf Channel + an international feed), can anyone advise likely birds and frequencies please, they have previously used *Orion-1* @ 37.5°W?

The Arianespace logo as seen prior to the *Hot Bird 4* launch.

For satellite digiters check out *Intelsat* 1°W 11.622GHz vertical, at S/R 4201 and FEC 2/3 there will be found 'Service 1' on a Saturday afternoon featuring pony trap racing, a Scandinavian favoured sport.

This hot tip from **John Womersley** (Bradford) who is an enthusiastic viewer of Scandinavian programming on both 1°W *Intelsat* and 5°E *Sirius-2*. He's compiled a teletext guide for Scandinavian and several German services, a hot satellite news service can be found on SAT EINS (*Astra*) on page 517 though in German, listings of other satellites are found on pages 675 through to 678.

Seen in digital!

Now I'm of Saga membership age I found an appropriate interview/conference feed on *Intelsat K*, 11.680GHz horizontal, 4th May at 1800UTC, this concentrated on the problems of old age and organised by 'Age Concern'. And May 10th checking out *PAS-3R* and a quite dramatic funeral, police and armed military keeping the crowds at a distance, the coffin, cortege, a mega funeral in fact, uplinked by Telefonica out of Madrid at 1800. I wondered if this a Mafia occasion ?...funerals, Saga, Age Concern, I sound like an analogue geriatric sat-zapper...pass my hot water bottle please...

Another Australian test card, this time the TEN-10 Sydney Master Control (MCR) via *Intelsat K* digital.

The Geostationary Arc

Attempts to control the recent rather cavalier regulation of the broadcasting spectrum in Greece has delayed the opening of the Multichoice Hellas/Nova pay-TV. The state broadcaster now has the say-so as to who opens what and they're delaying the potential rival Nova package until July at least when decisions may be forthcoming as to future digital aspirations. Nova reckons to open with an 18 channel package via 13°E *Eutelsat* with dedicated Greek services, two transponders have already been booked for the anticipated service.

A news feed for TV3, Spain from Washington in digital.

Disney Channel has opened on Orbit Middle East digital package with dubbed programme services (24-hour) as a free standing service to existing subscribers. And a new MTV service opens into the Nordic region June 14th via *Sirius-2* @ 5°E. With an MTV-Russia upcoming this will bring the regionalised services to six. And the lucky folk in Hungary will be able to view Nickelodean from the Autumn, either via satellite, cable or MMDS.

Eutelsat are placing a new satellite - *Europesat-1* - at the controversial 29°E slot to launch in the year 2000 offering Ku-band downink services across Europe, into mid Asia and the Middle East. Their press release mentions their awareness of *Astra* at 28.2°E and Eutelsat's plan claims a peaceful co-existance with their near neighbour.

Intelsat 'de-orbited' their long lived senior '502 bird on April 14th after over 17 years in orbit, it's final operational slot was at 40.5°W in C and Ku-band service. The original expectation was for an orbital service of seven years. Another old timer, *Anik-C2*, was terminated January 7th after 14 and a half years of orbital action from an expected life on launch of more than eight years. And new kid on the Brazilian block is *Intelsat 709* now slotted at 50°W and offering a DTH (direct to home) service into Brazil running three x +50dBW transponders on boresight.

The year 2000 will see *Eurasiasat-1* launch into a 42°E slot alongside *Turksat-1C* offering 32 Ku-band transponders for TV and telecomms. Aerospatiale will construct the new bird and retain a 49% partnership with Turk Telecom 51%. Main ground control will be at the existing Golbasi base, Turkey which will be upgraded in readiness for the launch. Eurasiasat as a company will be located at Monaco gaining tax advantages and avoiding EU regulatory guidelines.

Digital Arts & Music

SVT (Swedish TV) and the BBC are in talks over the formation of a digital arts/musical digital channel to partner ARTE. The service will be dubbed into Swedish. SVT plan a 24-hour news channel to open Spring '99 following the opening of two other digital channels 'Channel One' and 'Channel Two'. These will also parallel transmit in analogue. All of these new channels will be available in terrestrial digital at start-up end '99. An interesting specialist channel, the Russian NTV, is to be included as part of the French CanalSatellite digital package at £6 monthly subscription.

Attempts are being made to 'save' the failed to orbit *AsiaSat-3* that didn't make orbit December 25th. The plan is to fire the satellite's station keeping rockets to make the craft leave it's incorrect Earth orbit, sail round the moon and on its return try to make it hit a geostationary Earth orbit. Mid May should see success - or failure! AsiaSat the company stress that the insurance payout for the lost *AsiaSat-3* is sufficient to fund the replacement *AsiaSat-3R* now under construction at Hughes for another launch attempt by the Russian Proton rocket ex Baiknour during March '99.

Good news for cheaper MPEG receivers next year with smaller, lower power consumption ICs carrying increased circuit packaging, reducing component counts and improving reliability, likely to be into quantity production Spring '99. Circuit alignment will now be reduced and new chips from Philips suggest working voltages can be down to 1.8V.

There is talk of a USA priced MPEG IRD down to $200 retail mid '99. Estimated cost of making a CAM operated MPEG IRD receiver is around $130 currently at the factory gate - I assume this is a Taiwan factory!

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Decode

If you've got Internet access you'll be delighted to hear that I've finally updated my Web pages! All the links have been updated and I've included one or two new features. The first is the proper version of Gordon West's *GWinProp* for Windows. My original attempt to put this on the site failed because I uploaded the wrong version - sorry to all those that were disappointed. All is okay now and the correct version has been on the site since the beginning of May. If you don't have a flashy PC you may be interested to know that I have also uploaded a DOS version of Gordon's propagation program. The function and output is very much the same as *GWinProp* but it will run happily on a much more modest PC. If you know of any other good propagation tools, please drop me a line with the details. Please don't E-mail a copy of the program without first asking if I want it. I know this sounds silly but otherwise my E-mail gets clogged-up with huge messages and it takes an age to check my mail.

Setting Standards

I've had my wrist slapped and quite rightly too! **Anthony Stewart** of Kingham whilst complimenting me on my general accuracy, pointed out that I was lapse in the names I had given a couple of transmission modes. In that column I had talked about a mode called FEC or SITOR-B.

