

OVER 2000 FREQUENCIES TO LISTEN TO IN THIS ISSUE

# shortwave magazine

October 1996 £2.50 ISSN 0037 - 4261

## TOP SECRET

**The Definitive Numbers  
Stations Supplement**

### ENIGMA

The Story of The Bombe

Active Antennas

Radio Rovers - 2

**The 'Wilson Review' -**

AOR DDS-2a

**Previewed**

New AKD Receiver

Frequency

Exchange

the truth is  
in here...



10 >

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AIRBAND SATELLITES BROADCAST DX TV SCANNERS



### AOR AR8000

Still the No.1 seller

- 500kHz-1900MHz
- Computer control
- Data clone
- 1000 Memories
- C/w NiCads & charger

**£349**



### AOR AR2700

- 500kHz-1300MHz
- 500 Memories

**SPECIAL PRICE**  
~~£269~~ **£189**



### YUPITERU MVT7100E

NEW EMC version of this popular radio.

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- AM/FM/WFM /SSB/CW
- 1000 Memories
- C/w NiCads & charger

**£299**



### TRIDENT 2400

One of the most comprehensive scanners on the market with a superb Rx front end.

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- Data clone
- C/w NiCads & charger

**£299**

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*We've got them*

# ALL!!



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- 66-512MHz (with gaps)
- 50 Memories
- Covers UK Civil Airband

**£99**



### COMMTEL 204

Top of the range handheld.

- 68-1000MHz (with gaps)
- 200 Memories
- AM/FM
- Requires NiCads & charger

**£169**



### TRIDENT 980

Triple conversion sensitive receiver.

- 5-1300MHz
- 125 Memory storage
- AM/FM/WFM
- Direct keyboard /rotary control
- C/w NiCads & charger, DC cigar lead, earpiece, carry strap

**£249**



### BEARCAT UBC 3000XLT

New top of the range handheld from Uniden with TURBO SCAN

- 25-1300MHz (with gaps)
- TURBO SCAN
- 400 Memories
- AM/FM
- Supplied c/w NiCads & charger

**SPECIAL PRICE**  
**£225**



### uniden BEARCAT UBC 220XLT

Easy to use with a good receiver.

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- AM/FM
- Supplied c/w NiCads & charger

**£189.95**



### uniden BEARCAT UBC 120XLT

Airband handheld that is easy to use with TURBO SCAN.

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

**£139**



### uniden BEARCAT UBC 65XLT

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- 66-512MHz (with gaps)
- 10 Memories
- AM/FM
- Required: 5 x AA Batteries

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**£89.95!!**

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## UBC 9000XLT



and tape output feature! Accessories included: AC mains power adapter, telescopic antenna and owners manual.

**£325.00**  
Optional CTCSS board .....£49.95



### BEARCAT UBC 860XLT

Wideband base scanner with TURBO SCAN. COVERS CIVIL AIRBAND.

- 66-956MHz (with gaps)
- 100 Memories
- AM/FM
- 12V DC
- Mains adaptor supplied.

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Low cost scanner covering UHF telephone band.

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

**£149.00**



uniden



### REALISTIC PRO 50

Low cost scanner covers Marine, Police, etc.

- 66-512MHz
- AM/FM
- 20 Memories
- Requires 6 X AA Batteries

**£99**



### REALISTIC PRO25

- 20 Memories
- Hyperscan
- 68-88, 137-174, 406-512, 806-956MHz

**£169.95**



### REALISTIC PRO 2037

A NEW Base scanner with triple conversion receiver.

- 66-960MHz (with gaps)
- 200 Memories
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- Hyperscan
- 240VAC or 12V DC operation

**SPECIAL!! £179.99**



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## Europe's Number 1 Supplier

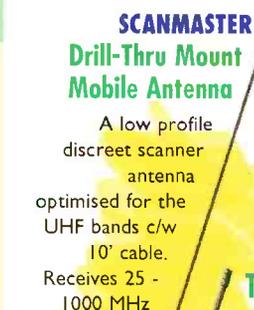
**SCANMASTER Base Stand**  
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**£19.95**



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**SCANMASTER Drill-Thru Mount Mobile Antenna**  
A low profile discreet scanner antenna optimised for the UHF bands c/w 10' cable. Receives 25 - 1000 MHz  
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**SCANMASTER TSC 2601**  
Handheld scanner high gain antenna, 29cm long, covers 100 - 1000 MHz with 3.4 dB gain @ 900 MHz  
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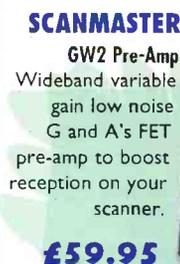
**SCANMASTER SP55 Pre-Amp**  
Using latest surface mount technology, with variable gain - 6dB to + 20 dB and three selectable bandpass filters this top range Pre-Amps will boost your scanners performance from 24 - 1500 MHz.  
**£69.95**



**SCANMASTER On Glass**  
Window mounting mobile scanner antenna 25 - 1300 MHz with cable.  
**£29.95**

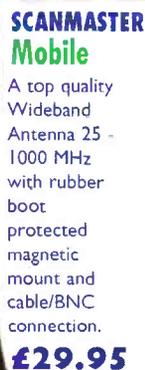


**SCANMASTER GW2 Pre-Amp**  
Wideband variable gain low noise G and A's FET pre-amp to boost reception on your scanner.  
**£59.95**



# SCANMASTER<sup>®</sup> by NEVADA

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A top quality Wideband Antenna 25 - 1000 MHz with rubber boot protected magnetic mount and cable/BNC connection.  
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**NEW! SCANMASTER Active Discone**  
As above with 20 dB Pre-Amp available august  
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**BEWARE LOW COST IMITATIONS!**



**SCANMASTER Double Discone**  
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• 25-1300MHz  
• Ultra wideband TX Capability



**NEW! SCANMASTER Active Base Antenna**  
As above with 20 dB Pre-Amp available august  
**£59.95**





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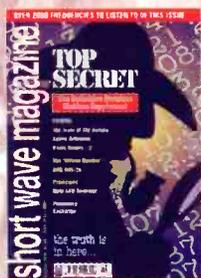
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Cover  
 Subject

Sherlock Holmes  
 conveys the  
 clandestine nature of  
 our main topic this  
 month - the Numbers  
 Stations.



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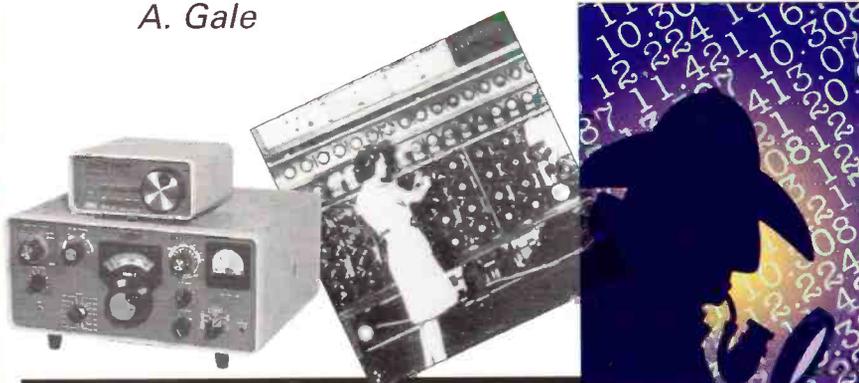
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*Good Listening*

**DISCLAIMER.** Short Wave Magazine wishes in no way to either condone, or encourage, listeners to monitor frequencies and services which are prohibited by law. We respectfully refer you all to both the Wireless Telegraphy Act 1949, and the Interception of Communications Act 1985. Some of the products offered for sale in advertisements in this magazine may have been obtained from abroad or from unauthorised sources. *Short Wave Magazine* advises readers contemplating mail order to enquire whether the products are suitable for use in the UK and have full after-sales back-up available. The Publishers of *Short Wave Magazine* wish to point out that it is the responsibility of readers to ascertain the legality or otherwise of items offered for sale by advertisers in this magazine.