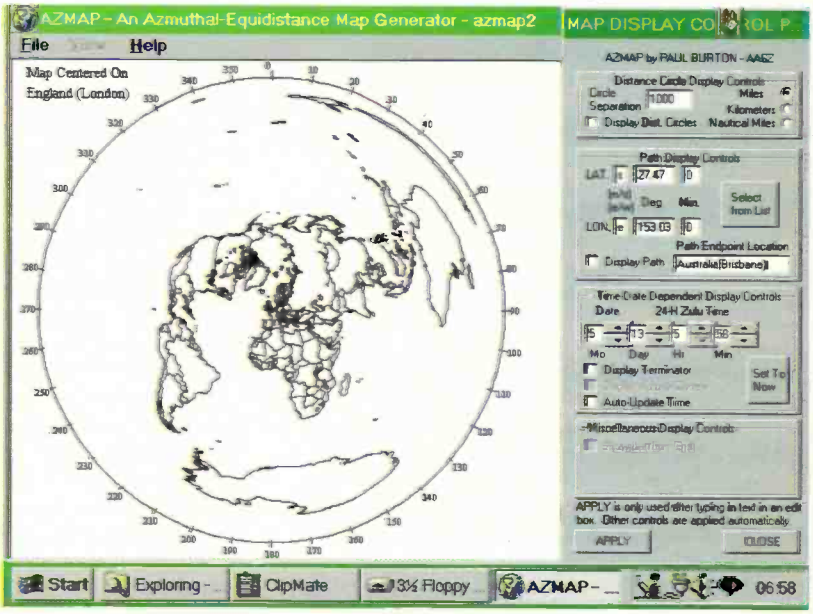
Of course the correct description of the mode is FEC SITOR-B. Now this may seem picky but it raises an important point when dealing with the more complex modes and is actually relevant for the simpler modes too. The problem is that, without clear standards, the newcomer can very easily get totally confused. A classic example is good old Morse Code or should that be c.w. or perhaps A1A or just Morse and is that with a capital letter or not! You see what I mean. To be precise, the system should be called Morse code using c.w. This is because the transmission code is Morse and the actual radio transmission mode is called Continuous Wave or c.w. This latter mode can also be described as A1A which is an international system for classifying modulation systems. This breaks down as follows: A (Double sideband) 1 (A single channel without the use of a modulating sub-carrier) A (Telegraphy for aural reception) - phew!

So you can see that the newcomer has to understand all these variations before he or she can start reading and using frequency lists with confidence. If the most basic modes get this complicated, how on earth can we cope with the more complex systems? It's actually quite easy as a number of experienced amateur and professional monitors have developed some useful standards.

The best amateur source of this information is the various guides produced by Joerg Klingenfuss. Joerg has been in the business longer than he probably cares to remember and has to face-up to the problems of naming new modes as they have appeared. The problem is that many listeners (and professionals) continue to abbreviate the full mode description which then leads to that confusion starting to creep in.

To help put matters a little straighter, I'll run through a few of the more common modes with their standard description and a selection of the 'slang' names you will often find being used. As I've already covered Morse code based systems, lets start with the basic Radio Teletype Systems. Incidentally, RTTY is a generic term used to describe just about all printed text radio transmission systems. ITA2 - International Telegraph Alphabet No2 - This is the bog standard RTTY system that's been used extensively by amateurs and can still be found carrying weather data for Hamburg Met and news reports from Third World countries.

However, you will find this mode called plain RTTY, Baudot (after the man who invented the five digit code) and ITA2. You will also find this same transmission system used to convey other alphabets such as Cyrillic and Arabic. SITOR-A - This is the common chirp-chirp signal that's been used extensively for ship-to-shore communications. You will also find a near identical mode used by radio amateurs but in their case it's called AMTOR mode A. SITOR-B - Now this mode is obviously very closely related to SITOR-A. Despite the similarity of the name, the actual make-up of the signal is quite different. Whereas SITOR-A sends the data in bursts, SITOR-B sends a continuous stream of data. Why the difference? Well



SITOR-A is used when just two stations want to communicate, whereas SITOR-B is a broadcast mode for contacting many stations. So what about the slang names? Well SITOR-A can be ARQ, SITOR, AMTOR or CCIR476-4. This latter is not really slang as it's the number of the International CCIR recommendation that defines the code used for both SITOR-A and B.

SITOR-B can be FEC, AMTOR or CCIR476-4. One of the most common naming errors is the general use of the terms ARQ and FEC. These stand for Automatic Repeat reQuest and Forward Error Correction respectively.

You cannot use these terms to fully describe any mode as they are a general term for the overall mode type. Any mode that uses some form of automated repeat request could be generally described as an ARQ mode but this wouldn't necessarily be very helpful if you wanted to try and receive it. The same is true of FEC. A quick check through the *Klingenfuss Radio Data Code Manual* reveals around fourteen ARQ based modes and a further six that could be described as FEC. So you can see that the slang names can be very misleading. If you want to find out more about the various data modes and how they work then you need to get yourself a copy of the *Klingenfuss Radio Data Code Manual* which is available from the *SWM* Bookstore.

Fig. 1: Screenshot of the *AZMAP* Bearing and 'Grey Line' Program.

Grey Line Aid

One of the tricks used by most DXers is to make good use of the enhanced propagation that exists during the changeover from night to day. As you can imagine at any one time there is effectively a band of the Earth that rests in this twilight zone between day and

night. This area is appropriately called the 'grey line'. The ionosphere undergoes a number of significant changes as the Earth rotates and one of the side benefits is that h.f. signals can travel over much greater distances than normal during this period.

Although the effect is present in the morning and evening you will usually find that the morning gives the best results. This is because all the local interference levels (TVs and home computers) are usually much reduced first thing in the morning. In order to make best use of this very handy phenomena, you need to know what countries are effected by the 'grey line' at the same time as you. Because of the Earth's movement around the Sun this will vary depending on the time of year. So what you really need is some form of prediction tool to help you.

The latest program to come my way is *AZMAP* by Paul Burton (AA6Z). This is a very simple *Windows95* based program that produces a circular projection of the Earth's surface which can be centred anywhere you care to specify. It was originally designed to help radio amateurs adjust their beam antennas by providing heading information. However, the main feature of interest to short wave listeners is the built-in grey line predictor.

This literally produces a grey line or band on the screen and provides an excellent illustration of the 'grey line' position. Another great feature is that it can be set to run in real-time so it will continue update the position of the line every few seconds. You also have the facility to manually enter any time or date you wish to see what it does to the 'grey line' position. All in all this a is very useful program and well worth a look. If you want to try a copy it can be found in **ftp.funet.fi/pub/ham/misc.azmap.zip**

If you know of any other interesting propagation or mapping programs please drop me a line with the details.

RadioRaft Tuning

First of all if you've not tried *RadioRaft* yet then please do so - it's an excellent decoding package. If you find you like it, then please remember to register not only to get the full version but to support the author in his efforts to improve the quality of your hobby!

One of the common problems that face new *RadioRaft* users is getting to grips with the tuning system. In almost every other decoder the tuning aid is usually some sort of frequency meter that tells you when the data signal lines-up with the decoder's tone and shift settings. However, *RadioRaft* uses a very different system and it's this difference that causes the problems. If you're really new you will find *RadioRaft's* tuning display in the top right-hand corner of the main screen and it looks like this ——— <SIGNAL>———.

Many new users expect this to function as a frequency meter with the ideal setting being an even spread of the hyphens. Whilst it is correct to link lengthening of the lines with the best signal, the lines have a very specific function. The lines on the left are used to indicate the error rate of the signal with more hyphens meaning that this aspect of the signal is improving. Rather then being a precise measure of the error rate it really just shows how well the received signal matches the data patterns that would be expected from the selected mode. The lines on the right have a totally different role and are used to show the quality of the signal with more lines meaning better synchronisation.

So as you can see it's not really surprising that some newcomers get a little confused if they try to use the *RadioRaft* system like a conventional tuning aid. So what about the tuning accuracy? One of the benefits of a software decoding systems such as that used by *RadioRaft* is that the program can, in effect, tune itself and decide the appropriate tuning point. The only problem is that you do need to get the signal roughly in tune. Now the best way to do this is by ear, but you can only do this if you have enough experience to know what a correctly tuned signal should sound like.

So where do you start? Well the first thing is to understand what we mean by a correctly tuned signal. In theory, if you can hear the two warbling tones of the data signal this should be good enough. In practice you can improve your chances of reliable decoding if you make sure the two tones are nicely placed in the audio passband of your receiver. If you take it that many h.f. data signals use a shift of 400Hz then the two tones with be spaced by 400Hz.

Next we need to look at the typical passband of a communications receiver. Although the full communications quality speech band runs from 300Hz to 3.4kHz, most communications receivers use a rather restricted range of around 300Hz to about 2.4kHz. As the frequency response of the receiver will roll-off towards the edges of this band we ideally need to find a safe place somewhere in the middle. As usual, there are some conventions or industry standards that we can use.

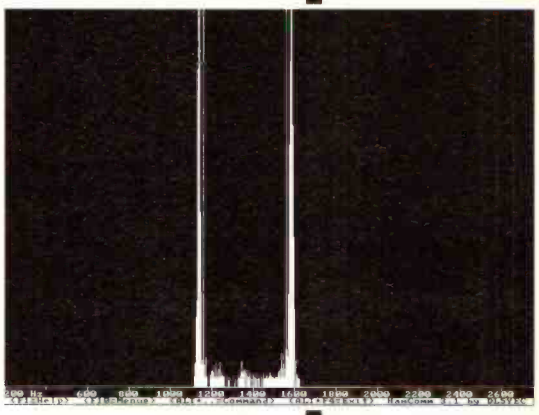


Fig. 2: The regular *Hamcomm* spectrum tuning display.

The most important single frequency is 1275Hz which is normally used for the lower of the two tones. Now this may seem an odd frequency to choose so let's explain where it came from. Back in the early days of data comms over telephone lines, modems were very simple, slow speed devices that relied on the use of just two tones to send data at around 300baud.

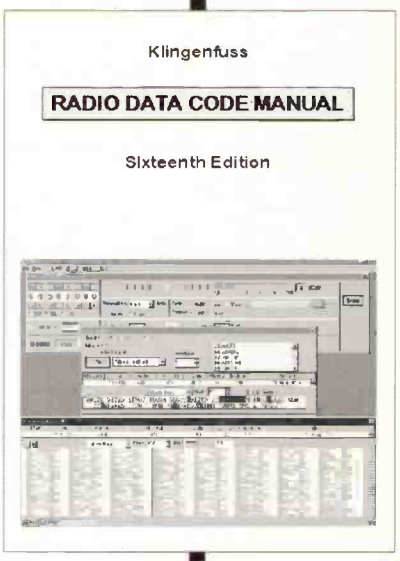
Much of the pioneering work was done by the Bell company of America and they had to face a similar problem of finding the best frequencies to use to send data down a 'phone line. The final solution was to use a tone spacing of 200Hz with frequencies of 1275 and 1475Hz . It was this agreement that set the standard - hence the use of 1275Hz for radio. So getting back to the original problem. With a lower tone of 1275Hz the higher frequency must be this plus 400Hz i.e. 1675Hz. The next problem is how to get used to the sound of these two frequencies.

Another way to train your ear is to use the spectrum analyser facility built into *Hamcomm* to set the tuning. To do this start *Hamcomm* and go to the 'Keying' menu and select 'Var? (...)' set this to 400Hz. Now go to the 'Mode' menu and select 'sPectrum'. You should than be presented with the display shown in **Fig. 1** . All that's left is to tune-in a suitable RTTY signal so that the two humps representing the signal align with the two vertical bars on the tuning display. When you've done this the sound you will hear from your receiver is the sound you need to get to know. You will find that you can very soon learn the sound and then you should find that the quality of your data decoding improves significantly.

If this doesn't crack the problem, then it could be worth trying some audio filtering. Let's just explain why you may need this. Although software decoders such as that used by *Hamcomm*, *JVFAX* and *RadioRaft* are very versatile they can be adversely effected by any interfering signals that may be present along with the wanted data. The best way to get rid of the interference is to use some filtering to limit the band of frequencies to those required by the data signal. The best way to do this is with some good quality i.f. filtering in your receiver.

However, there are not too many receivers on the market that offer much flexibility in this area. The most popular solution therefore, is to use some external audio filtering. With the advances in digital technology you will find that DSP filters offer excellent results at a pretty good price. If you're into the second-hand market or would prefer an analogue filter, keep a look-out for the excellent Datong FL2 and FL3 units. These are very good filters and are also easy to use.

I do however, offer a word of warning when using filters - please don't 'over-filter' the signal. By this I mean don't be tempted to narrow the bandwidth too much, or you will end up making the signal worse not better. The trick is to always keep the filter at least 10% wider that the required bandwidth - if in doubt back it off!



Klingenfuss *Radio Data Code Manual* cover.

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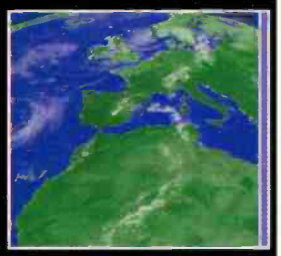
■ **E-MAIL:** info.orbit@pwpublishing.ltd.uk ■ **WEB SITE:** http://www.peverell.demon.co.uk

Info in Orbit

The residential conference on weather satellites held in Newport by the Remote Imaging Group at the beginning of May was a great success - judging from my experiences and the feedback that I received. A separate report will appear in *Short Wave Magazine*.

Stop Press



The first official image from METEOSAT 7 when it became operational 0930UTC 3 June

NOAA-15 Launch...and Problems

The launch of the latest American WXSAT NOAA-15 provided a few surprises! My pre-launch enquiries of the NOAA operations team confirmed that the a.p.t. transmitter (which provides the 137MHz band signal) would be activated shortly after successful injection into orbit - as has been the case with previous NOAA WXSATs. The official post-launch operations schedule lists the timeline along which the various on-board systems are activated, tested and formally declared operational. As an example, the infra-red sensor sub-system is subjected to 'evacuation' prior to 'switch-on' This allows out-gassing and minimises the subsequent precipitation of contaminating material when the cooler is switched on. This is the reason for the 15-days' delay before infra-red imagery is obtained.