# Communique

SEND YOUR NEWS TO KEVIN NICE AT THE EDITORIAL OFFICES

## Trippin' To Hamfest



Are you a radio amateur, s.w.l. or just interested in computers? If so, the **Barnsley & District Amateur Radio Club** are again running a coach trip in June 1997 to the largest Hamfest in Europe, Ham Radio '97 at Friedrichshafen. Accommodation is just off the beautiful island of Lindau, on the southern shores of Bodensee for six nights.

The organised trip will be staying bed and breakfast in one of the local hotels. For people wishing to make their own accommodation either in Lindau or Friedrichshafen the club are also doing transport only.

For further information or an information pack on this event, contact **Ernie G4LUE**, Secretary of the radio club, at **8 Hild Avenue, Cudworth, Barnsley, S. Yorkshire S72 8RN** or telephone Ernie on **(01226) 716339** or mobile on **(0836) 748958**.

## A Vision Of Tomorrow

Travel into tomorrow's electronic world at Connect, a home entertainment experience presented in association with Central Broadcasting, which debuts at the Birmingham NEC from the 18-27 October 1996. Connect will transport you into the dynamic and developing world of technology, providing an interactive experience into the world's latest consumer electronics.

The event will feature a purpose built TV studio, giving a unique

insight into the world of television and a sneak preview into Central's new £1.5 million headquarters, Central Court, in the heart of Birmingham. The Connect sound stage, a state of the art 'UFO' structure will be the focal point for impressive entertainment planned for the show, including top chart bands, light shows and lots more.

The feature will also incorporate a fully operational Show Radio Station broadcasting up to the minute 'what's on' information and show news, live from the NEC.

All of you budding photographers out there will have the chance to take pictures of your favourite sets using the latest in camera technology. The National Museum of Photography, Film and Television and The Royal Photographic Society will also be displaying film sets from the museum plus their new digital morphing studio.

There's so much more to say about Connect, but not enough room here in 'Communique'. So, for further information on tickets, prices, times, etc., contact **Emma Hill** or **Helen Coop** at **Charles Barker** on **0171-830 8423**.

## LOWE AT HONG KONG ELECTRONICS FAIR

Lowe Electronics will, for the first time ever, be exhibiting their products at the Hong Kong Electronics Fair in October. Lowe Electronics have established a reputation throughout the Western world for their short wave receivers over the last few years and this year they have decided to spread the word even further by exhibiting at the biggest consumer electronics show in the Far East.

The Hong Kong Electronics Fair is the annual venue for thousands of buyers from all over the world



to see the latest offerings from the hundreds of Pacific Rim manufacturers of consumer electronics products. It occupies seven floors of a massive exhibition and conference centre overlooking the harbour and lasts for four days.

As one of the handful of European manufactures there, Lowe will be showing their full range of UK designed and built h.f. receivers and accessories.

## FORGET BATTERIES FOREVER!

Every home should have one! 'What?' I hear you ask. A clockwork radio! It needs no electricity, battery or mains, and is now available in the UK through High Street retailers, direct mail order and through the Friends of the Earth Christmas catalogue.

Freeplay, the wind-up radio from BayGen is at home everywhere...so, if you're out of batteries, out of reach, or out in the garden, going fishing, camping or sailing, wherever you are, the BayGen Freeplay will work like clockwork. No batteries to replace, or corrode when not in use. It couldn't be simpler.

The inspiration for Freeplay, the wind-up radio, was a television documentary about the spread of Aids in Africa. People relied on their radio for health education, but they couldn't always get batteries. So, British inventor Trevor Baylis, a former stuntman and escapologist, designed a radio that could power itself using a clockwork mechanism.

The radio has been featured on QED, reviewed in SWM and voted Best Product and Most Popular Product at the 1996 BBC Design Awards. Now manufactured in a modern socially-responsible factory in South African, where President Nelson Mandela called the invention 'a fantasy achievement', a percentage of profits from all sales in the West will be used to provide radios to needy areas in the majority world.



The stylish, robust radio (RRP £69.99) has a great quality sound on f.m., m.w. and s.w. and is driven by an internal spring-driven generator, powered by an easy to use winding handle. A 25 second wind gives 25 minutes of listening time.

To get one of these splendid radios by direct mail, call **0181-878 3093**.

## NEW INTERNATIONAL TELECOMS

The DTI's proposals to licence new international telecoms services have received a strong response from the industry. Forty six companies have applied for licences to provide international services over their own facilities in time to be included in the first tranche of applications.

Science and Technology Minister Ian Taylor today welcomed their strong response and enthusiasm. He said, "The UK has gained a lead in Europe by early liberalisation of its telecommunications market. The Government is committed to developing a strong, competitive UK telecommunications industry.

"Increasing competition into every sector of the telecoms market means cheap, high-quality telecoms services are available to companies across UK industry - that boosts our competitiveness and our attractiveness to inward investors. Our dynamic telecoms companies are used to competition, and so well fitted to enter the new markets opening in Europe and around the world.

"I am delighted at the response

NEWS • NEWS

to our invitation to apply for new international licenses and we should see the market open for business within a matter of months."

The proposals for licensing new international services are available in a consultative document which can be obtained from **DTI Communications and Information Industries (CII)** Directorate on **0171-215 1746**.

## RADIO STAMPS

In this centennial year of radio communications, Solomon Islands in the SW Pacific have issued a set of four stamps commemorating Marconi's achievements. They show Marconi demonstration on Salisbury Plain c. 1896, Marconi maritime installation c. 1900, First aeronautical radio - aircraft at Croydon Airport c. 1920 and Marconi in Japan during his 1933-34 world tour.

The set of four stamps is available on a First Day Cover (FDC) for £2.50 + 50p postage from: **Peter Taylor, 6 Bray Court, Plantation Road, Amersham HP6 6JB**. Mint stamps are also available at the same price.

Issued for World Communications Year in 1983 a small number of the special H44SI Solomon Islands Radio Society FDCs are still available at £3 inc. postage. To see these FDCs in full colour, [http://ourworld.compuserve.com/homepages/Peter\\_and\\_Jackie\\_Taylor](http://ourworld.compuserve.com/homepages/Peter_and_Jackie_Taylor) is the web site to visit.

## RADIO AND TV NEWS

**Athens:** The terrestrial Filmnet channel will be offering kids' 'KTV' and 'Supersport' programmes from September '96 and US sports provider ESPN has also been signed up by the same station.

**Sri Lanka:** Sky TV News is now transmitted in Colombo during the night-time hours over the ETV service 0000-0700 local and there are plans to extend the service into more convenient viewing times.

## LUCKY READER WINS AR-7030

Philip C. Mitchell, winner of our recent AOR AR-7030 competition, met SWM Editor, Dick Ganderton and Richard Hillier of AOR (UK) for a tour of the Belper factory to see how the new receiver was assembled and tested. Philip, well known as the author of *Fax and RTTY Weather Reports*, was presented with his prize by Richard Hillier, and is already putting it to good use.

Following recent test transmissions, BBC World has also opened programming in Colombo on ch.E25.

**Spain:** Changes are in the air with Spanish TV. The following channels will be privatised - TV3 and C33 Catalonia; ETB1 and ETB2 in the Basque region; Canal Sur in Andalucia; TVG in Galicia; TM3 in Madrid and TVV in Valencia. It's also possible that the national broadcast network, TVE-2, will be privatised in the year 2000.