The launch was on schedule on 13 May and I received my first pass in Plymouth a few hours later - at 0840UTC on 14 May. It was immediately obvious that all was not well. I have a roof-mounted crossed-dipole feeding a low-loss matched cable into a PROscan receiver - and the signal on 137.50MHz was very low. It was then that I was reminded of the parable of the Emperor's new clothes - was it just me? I sent an E-mail to the WXSAT list concerning the weak signal, and it crossed with dozens of other mails reporting very weak signals - so it was not just me!

My first NOAA-15 picture shows lines (image data) missing where the signal strength simply dropped away for several seconds, and, on occasions, even minutes - **Fig. 1**. The following passes similarly provided very low signal strength. An extract of the NOAA daily report from 15 May is shown in **Fig. 2** I have added a brief explanation where appropriate

Latest tests: As at press deadline the NOAA operations team switched the WXSAT from 137.50 to 137.62MHz to check out the transponder; there appears to be no improvement.

Fig. 1: NOAA-15 0841UTC 14 May low quality first a.p.t. picture received in Plymouth.

"The COMM system's characterisation of the EIRP and antenna patterns is proceeding nominally and will continue today. *Checking out the communication systems and the antenna radiation pattern.*

Spacecraft: currently, the spacecraft's APT signal is degraded. It is possible that the antenna deployment was not nominal, this under investigation. There is also a problem receiving HRPT data format on the ground. We are currently using the TIP data from the beacon downlink (v.h.f.) for real-time operations. Suspected hardware problem, also being investigated. *The APT data is the 137MHz band signal which we are all seeing as very weak; the words 'not nominal' strongly suggests the possibility of the antenna not being in its planned position. TIP data is that contained in the beacon which can be heard on 136.77 or 137.77MHz*

[section deleted]

Communications: data drop-outs between Fairbanks and SOCC are being looked at by GE Aerospace as the drop-outs are common to all operational spacecraft along with NOAA-15.

Scheduling: at NASA's request, scheduling has been asked to not use DTR 5A, which has the Launch Boost data, in its routine operations until after the data can be played back. This request caused real-time "workarounds" throughout the night. Also, it was requested that DTR 1B, the safe state recorder, not be used in routine operations. *DTR is Digital Tape Recorder and this stores all the information about each operation on the satellites. The intention is to avoid losing this precious data before the problem is thoroughly analysed.*

Planned Activities: [part deleted] A second playback of the launch boost data is planned in order to guarantee that enough "independent" copies of the data exist."

[remainder deleted]

Fig. 2: NOAA Report for 15 May (extracts).

NOAA-15 Pictures

On 15 May I obtained the marginal picture **Fig. 3**. Then images started arriving on disk from correspondents. **Alan Jarvis** sent me **Fig. 4**, his recording of a NOAA-15 pass received on 17 May.

Alan, **Les Hamilton** and I spent a considerable time discussing WXSAT matters at the RIG conference, and I was delighted to have such an opportunity to meet so many like-minded people.

Other WXSATs

METEOR 3-5 pictures unexpectedly improved in April. A close examination of earlier METEOR images always showed jitter, in which lines were marginally displaced sideways to varying extents.

Meanwhile, NOAAs-12 and 14 continued to behave nominally and the visible-light images - even from NOAA-12 which has an orbit near the terminator - have been of excellent quality.

Both OKEAN-4 (or 1-7) and SICH-1 have been heard transmitting on 137.40MHz. My own images were limited in quality by the low satellite elevation.

News From EUMETSAT

METEOSAT-5 was the prime geostationary European imaging WXSAT until METEOSAT-6 was successfully commissioned; this became the prime spacecraft from February 1997. On 14 January this year METEOSAT-5 was commanded to start drifting eastwards and was scheduled to arrive at its new slot at about 63°E (over the Indian ocean) for the 18-month long INDOEX project.

METEOSAT-6 and -7

Currently located at longitude 0° (over Greenwich) METEOSAT-6's position will be adjusted for the mission exchange with METEOSAT-7 (currently at longitude 10°E), expected to happen on 3 June. From that date M-6 becomes the backup WXSAT.

METEOSAT Year-2000 Tests

Simulated Year 2000 PDUS and WEFAX data will be provided in June and August; during these tests PDUS data will not be encrypted.

EUMETSAT is to conduct this test in which WEFAX and PDUS

users can check whether their systems are at least, in principle, able to function correctly during the transition through the 1999 year-end. On 17 June, users taking part - that is, everyone who wishes to test their system (no formal application is required) will need to set their computer's clock from 1125UTC to 2325UTC for day 365 1999. There will then be a set of transmissions of PDUS and WEFAX images until 1250UTC (actual real-time) when the test ends. More information is or will be available on the ADMIN slot transmitted on channel A2 from METEOSAT.

Those running the Windows98 operating system should check the manual carefully to ensure that this particular clock change will not compromise their system. Like many others, I have an official beta copy waiting to be installed on my backup computer for test purposes.

Fig. 3 NOAA-15 0821UTC 15 May - the best section!

Satellite Receiving Stations - From Russia

For some time now we have been able to collect a transmission schedule for OKEAN 1-7 from the Scanex site on the Internet. This site is hosted by the Research & Development Centre, Scanex, based in Moscow, which also produces commercial hardware for receiving several imaging satellite systems. They currently produce systems for NOAA h.r.p.t. (ScanEX), RESURS (ScanER), a.p.t. satellites (Liana), METEOSAT and GOMS WEFAX (Liana-M), and GOMS primary digital format (Selena). The web URL is **http://scanex.ss.msu.ru/**

The ScanER personal ground station is designed for receiving data from the Resurs-01 series satellites which have spatial resolutions of 35 and 150m. These PC-based stations are designed for use at research and education institutions, environmental monitoring centres and everywhere where real-time satellite data are in use. One of the main goals of ScanER station design was to provide low cost data acquisition systems. ScanER stations form a backbone in a scheme that the centre proposes to establish regional satellite data centres. The complete product includes a software suite for data processing, archiving and distribution.

The system includes the computer, a 1.6m antenna system and interface, together with the entire receiving system. Operator intervention is minimal. The price depends on the type of system required; as a guide, an educational standard system for receiving RESURS-01-3 costs about $115 000 US, or $145 000 US for the RESURS-01-4 satellite.

Interested parties can contact Scanex directly either by telephone: Tel: **+7(095) 939-5640, 246-2593**, by E-mail: **scanex@scan.ss.msu.ru** or by writing to **Scanex 119021 Moscow, Lva Tolstogo st. 22/5**

A full description of the features of this and other systems can be obtained from Scanex. I plan to provide occasional features on WXSAT hardware and systems from various sources in future editions. Features will include h.r.p.t. and PDUS systems.

Fig. 7: RESURS-01-3 image May 1997 of 'Oil drill polygons' © published courtesy Scanex Centre. Original images show full resolution.

Correspondence

At first glance, **Fig. 8** might seen a little curious. It is actually a night-time 'visible-light' view of the eastern Mediterranean Sea as imaged by a DMSP satellite. The Defence Meteorological Satellite Programme is an American constellation and, thanks to **Hank Brandli**, a satellite meteorologist, I have received a number of pictures courtesy of the US Air Force Weather Agency (US AFWA). Hank helped to run the DMSP program between 1970-71, and then worked at Scott Air Force Base, and Kennedy Space Centre between 1971-76. Hank has continued to receive DMSP telemetry for the last 22 years. The DMSP satellites transmit unclassified but encrypted images on 2207MHz to sites world-wide.

Fig. 4: NOAA-15 17 May from Alan Jarvis.

Fig. 5: METEOSAT-5 full-disc image during drift manoeuvre on 30 April courtesy EUMETSAT.

Jack McEwen G8HIK of Radcliffe, Greater Manchester, sent **Fig. 9** - a picture from NOAA-14 received on 10 May. Jack makes the point that WXSAT pictures can be received on pretty basic equipment - he used a Uniden/Bearcat UBC9000XLT scanning receiver fed from a 2m-band Slim Jim antenna. Jack uses a Pentium 166MMX computer running 'WXSAT'. He adds that the picture is cropped but not enhanced.

Brian Powell recently upgraded his computer by adding a 200MHz CPU to help cope with the increasing workload (I also performed this upgrade - on Christmas Day); I hope Brian remembered to get a larger hard drive for the summer images. Brian has added artificial colour to the image.

Fig. 6: Dish used for receiving RESURS satellite.

Gordon in Grenada

Gordon Train is the software author who produced a satellite predictions program which runs on a computer of minimal specification. He

has also sent occasional images for inclusion in the column, so when he told me of his trip to Grenada in the West Indies I anticipated something unusual. It arrived in the form of a CD containing 75Mb of images and 173Mb of sound file versions of those images!

There are several images which I propose to include in later edition of the column.

MIR Mortals

Karl Hobson of Shipley noticed my regular reference to the well-known voice frequency of 143.635MHz for MIR (there are several others which are used for other forms of telemetry) and made a special effort to monitor it. From Karl's letter, I assume that he does not yet have a satellite tracking program to produce a set of 'listening times', because Karl told me that he personally monitored the signal until, finally, at about 0430 (exact date and time not noted) he picked up the voices of the cosmonauts.

Having proved that he can receive the signals, he mounted a discone high above the chimney, and found a substantial increase in the total time for which he could hear the signal.

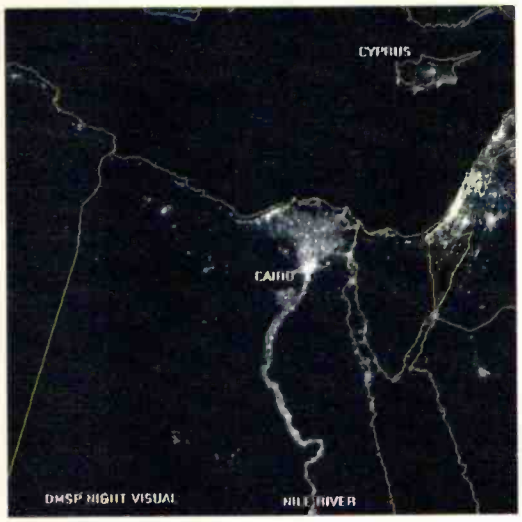


Fig. 8: Nile - DSMP image courtesy US AFWA from Hank Brandli.

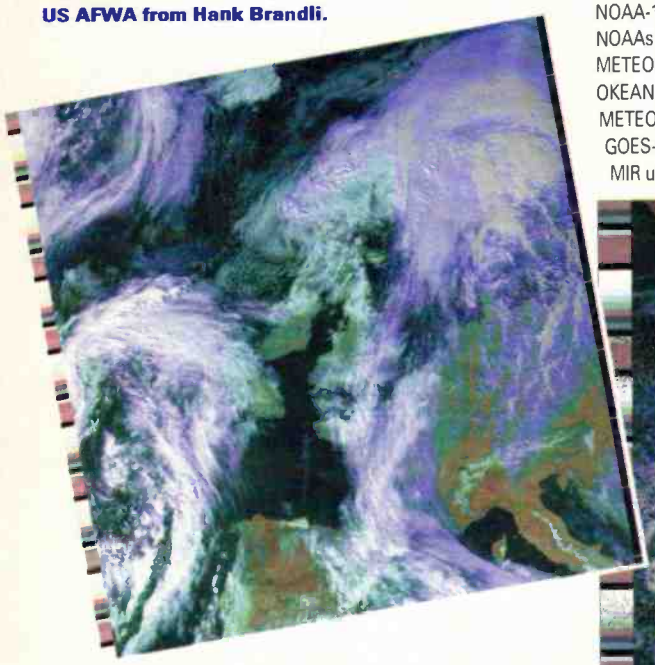


Fig. 10: NOAA-14 1 April image from Brian Powell.

Kepler Elements - MIR & Shuttle

1) For a print-out of the latest WXSAT elements, MIR, and the Shuttle (if in orbit), send a stamped addressed envelope and secured 20p coin or separate, extra stamp. Transmission frequencies are given for operating satellites. This data originates from NASA. During Shuttle operations I send Kepler elements by return-of-post.
2) I also send monthly Kepler print-outs to many people. To join the list please send a 'subscription' of £1 (secured, plus four self-addressed, stamped envelopes) for four editions.
3) You can have the data as a computer disk file containing recent elements for the WXSATs, and a large file holding elements for thousands of satellites. A print-out is included, identifying NASA catalogue numbers (for the WXSATs, Amateur Radio satellites, and others of general interest), ideal for automatic updating of your tracking software. Please enclose 50p with your PC-formatted disk and stamped envelope.

The QFH project

Two months back I referred to the construction of the quadrifilar helical antenna project notes kindly provided by **Bill Sykes** and **Bob Cobey**. Many requests followed this article and it is evident that several people are undertaking construction. I would be very interested to hear about the results when the various projects are completed. I am sure I speak for many when I say "Thank you" to Bill and Bob.

Fig. 9: NOAA-14 on 10 May from Jack McEwen.