**America:** The FCC has suggested that 1600 TV stations now transmitting analogue signals be given a digital channel to phase them into the new technology over a stated period of time. The first terrestrials opting for dual transmission, ie. with a digital channel, will be operating by mid-1977.

**Pakistan:** An MMDS (terrestrial microwave distribution) TV channel, the private Shaheen-TV, has opened in Karachi serving around 10000 homes with plans to extend into Lahore. Shaheen is the commercial operation of the Pakistan Air Force and currently transmits eight English language programmes over the MMDS network. It is interesting that viewers have to make a once only payment of 2950 Rupees for the decoder box, there's no monthly subscription.

**South Africa:** Media moguls Rupert Murdoch and Kerry Packer both are seeking TV networking interests in South Africa. Murdoch via News Corporation are seeking involvement with the SABC AstraSat project with two free to air channels and elsewhere Rupert has connections with 'Free to Air', a South African group now conducting feasibility studies for a new service; meanwhile Packer has signed up for South Africa's first black only TV service 'Station for the Nation'.

**Digital Satellite Revolution:** The three big names in European satellite/cable programming are Murdoch, Kirch and Bertelsmann, all preparing for the digital satellite revolution. Bertelsmann has dropped development of its own

digital box standard (through MediaBox) and has now opted for a digital agreement with the Kirch standard, making for a single German digital standard - 'd-BOX'. This decision has upset MediaBox, who have been developing a stand-alone Bertelsmann digital decoder. Back at Isleworth, Sky have been considering a working relationship by buying into Kirch. Kirch also have interests in Italy's Telepiu, Mediaset and the Dutch NetHold group. Quite a commercial carve-up!

**New Russia:** The 'new Russia' operator, Intersputnik, is planning a new series of satellites, 'Intersputnik 8', to operate aggressively within the commercial and competitive space communications environment. First launches are expected late '97 or early '98 to give 24 C-Band and 16 Ku-Band transponders running at 40 and 53dBW respectively. The first two birds will sit at 16°W

and 75°E with C-Band aimed at the traditional 4GHz markets of Africa, Asia, the Pacific Rim and C America. The Ku platforms will spot into W Europe, India, S Africa, C and SE Asia. SESAT (Siberian-European SATellite) is another satellite produced by a Franco-Russian consortium to slot at 48°E, though no further information is available.

**SE Asia:** The AV-COMM newsletter reports on three new analogue TV channels downlinked from AsiaSat-2 @ 100.5°E - it's over the UK horizon, before you ask! These are Henan TV 4.130GHz; Guangdong Satellite TV 4.010GHz - both Chinese - and the Mongolian Television Broadcasters (MTB) at 4.170GHz. The first Philippine satellite MABUHAY, previously owned by Indonesia, will be slotted at 144°E, it cost \$230 million and programmes open in December. Mabusay means 'good times' or

## TRANSMITTER ENGINEERING INFORMATION

### New BBC FM Radio Transmitters

**Ogmore Vale:** More than 5000 listeners in Blackmill, Lewistown, Ogmore vale, Wyndhan, Price Town and Nanty-Moel now have good reception of f.m. radio services.

The station broadcasts with vertical polarisation, so antenna elements must be arranged to be vertical.

#### Station Details

Service:	Radio Cymru	103.7MHz
	Radio 1	98.8MHz
	Radio 2	89.2MHz
	Radio 3	91.4MHz
	Radio 4	93.6MHz

Polarisation:	Vertical
ERP:	10W max. per service
Grid Reference:	SS 929 894

### New Television Transmitters

**Grangemouth:** A new television relay station opened on 9 August to serve Grangemouth, about 18km south-east of Stirling. The relay is a joint effort by the BBC and NTL on behalf of ITC and is located near West Beancross farm. It should bring good TV, NICAM and teletext reception to around 2200 people in Grangemouth.

#### Station Details

Channels:	BBC 1 (Scotland)	57
	BBC 2	63
	ITV (Scottish)	60
	Channel 4	53

Antenna Group:	C/D
Polarisation:	Vertical
ERP:	8W
Grid Reference:	NS 921 796

**Gib Heath:** A new television relay station opened on 18 June to serve Gib Heath, about 3km north-west of Birmingham City Centre.

The relay is a joint effort by the BBC and NTL on behalf of ITC and is located some 400m south-west of Hockley Circus. It should bring good TV, NICAM and teletext reception to around 2000 people in the district of Gib Heath.

#### Station Details

Channels:	BBC 1 (W. Midlands)	56
	BBC 2	66
	ITV (Central)	62
	Channel 4	68

Antenna Group:	C/D
Polarisation:	Vertical
ERP:	12.5W
Grid Reference:	SP 056 883

**Philip C. Mitchell (left) shown with Richard Hillier of AOR receiving his prize, the AOR AR-7030.**



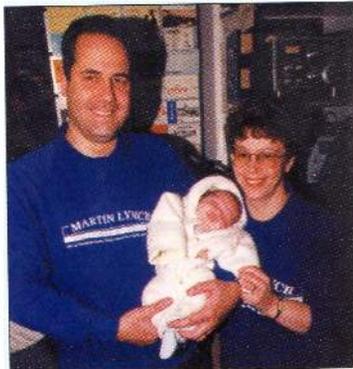
## MARTIN IS 40!

Young Henry Lynch has let it slip that his dad will be 40 on November 2 this year! To celebrate the 'start of life', Henry is flinging open his dad's shop and inviting you all to come and partake of the goodies. Henry - who gives his old dad 39 years head start - is determined to ensure that a good time is had by all.

The event is co-sponsored by Icom UK and all the usual 'razamatazz' associated with a Lynchy style Open Day will be on offer. Other major manufacturers helping to support him will be Alinco, AOR, Kenwood and Yaesu. The RSGB and, of course *Short Wave Magazine* and *Practical Wireless* will be there

with a selection of books.

Don't forget to make a note in your diary to be at **Martin Lynch & Son, 140-142 Northfield Avenue, Ealing, London W13 9SB** between 0900 and 1800 on November 2.



▶ 'have a good day'. Good news for those SE Asian digital pioneers experiencing difficulties in resolving digital TV with so-called DVB compliant receivers - which are far from compliant it seems. A New Zealand MPEG/computer expert has successfully decoded digital TV signals with different technical parameters, on a reluctant DVB compliant satellite receiver that preferred only a single digital standard.

**Europe:** SES Astra have applied for their series 2 satellites in a preferred 28°E slot, intended for digital TV services across Europe now that the prime 19.2°E slot is full up. BSKYB have been pushing for their own digital services and have opted for a 14 transponder lease on Astra 2A, which will be on-stream late 1997 with 2B following late 1998.

## ANYWUN OUT THERE

Those of you who are keen utility listeners, may well already know about the World Utility Network - WUN based in the USA, operate a listserv to provide an invaluable feed of daily postings from the band of some 600 members from about 30 different countries around the world.

There are on average about 20 postings per day from the group members.

Each month WUN publish a newsletter *WUNNEWS* of about 100 pages, which contains

invaluable Utility listening info. The Newsletter is distributed to subscribers via E-mail, but for those without Internet connectivity it is available by mail in printed format. The rear half of the newsletter is made up of loggings supplied by members and makes fascinating reading!

WUN also have a web site <http://www.leonardo.net/berri/wun/index.html> which contains an archive of all newsletters to date and many other invaluable file and info. There are many links to other utility related sites world-wide.

Contrary to rumours that have propagated from subscribers with less than reliable Internet access points - you get what you pay for here - there is no problem with the server that runs the mailing list.

Kevin is a member of WUN and reports every thing is just fine. If you wish to subscribe to WUN then send an E-mail to [majordomo@grove.net](mailto:majordomo@grove.net) with just "subscribe wun" in the **body** of the message.