Shuttle Schedule

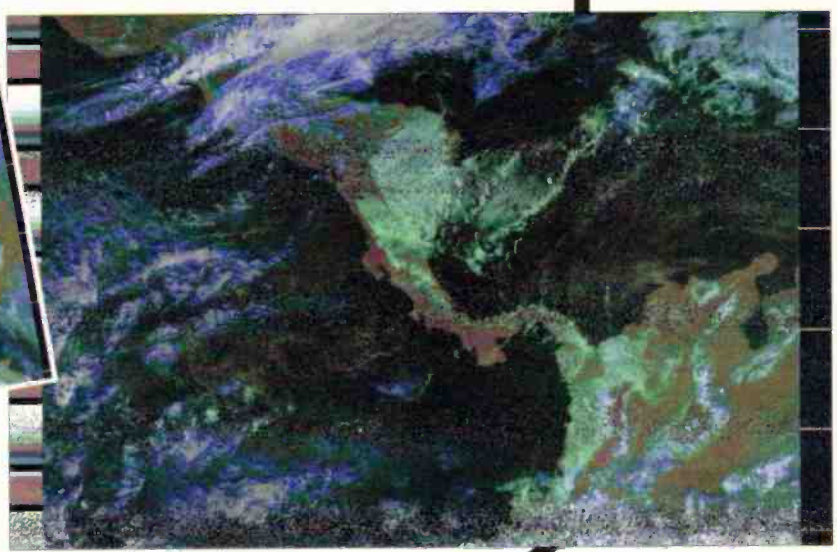
STS-88 Endeavour - First International Space Station component launch - Node-1 (Unity) is scheduled no earlier than 3 September.
STS-93 Columbia - no earlier than 3 December.

A comprehensive listing of all Shuttle flights and payloads, together with associated information is available from me as the *Shuttle Pack*. Please include a £1 and stamped s.a.e. for the A4 booklet.

Frequencies

NOAA-15 may use either 137.50MHz or 137.62MHz after tests (see above).
NOAA-14 transmits a.p.t. on 137.62MHz
NOAA-12 transmits a.p.t. on 137.50MHz
NOAAs transmit beacon data on 137.77 or 136.77MHz
METEOR 3-5 (or 2-21) use 137.85MHz
OKEAN-4 and SICH-1 use 137.40MHz
METEOSAT-6 (geostationary) uses 1691 and 1694.5MHz for WEFAX
GOES-8 (western horizon) uses 1691MHz for WEFAX
MIR uses 143.625MHz for voice.

Fig. 11: NOAA-14 image recorded in Grenada in February by Gordon Train.



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SSB Utilities

One of the benefits of compiling this column is that I get to ask my own questions when I want. For some time now I have been considering building-up a small h.f. listening station using a small receiver, a small a.t.u. and a simple wire antenna. I have in mind which receiver I will use (probably a small Sony), and the antenna will be a simple wire wound on some kind of spool, but I am having problems with a small a.t.u. The one that I use in my set-up at home is quite large, and is certainly not portable. So I thought that I would ask if anyone has any suggestions for a small a.t.u.

I am not looking for any fancy additional circuits in the a.t.u. (mine has a v.s.w.r. meter, which is not necessary), but it does need to be able to accept the signal via either low-impedance or high-impedance connections.

Has anyone any experience in collecting together such a small set-up, and can they offer any advice. Are there any recommendations for a ready-made a.t.u., or should I attempt to construct my own? Answers please!

EAMs

Kevin Wright writes to ask about a station that he heard reciting a long list of letters and numbers. The signals started with Croughton GHFS working station 'Whizbang', followed shortly after by a station with the callsign NEWSCAST. They arranged a 31 Alpha Conference, and NEWSCAST passed a long string of phonetic letters and numbers starting with 'DI6T6E'. Kevin wants to know what was going on.

Well Kevin, these strings of letters and numbers are known as Emergency Action messages (EAMs), and are not be confused with the similar sounding numbers stations as favoured by ENIGMA members. These EAMs are (allegedly) aimed at US forces, usually (or once again, allegedly) the nuclear forces. I did a write-up about them a few years ago as a result of some information received from America. Kevin asks what the message meant, but I doubt very much whether anyone has ever succeeded in decoding these messages, so amateur efforts are really just limited to looking for patterns in the characters, transmission times, and details of who made the transmission.

One of the most significant patterns can be found in the pre-amble. EAMs can be broken down into a six-character pre-amble, followed by a variable length message. The message varies from less than 20 to those in the hundreds. The commonest ones are quite short, usually only 20 characters. These codes probably represent the real message for the intended recipient, and it is thought that the recipient is identified by the six-character pre-amble. After careful monitoring for a few months, it was noticed that these first two characters of the pre-amble are static for a few weeks, and then change to a different pair. There is no set length of time that these characters are fixed, but it does seem to vary between about 18 or 19 days, and about 30-or-so days.

If you have the time and patience, there is a simple method of checking these EAMs. Every time that you hear an EAM, make a note of the start-time, full message (both the pre-amble and the message), and also the transmitting station. The whole EAM is usually repeated twice, so check that you have noted everything correctly. When the EAM sequence is finished, count the numbers and letters in it, and make a note of that figure beside the EAM. If you do this over several days and weeks (this is where you need the patience!), you will see that certain EAMs start with the same first two characters - and after a while they will change to another pair. The trick is to identify exactly when they change from one set to another.

By recording the details of the transmission times and transmitting station, you will find that certain stations start their transmissions at certain times. You will also begin to notice other patterns, such as the way that some EAMs start with different numbers or letters and are much longer than regular EAMs. I'll leave you all to investigate these signals, and write-in with details of what you hear.

Questions

Kevin Wright gets a double mention this month, as his letter asking about EAMs also contained a logging of a Jago flight which deserves more explanation. He says that he heard a flight using the callsign Jago 12, but he could not find this callsign in any of his books. Well, here's the answer; it is a bit long-winded, but it does explain the reason why this callsign is used.

Although the situation in the former republics of Yugoslavia has settled down in the past year, there are still plenty of military forces in the region prepared to go into action should the need arise. This is a UN operation, and the operation changes its name every few years as different UN peace accords become active. Initially, the operation was known as IFOR, and then became SFOR. Currently, it is known as Joint Guard.

Many aircraft involved in flights supported operations in the area use a three-letter callsign code to identify to everyone concerned that they are involved in UN and NATO air operations. Initially, the callsign codes were IFA to IFZ, and then became SFA to SFZ. Now that the operation has been renamed as Joint Guard, the callsign ranges are JGA to JGZ. The final letter of the code is used to identify the country operating the flight, and the following have been noted...see table (right)...

The Americans always like to make words out of their callsigns, and their code JGO is usually pronounced as Jago (or Jay-go) by the pilots.

So, referring back to Kevin's original logging, the Jago 12 flight was a US flight. It is not really possible to work out exactly what kind of aircraft was involved in Kevin's logging, as the JGO callsigns are being used by all sorts of aircraft - VIP jets, transport aircraft, US Army aircraft and helicopters and even (I believe) contracted commercial airliners.

South America

A **Mr. Sillifant** from the West Midlands writes to ask about some signals that he heard in April. He seems to be a bit of a night-owl, as he was listening between midnight and 0100 (well past my bed-time!). He was tuning through the 5MHz aero band (5.480 - 5.730MHz) and came across two stations on frequencies that he had not heard before.

The first of these was Bombay ATC on 5.648MHz. I find this strange, as there is nothing listed for this frequency in any of the books that I have seen (*CFL* 10th Edition, Klingenfuss, Photavia). The second station was more interesting; on 5.595MHz he heard an unknown South American station which seemed to be conducting some kind of rescue service. Mr. Sillifant asks if anyone can provide any additional information on either of these stations. All that I can find in my books for the second frequency is the ATC area control centre (ACC) at Guayaquil in Ecuador, which in itself is a rare station to hear. I have never seen any loggings of this station before, has anyone else heard this station?

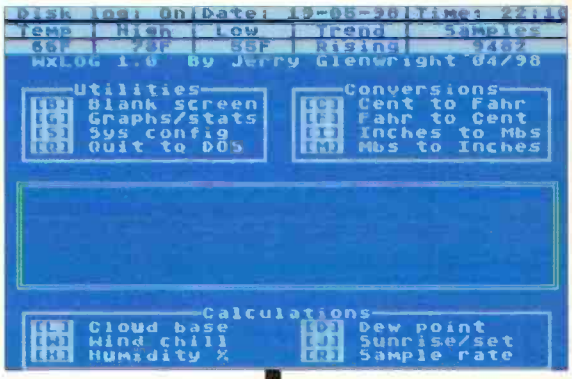
It could have been something like this McDonnell Douglas F-15 Eagle of the USAF, Kevin.

CALLSIGNS

JGA	Belgium
JGB	Canada
JGD	France
JGE	Germany
JGF	Greece
JGG	Italy
JGI	Netherlands
JGK	Portugal
JGL	Spain
JGN	UK
JGO	USA
JGP	Turkey
JGW	Slovenia

■ JERRY GLENWRIGHT, 23 DOWNLAND AVENUE, SOUTHWICK, WEST SUSSEX, BN42 4RF ■ E-MAIL: shackware@pwpublishing.ltd.uk

Shackware



I t'll have been said again and again by the time I reach print but thanks, Dick, for your years as editor of *SWM*. Under your direction, *SWM* has been a consistently excellent magazine that previously I read avidly, and now happily contribute to. Here's to a long and enjoyable retirement (and many years at the lathe!). Congratulations to able assistant and now new editor, Kevin Nice.

(Occasional) Computer Cameo

Not actually quarterly any more but still, I hope, useful for those boot sale finds! This time it's the turn of the venerable ST, a 16-bit 68000-based machine that, in its day, was all set to take the computer world by storm.

Back in the middle-80s when the PC was just beginning to make its presence felt as a viable home computer in the UK (courtesy of Amstrad), and the Macintosh offered a windows-and-mouse user interface that would cost you your first born to finance, Jack Tramiel, erstwhile founder/owner of Commodore, sold up, slipped quietly away and resurfaced six or so months later as the new owner of Atari Inc., bought from ailing parent company Warner Bros. for not many millions - and some of that as a loan from Warner itself.

Tramiel renamed the company Atari Corp. and himself Uncle Jack, and set about single-handedly revitalising the stagnant home computer industry by launching a competitor to the successful but expensive Apple Macintosh. Dubbed the 'Jackintosh' by media wags, the machine used the same 68000 processor and a 'windows' interface based on GEM from Digital Research. The result was a computer around 20 per cent faster than its Apple peer and with a bigger screen and potential for a colour as well as a mono display, at a price less than a quarter of the Mac's.

In Europe and the UK the ST was an instant and convincing success. In the States however, it fared rather less well. In a land where income is large, our transatlantic cousins were less worried by the expense of computers such as the PC and Mac. The ST faced an uphill struggle and one which it eventually lost. However, in the UK the ST enjoyed around ten years of healthy sales and software support before slipping. Today, you'll find a plain-vanilla 512K ST with a built-in 1Mb 3.5in disk drive for around £25 at boot sales – often a bit less.

A good machine in the shack then? Very. Last time I told you about the excellent *FaxCode* shareware data modes package from Dave Miller, and there's also *Pictures From Space*, another shareware offering which decodes APT from weather satellites. There are also any number of Morse tutors, data logs, electronics utilities and so on. What's more, underlying the ST's GEM interface is Digital Research's CP/M-86, an updated, multi-tasking version of the once hugely popular CP/M operating system. It's therefore easy to run a CP/M emulator on the ST and tap into the substantial quantity of CP/M radio-oriented software - check-out regular advertiser PDSL's cheap CP/M CD containing hundreds of Mb of CP/M software and quite a bit of 'shacksoft' too!

It's also possible to run PC emulators, though these usually provide only basic DOS operation and, given the ST's slightly cut-down RS-232 port, cannot be used with DOS-based PC radio software for the most part.

That said, user groups abound, peripherals are plentiful and...well, it's a fine machine and one which will be a very useful tool for s.w.l.s who need a cheap computer.

All My Own Work...

Those of you whose primary interest in listening is using what you hear to further your knowledge of things meteorological may be interested in some code I'm writing at the moment which offers real-time weather data logging to disk, as well as a host of weather-oriented conversion and calculation routines.

As a self-confessed meteorological nut and avid consumer of radio and weather guides such as Philip C Mitchell's *Weather Reports From Radio Sources*, I'm fascinated by the depth of data that can be gleaned from the airwaves.

Naturally, there's some excellent weather-oriented software available in the PC world but try looking for stuff for other machines and suffice it to say, you'll look for a long time with little chance of success. That's what prompted me to write my own and the result is *WxLOG*.

When used with a simple home-brew interface and the Maplin temperature module (around £9), the software can continually monitor outdoor temperature, plotting mini graphs, and saving the results to disk in a variety of formats (including ASCII and the once popular DIF format used by *VisiCalc* and lookalikes). These disk logs can then be manipulated by your favourite spreadsheet, statistical analysis or graphing package to uncover interesting trends. Sampling frequency is anything from 1 second to 78 hours, and the software tracks highest and lowest temperatures too.

WxLOG also offers a variety of useful conversions and calculation: centigrade to Fahrenheit, inches to millibars and *vice versa*, estimated cloud base, humidity, dew point and the wind chill factor.

I plan to upgrade the software to offer continuous humidity, atmospheric pressure and possibly wind speed monitoring too just as soon as I can find suitable modules to attach to the computer. *WxLOG* is in beta at the moment but I'll let you know when it's completed, whereupon it will be available for the price of a 5.25in disk and s.a.e.

Until next time, good listening.

Mail Bag

When I began writing this column two and a bit years ago, I confessed I was a something of a freak where the Atari 8-bit was concerned. While they pale before today's mighty Intel-driven monsters, Ataris can still prove a useful tool in the shack. I've had to work hard to control my urge to mention them in every instalment but this month I've got a good excuse - two in fact - for a 'ShackWare' Atari special. The second is some self-penned software for listeners who are also amateur meteorologists, but first, let's read a few lines written by **Robert Bosher** of Sunderland.