## SHARE SHARE SHAREWARE FROM PDSL

### CD Rom for Antenna Users

PDSL have a wealth of new software available. First is a CD ROM intended for radio enthusiasts, telecommunications, RADAR and broadcast engineers, radio amateurs and those involved in the design,

maintenance or use of radio, TV or other antennas and communications equipment.

The title carries over 2000 files on 50 different types of antennas, including all the common dipole, vertical, Yagi and quad variations. Less common types such as horns, parabolas, corner reflectors are also covered. Many articles and programs are available exclusively on this CD ROM.

Reference material on a wide range of subjects is provided in the form of application and design data, for masts, towers, elements, wire and anchors, etc. Many articles include illustrations.

There are also many historical write-ups and bibliographies for additional reference.

The new *Specialist CD ROM for Antenna Users* is available from PDSL priced at £24.00.

### Blackhawk

For Windows 95 users comes the *Blackhawk CD ROM* containing fully working programs. Categories included are graphics, internet applications such as FTP, HTML, VRML, IRC, E-mail and browsers. Educational titles, animated cursors, communications programs, add-ons and modifications to customise your desktop, music programs, multimedia players, utilities and many more help to make this CD burst at the seams.

Some examples are WinZip 6.0, McAfee VirusScan, LviewPro and Snapshot, A-Talk, CommNet v2.1, Qmodem and even Mahjongg, Boggle and Bomb Squad for Windows 95 are there in the games selection.

*Blackhawk* costs £24.00.

### Linux Slackware

The official Linux Slackware four disk set has now been released. It features a new easy 'no floppy' install. This Set will turn your machine into a powerful 32-bit multi-tasking workstation. Slackware Linux is compatible with most Intel PD hardware and supports all CD ROM drives, sound cards, ethernet cards and mice.

The advanced 2.0 Kernel will provide stellar performance on high-end systems, including support for symmetric multi-processing, PCI and special code optimisations for the '486,

Pentium and PentiumPro. The official Slackware requires 4 to 8Mb of memory and 12Mb of hard disk space.

Users can develop programs with a full range of software development, text editing and image processing tools. You can connect to the Internet, set up a WWW site, use electronic mail and read Netnews.

Also included is a wealth of Internet Linux archives. Price for the set - £24.00.

### PDSL Subscriptions

Joining the subscription service costs nothing. All it takes is a phone call stating which program you want to subscribe to. When the author updates that program, PDSL guarantee to send the update to you as soon as they have stock. Payment is then taken for the update upon despatch of the update - no sooner.

Rod Smith, who has run PDSL for some 12 years, says "It can be a bit awkward keeping in touch with program updates. This system of subscription saves time and money on the efforts made to see if a favourite program has been updated or not. Plus it's a cheaper way to obtain the update. When obtained through the subscription system, the cost of an update disk is £5.40 instead of the usual £6.00 including postage and packing. As far as we are aware, PDSL is the first shareware library to offer this kind of service."

PDSL believe that this new service will offer both customers and shareware offers significant benefits.

For more information about from the above, or to order any of the PDSL catalogue, contact:

**PDSL, Winscombe House, Beacon Road, Crowborough, Sussex TN6 1UL. Tel: (01892) 663298, FAX: (01892) 667473.**

### NEW BOOK FROM SWM AUTHOR

*Fax and RTTY Weather Reports*, is written by Philip C. Mitchell, it brings together all the necessary information to increase your enjoyment of WEFAX and Synop stations from around the globe.

This new title replaces the

## AKD ON TARGET?

A new budget h.f. receiver has just hit the s.w.l. scene from AKD - better known for their excellent range of v.h.f. and u.h.f. mobile transceivers for licensed radio amateurs. As usual you can rely on SWM to bring you details **first!** We managed to sneak a surreptitious look at one of the first pre-production models of the 'Target HF3' receiver so that Kevin could do a quick preview (*All this clandestine activity makes us feel like a car magazine trying to get a scoop on the latest model - Ed*).

The Target is priced so as to make it an ideal 'first radio'. However, after putting the unit through its paces it seems that it could also be invaluable as a second, third or even fourth receiver.

There are some minor criticisms of the radio, but putting these into perspective this little set could well prove to be a shack essential. One of the most useful features is the four speed increasing rate tuning - this took a while to get accustomed to, but you quickly become acclimatised to the action. I - unlike JW, I suspect - think it's great (*though we will get John's opinion next month - Ed*).

Curious omissions are a headphone and 'tape output' sockets. The antenna socket is a somewhat non-standard phono type. I would rather pay an additional £10 and see these features corrected - AKD are you listening?

Another strange anomaly is that the receiver was supplied tuned to 4.717MHz. The 16-page user guide informs us that the RAF VOLMET broadcasts are on this frequency - if you didn't know better then you would take this as true. The fact is VOLMET currently transmits on 4.715MHz - therefore the HF3 display is some 2kHz too high! Zero beat on Radio 4 long wave confirms this, as it occurs where the station used to reside - 200kHz. The general performance of the unit was very acceptable, aside from the 2kHz error, and for a receiver of this price range you do actually get a communications receiver with continuous coverage from 30kHz to 30MHz, as opposed to a battery guzzling portable.

The Target is more than sensitive enough in practice, even if the i.f. filters are a smidgen wide. When Dick tried it out he tuned to WWV on an indicated 15.000MHz and found a 'birdie'.

The front panel is simple - and could be simplified even more with the removal of a redundant mode button!

The HF3 costs £159.95 inc. VAT plus £6.00 P&P, and it comes with a two year guarantee. For more details contact: **AKD, Unit 5, Parson Green Estate, Boulton Road, Stevenage, Herts. SG1 4QG. Tel: (01438) 351710, FAX: (01438) 357591.**

## PUBLISHED SPECIFICATIONS:

Frequency Range:	30kHz - 30MHz ( $\pm 100\text{Hz}$ )
Synthesiser:	min step 1kHz
Clarify (fine tune):	$\pm 800\text{Hz}$
Modes:	a.m., l.s.b., u.s.b.
Bandwidth:	s.s.b. 3.8kHz
	a.m. 6kHz
Sensitivity:	1 $\mu\text{V}$
Antenna Impedance:	70 $\Omega$
Architecture:	Dual conversion Superhet
1st i.f.:	45MHz
2nd i.f.:	455kHz
Demodulator:	a.m. quasi-synchronous
	s.s.b. product detector
Tuning Rates:	10kHz per rev.
	100kHz per rev.
	1MHz per rev.
	10MHz per rev.
Audio output:	2W
Power:	12V d.c. @300mA from ext.
Size:	p.s.u. (supplied).
	185 x 200 x 60mm (w x d x h)
Weight:	inc. knobs & sockets.
	1kg excluding p.s.u.



## POLICE STYLE EARPIECE

Police-style earpieces are comfortable to wear - they have to be - by virtue of the special 'over the ear' design and soft material covering.

Watson have introduced a new model, their WEP-400, which is adjustable for either ear and comes with a washable ear pad and a right angle 3.5mm jack to suit most rigs. A Kenwood version with a 2.5mm jack is promised.

Price is just £14.95 from:

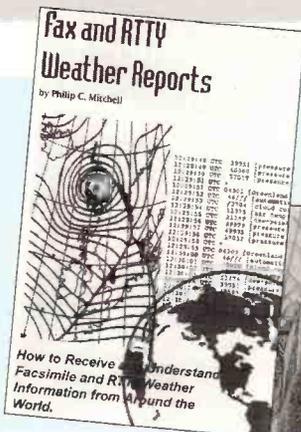


**Waters & Stanton, Spa House, 22 Main Road, Hockley, Essex SS5 2QS. Tel: (01702) 206835.**

now out of print manual *Interpretation of Facsimile Maps and Charts.*

The forward written by Bill Giles, the BBC Weather Centre Manager, tells the reader of his own fascination for the subject of weather. With the vast amount of radio traffic that relates to weather conditions and forecasting, it is without doubt a facet of the hobby not to be missed.

Armed with this guide the listener can fully exploit their interceptions. Chapters are included on, Surface Analysis, Surface Pressure Forecast, Upper Air Analysis and Forecast Maps, RTTY Weather Reports and much more.



This invaluable guide is available from the SWM Book Store. Price is £8.95 plus P&P.

## ARROWSMITH COURT, STATION APPROACH, BROADSTONE, DORSET BH18 8PW.

### NEW DIRECTOR FOR FEBA SEYCHELLES

Hugh Barton of Bognor Regis, West Sussex, with his wife Janice, is the new Director of FEBA Radio's short wave station in the Seychelles. Hugh left for the Seychelles back in July for a period handover from outgoing Director Stewart Pepper, who returned to the UK with his family back in August.

Chartered engineer, Hugh Barton moved into management and for many years worked with GEC-Marconi Defence Systems, latterly as Marketing Manager. "It involved a lot of administration and paperwork, but also global travel and a fascinating opportunity to meet people at all levels in their jobs," he says. Feba's Chief Executive Michael Roemmele adds, "We spread the net widely in recruiting the next Seychelles Director and had an impressive number and quality of candidates, yet there was no doubt in our minds that this was the man, and couple, of God's choice."

These are momentous days for Feba Seychelles in a year which has seen the major development of locating all station operations

(previously on two sites in different parts of Mahé island) at the transmitting base at Anse Etoile. The move was completed back in May and is already achieving greater efficiency as the station gears up to the challenges of broadcasting the Gospel on into the 21st century. General enquiries about the mission to **Jennie Ring** on **(01903) 237281.**



**Michael Roemmele (right) with Janice & Hugh Barton during a recent open day at the Worthing headquarters of FEBA Radio.**

# Rallies

## September 29:

The Three Counties Radio Rally is to be held at the Three Counties Showground, Malvern, Worcestershire. There will be trade stands, radio and computer dealers, parts and accessories, Bring & Buy and refreshments. There will also be free car parking. The venue is the Wye Hall and entry to the showground is via the 'Brown' gate only. Doors open 10.30am to 5pm and admission is £1. **Eddy Cotton** on (01905) 773181.

**September 29:** The Harlow & District Amateur Radio Club Rally is to be held at the Sports Centre, Harlow. Doors open at 10.30 (10am for disabled visitors). Easy access off junction 7 the M11, A414 signposted to the rally. Talk-in by G6UT on S22 and SU22. Morse tests on demand will be available (two passport photos required). Refreshments will also be available. All car parking is free, plus there is disabled parking near the entrance. For more details 'phone the Rally Manager **Mike G7BNF** on (01279) 865092.

**\*October 6:** The Great Lumley Amateur Radio & Electronics Society will take place in the Community Centre, Gt. Lumley, Chester-le-Street. Doors open at 10.30am for disabled visitors and 11am for others. There will be trade stands, a Bring & Buy and much more. **Barry G1JDP** on 0191-388 5936.

**October 12:** The G-QRP Club Mini Convention is being held at St. Aidans Hall, Sudden, Rochdale. Admission is £1 and doors open at 10am. Talk-in on S22. There is a large social area, lectures on QRP subjects, Bring & Buy, surplus, junk, components, kit traders, food and drink all day including the famous pie and peas. **Rev. George Dobbs G3RJV** on Tel/FAX: (01706) 31812.

**October 13:** The Kidderminster & District Amateur Radio Society are holding their rally at the Stourport on Severn High School. Doors open at 10am. There will be the usual traders, Bring & Buy, refreshments and ample car parking. Talk-in on S22. **G8JTL** on (01384) 894019 or **GORJP** on (01299) 822206.

**October 13:** Computercations '96 Computer/Radio Rally is to be held at Hillhead Camping, Kingswear Road, Hillhead, Brixham, Devon. Overnight camping, car boot sale (weather permitting), trade stands, professional flight simulator demonstration, Bring & Buy, refreshments, unlimited free parking, talk-in on S22 by G7FDC, special event station GB2CPU. **Mr. Bill Trezise G6ZRM** on (01803) 522216.

**\*October 18-19:** The Leicester ARS (25th anniversary) is being held at the Granby Halls, Leicester. Doors open at 10am each day (9.30am for disabled visitors). All major companies will be in attendance plus a large Bring & Buy stand run by the Leicester Radio Society. Morse tests will be available on demand, but two photographs plus proof of identity will be required. There are ample car parking facilities. Talk-in on S22 and SU22 callsign GB2GH. **Frank G4PDZ** on 0116-287 1086.

It has been splashed all over the newspapers here in Britain - the death, at the premature age of 64, of BBC World Service. MPs, former BBC Governors and senior managers, even the Dalai Lama have been registering their protest about the changes brought about by BBC Director-General, John Birt.

He wants to merge all programme production across BBC radio, television and the World Service into a single unit called, imaginatively, BBC Production. He wants all radio, TV and World Service news to be made by a single BBC News operation. And all the commissioning of programmes - again right across radio, television and World Service - to be dealt with by BBC Broadcast.

This new structure is designed to take the BBC into the digital age, but opponents of the plan - including John Tusa, Austen Kark and Gerald Mansell, three recent Managing Directors of BBC World Service, fear that it means the end of BBC World Service as a separate entity, commissioning and making its own programmes for overseas audiences. They think that in order to save costs - and cost saving is a principal reason for the plan since moving to the digital age will cost at least £200 million over the next few years - the unique agenda of World Service will be diluted.

MPs questioned John Birt at the Foreign Affairs Select Committee, but he rebutted all criticism. The Chairman, Sir Christopher Bland, was summoned to see the Foreign Secretary to explain why the Foreign Office, which pays around £170 million each year for World Service, was given only two days notice of the changes. As a result of this meeting, a joint Foreign Office/BBC working party was formed to investigate further. It is due to report during October. We'll keep you up-to-date here in *Short Wave Magazine*.

## IRELAND ON SHORT WAVE

The Republic of Ireland's national broadcaster, RTE, made two short wave transmissions on 1 and 15 September. The station hired time on Deutsche Welle transmitters in Germany to beam coverage of the All-Ireland hurling finals and the Gaelic football finals to audiences in North and Central America, Africa, Eastern Europe and Australia. Some months ago, a commercial operation relayed sport from the Republic using BBC transmitters.

This new venture is an experiment by RTE to assess the impact of short wave broadcasting, a delivery method that the station has always been reluctant to employ. The

broadcasts, at 1400-1700, were carried on five frequencies: 9.815, 12.055, 13.82, 15.60 and 21.55MHz.

## SATELLITE CHANGES FOR RNW

RTL-5, the satellite television channel beamed to Holland from Astra, has gone digital. Radio Netherlands has been using two audio subcarriers for its Dutch and foreign language services, but because RTL has other plans for the subcarriers, the Dutch international radio station has moved to transponder 58 on Astra 1D, the German Multithematiques television channel. RNW's Dutch language services are on the subcarrier at 7.38MHz and other languages are at 7.56MHz.

## EXIT FROM AERO BAND

Listeners to BBC World Service in Europe, and further afield, who are used to tuning to London on the 19 metre band frequency of 15.07MHz will be surprised that it is no longer in use. The former Empire Service channel has been replaced by 15.575MHz from the start of the winter schedule on 27 October. This follows a European agreement to move broadcasters away from out-of-band frequencies which are in parts of the short wave spectrum used by other services.