"I noted in one of your first columns that you praised the old 8-bit computers from Atari so when I saw one at a boot sale I bought it for £4.50!" writes Robert. For that sum Robert also got a 1050 disk drive, a 1010 cassette recorder, a joystick and several games programs on tape. Now however, he's bored with the games and wants to know what he can do with the machine in his shack. "I've yet to explore computers at my station, but I'd quite like to try my hand at decoding some of the easier data modes – is this computer suitable?"

Perfectly - though within limits. By home-brewing a simple interface using a few pound's worth of components available from Maplin, you can decode FAX, and save the results to disk for later enhancing or printing. This is a two-colour only decode but as an introduction, the results are more than acceptable.

There's also a very good home-brew c.w. interface that you can make and use to decode Morse transmissions on the fly. Both of these devices are suitable for beginners and require only an ability to use a soldering iron and read basic electronics diagrams. I'll pass on the instructions and software to interested s.w.l.s who send me a s.a.e. and a 5.25in disk.

The books listed have been selected as being of special interest to our readers. They are supplied direct to your door. Many titles are overseas in origin.

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LISTENING GUIDES

Airband

ABC CIVIL AIRCRAFT MARKINGS 1998. Alan J. Wright	336 pages	£6.99
ABC MILITARY AIRCRAFT MARKINGS 1998. Alan J. Wright	192 pages	£6.99
AIR BAND RADIO HANDBOOK 6th Edition. David J. Smith	192 pages	£9.99
AIRBAND RADIO GUIDE 3rd Edition. Graham Duke.	96 pages	£6.99
AIRCRAFT RADIO FREQUENCIES & GUIDE BOOK 2nd Edition	96 pages	£5.99
AIR TRAFFIC CONTROL 7th Edition. Graham Duke	112 pages	£7.99
AIRWAVES 98.	100 pages	£8.95
CALLSIGN 98.	156 pages	£8.95
FLIGHT ROUTINGS 1998. Williams		£6.95
INTERNATIONAL AIR BAND RADIO HANDBOOK. David J. Smith	192 pages	£9.99
UNDERSTANDING ACARS		
3rd Edition. Aircraft Communications Addressing and Reporting System. Ed Flynn	80 pages	£9.95
VHF/UHF AIRBAND FREQUENCY GUIDE & CALLSIGN GUIDE	280 pages	£12.50
WORLDWIDE AERONAUTICAL COMMUNICATIONS FREQUENCY DIRECTORY		
2nd Editon. Robert E. Evans	260 pages	£19.95

Datamodes

FAX & RTTY WEATHER REPORTS. Philip Mitchell	88 pages	£11.50
GUIDE TO UTILITY STATIONS. 16th Editon. Joerg Klingenfuss.	588 pages	£35.00
GUIDE TO WORLDWIDE WEATHERFAX SERVICES. 17th Edition		
Joerg Klingenfuss.	436 pages	£25.00
WEATHER REPORTS FROM RADIO SOURCES. Philip Mitchell	32 pages	£7.50
RADIO DATA CODE MANUAL. 15th Edition. Joerg Klingenfuss.	604 pages	£28.00

DXTV

DXTV FOR BEGINNERS. Simon Hamer	31 pages	£3.95
GUIDE TO DX-TV. Kelth Hamer & Garry Smith	36 pages	£3.95
GUIDE TO WORLDWIDE TV TEST CARDS	60 pages	£4.95
THIS IS BBC TV - FIRST 30YRS OF TV GRAPHICS. Keith Hamer & Garry Smith.	38 pages	£4.95
THE FIRST 30 YEARS OF BBC-2. Keith Hamer & Garry Smith	60 pages	£4.95
THE STORY OF BBC COLOUR TELEVISION.	36 pages	£5.95

Frequency Guides

1998 SHORTWAVE FREQUENCY GUIDE. Joerg Klingenfuss.	584 pages	£23.00
1998 SUPER FREQUENCY LIST CD-ROM. Joerg Klingenfuss.		£25.00
* FERRELL'S CONFIDENTIAL FREQUENCY LIST 10th Edition.	450 pages	£19.95
GLOBAL RADIO GUIDE 1998	40 pages	£3.95
PASSPORT TO WORLD BAND RADIO 1998.	528 pages	£15.50
RADIO LISTENERS GUIDE 1998	112 pages	£4.50
SHORTWAVE INTERNATIONAL FREQUENCY GUIDE	176 pages	£12.95
VHF-UHF SCANNING FREQUENCY GUIDE. Bill Laver	192 pages	£12.95
WORLD RADIO TV HANDBOOK 1998	608 pages	£18.95

General

BUYING A USED SHORT WAVE RECEIVER 3rd Edition (Booklet). F. Osterman	23 pages	£2.95
GETTING ON TRACK WITH APRS. Stan Horzepa WA1LOU	165 pages	£11.50
POP WENT THE PIRATES. Keith Skues.	568 pages	£15.95
*SHORT WAVE COMMUNICATIONS. Peter Rouse GU1DKD.	187 pages	£4.50
SHORT WAVE DIRECTORY (LOOSE LEAF). Bob Grove		£8.00
SHORT WAVE DIRECTORY BINDER		£4.00
SHORT WAVE RADIO LISTENING FOR BEGINNERS	174 pages	£13.95
SHORTWAVE RECEIVERS PAST & PRESENT (NEW 3RD EDITION)	450 pages	£25.95
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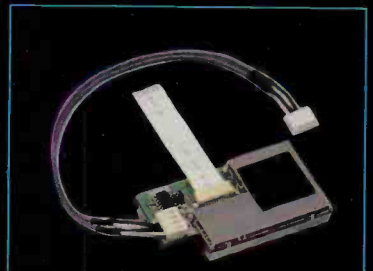

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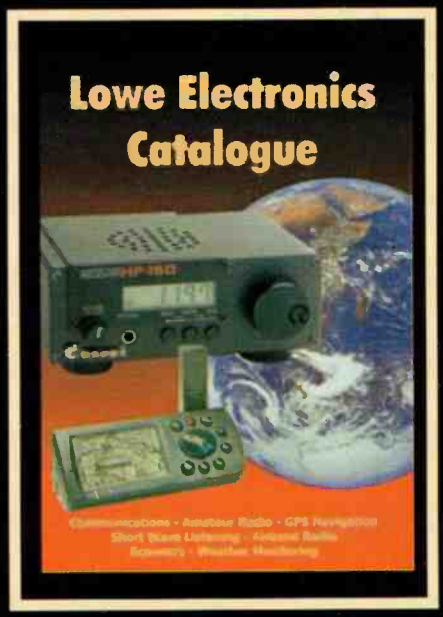

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