## SWAHILI FROM HILVERSUM?

Did you know that Radio Netherlands broadcasts in Swahili? Neither did the staff at the Dutch international service until a report on the future of public service broadcasting in the Netherlands was published during the summer. The 85-page document looks at the way in which the complex Dutch broadcasting scene might be structured for the new century, and said that essentially Radio Netherlands ought to broadcast only in Dutch with programmes simply being repeats from the home services. But with a glaring

error made about which languages Radio Netherlands broadcasts, the accuracy and validity of the whole report has



been called into question by the station's senior management. At present, Radio

Netherlands is paid for from the domestic licence fee, rather than by direct subsidy from the foreign affairs ministry which tends to be the paymasters for foreign broadcasting in most European countries. The commission which was established to undertake the study believes that there is still a rôle for international radio from Holland, but that it should be targeted to specific countries or regions. The Dutch government is studying the report and will decide what action to take towards the end of 1996.

That is all for this quarterly sketch of the broadcast scene in Europe. Until next time around, good listening!

If you're travelling a long distance to a rally, it could be worth phoning the contact number to check all is well, before setting off. The Editorial staff of SWM cannot be held responsible for information on rallies, as this is supplied by the organisers and is published in good faith as a service to readers. If you have any queries about a particular event, please contact the organisers direct.

## MALTA BACK ON THE AIR - FROM RUSSIA

In my the last *Bandscan Europe* I reported that the Voice of the Mediterranean had been forced off the air after the closure of the Deutsche Welle relay station on Malta. But now, VoM as it is known currently, is back on the airwaves using hired short wave transmitters in Malta. The station is on the air every day at 1900 for an hour on 9.765 and 12.06MHz in English. On Sunday this is followed by half-an-hour of French and a further thirty minutes of German, both on the same frequencies. Between Monday and Saturday, there is an hour of Arabic programmes starting at 2000.

There is also a broadcast in English and Maltese on Sunday beamed to Asia and the Pacific for three hours starting at 0130 on 15.55 and 17.57MHz. Reports on reception to **VoM, PO Box 143, Valletta, Malta.**

## MEDIA SHOW BECOMES ADVICE SLOT

BBC World Service has brought back the late, lamented *Waveguide* after an absence of some five months. The weekly programme, which ran for sixteen years, had a useful roundup of news from around the international broadcasting industry, lots of news about the BBC, plus reviews of the latest receivers on the market.

Now the programme is back for an eight week series, giving the basics of listening. The show, still hosted by Simon Spanswick, is investigating how short wave signals travel, how to choose a radio receiver, what causes interference and offers advice on how to cure it, and also looks at the future of international broadcasting.

Catch the new *Waveguide* at 1550 on Sunday or 0750 on Tuesday if you live in Europe.

## AVON

**Bristol International RC:** Tuesdays, 8pm. The Black Horse Public House, West Street, Old Market, Bristol. All visitors are welcome. The club has been formed so that all radio enthusiasts, whether they be licensed Amateurs, s.w.l.s or CBers can get together and have a good natter and do things that you do in radio clubs. PO Box 28, Bristol BS99 1GL.

**South Bristol ARC:** Wednesdays, 7.30pm. Whitchurch Folkhouse Assoc., Bridge Farm House, East Dundry Rd, Whitchurch. October 2 - CW practice evening, 9th - Chat evening, 16th - Judging home construction, 23rd - History of WD & HO Wills. For more information ring (01275) 834282 on a Wednesday evening.

## BUCKINGHAMSHIRE

**Aylesbury Vale RS:** Wednesday evenings, 8pm. Hardwick Village Hall, (Hardwick is situated off the A413 between Aylesbury and Buckingham). October 16 - Grand sale. Gerry Somers G7VFN on (01296) 432234.

## DERBYSHIRE

**Derby & DARS:** Wednesdays, 7.30pm. 119 Green Lane, Derby. October 2 - Junk sale, 9th - Visit to the Sutton in Ashfield Observatory, 16th - Visit to Kodak at Annesley, 23rd - Natter night. Martin Shardlow G3S2J, 19 Portreath Drive, Allestree, Derby DE22 2BJ on (01332) 556875.

## DEVON

**Appledore & DARC:** 3rd Mondays, 7.30pm. Appledore Football Clubroom. October 21 - Annual Bring & Buy sale. Dave Brierley G3YGI. (01237) 476124.

**Exmouth ARC:** Alternate Wednesdays at the Scout Hut, Maripool Hill, Exmouth. October 9 - HF operating night. D. Fox G0NRR on (01395) 271880.

**Plymouth RC:** 1st & 3rd Tuesdays, 7.30pm. The Royal Fleet Club, Devonport, Plymouth. October 9 - Roynet - Goose Fair. John Doherty G7HIK on (01752) 896501.

**Torbay ARS:** Fridays, 7.30pm. ECC Social Club, Highweek, Newton Abbot. October 18 - How is the club magazine TARS produced? Peter G4UTO. (01803) 864528.

## EDINBURGH

**Lothians RS:** 2nd & 4th Wednesdays, 7.30pm. Orwell Lodge Hotel, Polworth Terrace, Edinburgh. As this is the 50th year of the Society, they plan a number of commemorative events and wish to hear from former members from the early years of the club. Tommy Main GM4DCL, QTHR on 0131-663 8501 day and evening.

## GREATER LONDON

**Southgate ARC:** 2nd & 3rd Thursdays, 7.30pm. The Pavilion, Winchmore Hill Cricket Club, Firs Lane, Winchmore Hill, London N21 3ER. September 26 - Great erg race at the Winchmore Hill Cricket Club, October 10 - Second surplus equipment sale, 24th - Radio on the air. M. E. Viney G0ANN. (01707) 850146.

## HAMPSHIRE

**Hordean & DARC:** 1st & 4th Tuesdays, 7.30pm. Lovedean Village Hall, Lovedean Lane, Lovedean, Hants. October 1 - Natter night, 9th - Official 21st birthday of the club, 22nd - AGM. S. Swain (01705) 472846.

**Southampton ARC:** Mondays, 7pm. This club is now up-and-running after some years of inactivity. New members welcome. Harold McIntyre on (01703) 737715.

## HEREFORD & WORCESTER

**Bromsgrove ARS:** 2nd & 4th Tuesdays. Lickey End Social Club, Alcester Road, Burcot, Bromsgrove. October 8 - In practice, 22nd - Quiz night. Barry Taylor. (01527) 542266.

**Droitwich Spa ARC:** 1st Tuesday, 8pm. Droitwich Community Hall. Many interesting evenings already booked. October 1 - Surplus sale, turn your surplus equipment into cash. John Jackson G4OPV (01299) 826188.

**Malvern Hills RAC:** 2nd Tuesdays. Red Lion, St Annes Rd. Jim Davis G0OWS. (01684) 576538.

## KENT

**Bromley & DARS:** 3rd Tuesdays, 7.30pm. The Victory Social Club, Kechill Gardens, Hayes. October 15 - Surplus equipment sale. A. Messenger G0TLK. 0181-777 0420

**Medway AR & TS:** Fridays, 7.30pm. Tunbury Hall, Calkin Close, Tunbury Avenue, Walderslade, Chatham, Kent. September 27 - Peter G0GIR on video recorder servicing. G3VUN, 40 Linwood Avenue, Strood, Rochester, Kent ME2 3TR. (01634) 710023.

## LANCASHIRE

**Preston ARS:** Thursdays, 8pm. The Lonsdale Sports & Social Club, Fulwood Hall Lane, Fulwood, Preston. September 26 - Auction evening - o sale of members' surplus equipment, October 10 - General discussion evening, natter night and G3KUE on air, 24th - RSGB video - on evening's viewing. Eric Eastwood G1WCQ. (01772) 686708.

## NORTH YORKSHIRE

**Hambleton ARS:** All meetings held at Allertonshire School, Northallerton, 7.30 to 9.30pm. October 3 - Speaker, 17th - Construction night. More details from John G0VXH on (01845) 537547.

## SHROPSHIRE

**Salop ARS:** Thursdays, 8pm. The Telesports Club, Abberly Foregate, Shrewsbury. September 26 - Steam rollers and how one in particular was restored, by Steve Milne, October 3 - On air night/natter night, 10th - AGM, 17th - On air night/natter night, 24th - DXTV from satellite by Dave G7WBH. Ian Dovies G7SBD, QTHR or @GB7PMB.

## SOMERSET

**Yeovil ARC:** Thursdays, 7.30pm. The Red Cross Centre, 72 Grove Avenue, Yeovil. September 26 - Club station on air and committee meeting, October 3 - Oscillator design by Rex Legate, 10th - Stocktake of club equipment and club station on air, 17th - 50th anniversary party, 24th - The GSB 900 h.f. transceiver revealed by G7LNJ. Cedric White, QTHR. (01258) 473845.

## SOUTH YORKSHIRE

**Barnsley & DARC:** Mondays. September 30 - Natter night, October 7 - Talk by Gordon Adams G3LEW on Propaganda Broadcasting, starts 8.15pm prompt, 14th - On the air night, 21st - Rig test night, starts at 8.15pm prompt. Ernie Bailey G4LUE on (01226) 716339 between 6 and 8pm.

## TAYSIDE

**Dundee ARC:** Tuesdays, 7pm. Dundee College, Graham Street, Dundee. October 8 - Construction and training, 15th - RSGB club visitation, 22nd - Construction and training. Allan Martin GM7ONJ, 11 Langlee Place, Broughty Ferry, Dundee, Tayside DD5 3RP.

## WARWICKSHIRE

**Mid Warwickshire ARS:** 2nd & 4th Tuesdays, 8pm. St Johns HQ, Warwick Div., 61 Emscote Road, Warwick. October 8 - Open night, 22nd - My other hobby. GBHRI on (01926) 424465.

**Stratford-upon-Avon & DRS:** 2nd & 4th Mondays, 7.30pm. Home Guard Club, Main Street, Tiddington, Stratford-upon-Avon. October 14 - VHF Contesting in the 1960s by David Browning G3UEY. The Society are again organising a course of instruction for the Radio Amateur Examination of the City & Guilds of London Institute and further details can be obtained by writing to the Chairman of the Society, Mr J. Harris G8HUS, enclosing a stamped addressed envelope. The address to write to is: 57 Evesham Road, Stratford-upon-Avon, Warks CV31 2PB.

## WEST MIDLANDS

**Sandwell ARC:** The Broadway, Warley. RAE class on Monday nights, Morse class on Wednesday nights and RAE Novice class on Thursday nights. Three operating shacks, h.f./v.h.f./u.h.f., Phone, c.w., RTTY, AMTOR, Packet, all bands. Talks, outings, contest and demonstrations. Full RAE course commencing September, enrolment Thursday 5th at 7.30pm and course commences Thursday 12th at 7.30pm. Club nights Mondays, Morse classes on Wednesday nights. For further information please ring 0121-552 4619/0121-552 4902.

Lorna Mower, Short Wave Magazine, Arrowsmith Court, Station Approach, Broadstone, Dorset BH18 8PW. Send all details of your club's up-and-coming events to: Club Secretaries:

# Grassroots



## CHANGES

You will notice some more changes in this issue. I have decided to give 'Junior Listener' a rest in order to enable me to introduce a couple of new items. The first is 'The Frequency Exchange'. This page will carry interesting frequencies suggested by you, the reader. Here you can suggest frequencies that other readers might find interesting, ask for help in identifying what the signal is on a given channel and anything else to do with frequencies you can think of. In time this should build into a very useful frequency guide.

Starting in the November issue, Peter Bond will be running a 'Military Airband' column to complement Godfrey Manning's 'Airband' column, which will continue in its present style. *Short Wave Magazine* will continue to be the place to get that interesting airband info!

## TECHNICAL QUERIES

One of the aspects of producing a magazine such as *Short Wave Magazine* is that readers feel that they can turn to us as the 'fount of all knowledge'. While we do have a lot of technical expertise between us and the editorial staff of our sister magazine, *Practical Wireless*, we cannot be expected to know everything about everything pertaining to radio!

Answering just one single technical query can take a lot of valuable time - a commodity which is in rather short supply here at *SWM*. Although we have a complete archive set of every issue published - going back to March 1937 - they have never been properly indexed, let alone put onto a data base of any description. To research an answer is obviously going to take time. Add to this the illegible handwriting of a lot of letters and the very sparse amount of useful information given, and attempting an answer becomes a nightmare - probably to be consigned to the ever growing pile of things to be done when and if!

If you really feel that you cannot find out the answers for yourself by reading the many books available - just take a look at the *SWM* Book Store on pages 80-83 - and, therefore, need to write to us, please, please, give as much information as you can. It is not enough to ask us to supply copies of a pamphlet on some obscure radio service mentioned 'in the current issue'. We need at least the issue date and a page number to even be able to find out what you are talking about, let alone do anything about replying. Each issue of *SWM* is crammed with information - probably around 50 000 words. As I write this, the cover date of the 'current' issue is September '96 - the one with a couple of footballers on the cover, for those who, like me, identify issues by the cover picture. We put this one 'to bed' over three weeks ago and are now in the middle of the October '96 issue. By the time you read this, we will be on the November issue and thinking about December!

Dick Ganderton G8VHF

# Letters



## Dear Sir

I have been nuts on short wave radio since about 1959 when I first had an Invicta Radio with one short wave band on it. This would receive what was then Prestwick Air Radio and Shannon Air Radio. My so-called 'aerial' was just a piece of copper wire stuck up outside of the window of our downstairs flat. Such was my ignorance in those days, I didn't know anything about aerial lengths relative to frequencies. This would have been all double Dutch to me.

I also had a Regatone Radio, which like the Invicta, only had one short wave band from about 6 to 18MHz, I think. I seem to remember picking up amateurs on it, some of whom I think were on a.m. I am certain that Prestwick and Shannon were. I remember when Prestwick and Shannon became Shanwick and then began transmitting on s.s.b., which put them beyond my being able to listen to them as a radio set with a b.f.o. was outside by means.

Such was the simplicity of those days, which brings me to the point of my letter. I now have those radios which I could have only dreamed about in my younger days. They are the Philips D-2999 and the Realistic DX-390. But they have their limitations and one begins to wonder when one reads the 'SSB Utility Listening' column if they are any good at all, because I'll be damned if I can pick up any of the stations that Graham Tanner writes about. It makes me sick as a parrot.

When I try the frequencies that he mentions, all I get is noise. According to Peter Rouse in *Short Wave Communications*, if your radio doesn't have the filters to eliminate this noise, then you are wasting your time with these inexpensive radios. You get what you pay for, in other words.

If you can afford seven hundred pounds plus, then you will get a good radio and if not, then you must expect the limitations of the cheaper models. If you think you are going to pick up Miami Radio on the cheaper models then you shouldn't expect too much of them and if you are unemployed, then you will be stuck with the cheaper models or second-hand. Never an IC-R8500 at £1499. Only in your dreams. Dream on!

**W. R. Semmens**  
Penzance  
Cornwall

*All hobbies cost you! That's the way of life. However, some hobbies cost*

*you a lot more than others. It is possible to get an immense amount of pleasure out of the short wave listening hobby without spending a fortune. Antennas are a good hunting ground for improving your listening capabilities without spending a lot of money. A cheap reel of wire, a few plastics four-pack retainers and some thin rope and you are in business! However, the biggest investment you can make will cost you nothing at all. Patience. Utility listening is all about patience! You can sit on a utility frequency for days and hear nothing at all. Then, all of a sudden, bingo, there it is! Your patience has been rewarded. So, don't despair, persevere. Ed.*



## Dear Sir

I would be very grateful if you can help me. Back in the 1970s I built myself a very powerful, selective and sensitive m.w./l.w. radio and I used a high-permeability 1/2in diameter, 6in long ferrite rod aerial. In the 1970s and 1980s I found these high-gain aerials very easy to obtain in Sheffield, but in recent years I've been unable to even obtain one.

I'd be extremely grateful if you know of anywhere where I could obtain these aerials - they must be 1/2in diameter (not 3/8in). I've run adverts in various radio magazines for over two and a half years and I've had 1/2in aerials sent to me through the post, but they've all been very low permeability.

I'm willing to pay good money for these aerials. Many thanks.

**P. Tankard**  
Crookes  
Sheffield

*Here at the Editorial Offices we have noted, with great interest, Peter's adverts, month in month out. Perhaps he will enlighten us all as to just what he is building that needs so many 1/2in ferrite rods! It might just be a project of interest to many SWM readers. Ed.*



## Dear Sir

First of all, may I pass on my congratulations regarding the slight 're-vamp' in the latest issue. Usually I don't like change, but must say that I do like the new layout and design to the front section of the magazine. Having said that, I still hanker for the style that was used in the 70s, when I started reading *SWM*!

The Editor reserves the right to shorten any letters for publication but will try not to alter their sense. Letters must be original and not have been submitted to any other magazines. **The views expressed in letters published in this magazine are not necessarily those of *Short Wave Magazine*.**

Your Editorial this month has prompted me to write regarding rallies. I would agree with you that attendances are down. I can remember fighting my way through crowds six deep to get a look at the more popular stands.

I for one miss the RSGB show at the NEC, but I am probably biased - living only a ten minute drive from the NEC made it very popular with me.

I wonder if there are two main reasons for the rallies and shows not being so popular these days? The first reason that springs to mind is computers. Letters to *SWM* over the last few months have proved that there is a 50/50 split between amateurs that love or hate computers. I for one am very much in favour of them, but was very disappointed that the recent Woburn Abbey rally seemed to be half radio and half computers. If I go to a radio show, this is exactly what I want to see.....radio equipment. I don't mind computers being there, but not to the extent of taking over half the show!

The second reason, I feel, is the dealers themselves. Who else can remember 'fighting' to get to look at the latest models on dealers stands? These days, the dealers don't seem to make too much of an effort to show off the latest kit to its best advantage. It is more like a glorified car boot sale.

More importantly, what has happened to the second-hand market? Most dealers used to have a large part of their stands given over to an excellent selection of reasonable priced gear. Not anymore. Now you get the odd bit here and there, mostly at extortionate prices.

It only takes a quick look through the adverts in *SWM* to see what I mean: IC-R71Es at £599.95, HF-225s at £399.95, R-2000s at £399.95 and £425, FRG-7700s at £299 and FRG-7s at £195. The list could go on and on.

Some of these radios didn't sell for that much when they were new! I wouldn't mind so much if they were prepared to pay decent part exchange prices when they buy them in, but the attitude today seems to be pay peanuts for them and then retail them as high as possible. I know the dealers have to make a profit to survive - I am in retail myself - but there is profit and then there is PROFIT!

There are good deals around on the second-hand market from dealers, but you really have to

search them out. Spending a morning on the 'phone can save you quite a bit of money, but then again it may just help boost BT's coffers!

I'm sure that everyone would love to buy the new Icom R8500, but not all of us can afford to pay over £1500 for the latest 'wonder radio' - not unless we want severe 'QRM' from the XYL anyway! Also, these days, you have to bear in mind that within a few months, someone else will have brought out something 'better, but cheaper'. Those into hi-fi will know exactly what I mean.

The way things are going, newcomers to this hobby will be frightened off by the cost of getting started. I'm sure that there are many who, having visited a rally for the first time recently, have probably vowed never to go to another.

So, to sum up. Rally organisers need to consider who they want to aim that shows at and the dealers have a **very** tough decision to make. Do they keep prices high and have shelves full of radios gathering dust, or do they price them sensibly, have empty shelves and money in the till? It's up to you chaps, but in the meantime, my wallet is firmly closed.

**Mike Newell G1HGD**  
**Kenilworth**  
**Warwickshire**

*I found your comments very interesting. If everybody waited for the latest 'wonder' radio to come down in price or be superseded by a later model, there would be no second-hand market to speak of as nobody would be replacing their older radios! On the rally front I like to be able to browse through the piles of interesting parts and equipment. You never know what you might find. Every year, at Friedrichshafen, I look over the enormous flea market and think "How frustrating. What I want must be in there somewhere - if only I knew what it was that I wanted!"*  
**Ed.**

**Dear Sir**

I read with great interest the recent article on the new VOA site near Tangier, which came on line recently with its ten 500kW transmitters and antennas capable of radiating over 100MW e.r.p. And then I wondered why, with all this modern technology, that reception of VOA English programmes is still pathetic. Then I realised the VOA had ceased transmitting to Europe as a cost cutting measure, even though some of the programmes still appear to be for European audiences.

This all seems very strange considering the millions of dollars that have been spent on new transmission facilities when there

appears to be over capacity with RL/RFE sites in Spain and Portugal. I find it hard to believe that VOA cannot afford the extra cash required run a couple of 250/500kW transmitters for a few hours a day to serve western Europe. Maybe the real reasons are:

1) The VOA is technically incompetent and does not know how to use 1930s technology to generate signals that can compete with other broadcasters, unlike the Russians who have mastered the art!

2) There are too few listeners left in Europe after the VOA, RL/RFE and Soviet jammers had battled for 40 years turning the short wave broadcasts bands into waste land. And now this has happened, the VOA disgracefully abandons its remaining audience.

It is a great shame that the US Government will be remembered for wasting a fortune helping to destroy short wave broadcasting in Europe and treating s.w.l.s as pawns for their propaganda. One wonders whether a similar situation would have been allowed to develop if the Russians had put fifty 250kW medium wave transmitters in Cuba at the height of the cold war. It's also a pity that some of the money spent by the US on this radio war could not have been used to help finance private s.w. stations like WRUL/WNYW. Instead, the US contribution the international broadcasting is now an ever increasing verbiage of boring religious programming from stations financed by naive people who think they are going to convert the rest of the world to God fearing Christians. Well, maybe one day I will become a 'Born Again Short Wave Listener' and everything will be okay.

**Andrew H. Ikin**  
**Bransgore**  
**Christchurch**

**Dear Dick**

It was a real pleasure to meet you and Richard Hillier of AOR (UK) at the Belper factory on Thursday and I would like to thank you for the opportunity to win the AOR7030 communications receiver through the good offices of *Short Wave Magazine*.

The receiver is now up-and-running with the rest of my rig and although it will be some time before I have mastered all the controls, it appears that I have a very exceptional piece of equipment. My previous Lowe receiver has been a good friend in many ways, being so easy to operate with a minimum of front panel controls, but it's amazing how much more refinement of the signal can be done with the AOR with only two more controls!

Since a lot of my interest is in the reception of facsimile weather maps and associated data, it is essential for me to receive clean, interference free (or nearly so) signals in this direction. Initial tests so far indicate a very great improvement in signal strength and selectivity over the Lowe receiver and a subsequent enhancement of map detail. I am looking forward to many more hours of s.w.l., domestic priorities permitting!

Trust you had a hassle-free return journey to Broadstone.

**Philip C. Mitchell**  
**Newbury**  
**Berks**

*Thank you, and the many other SWM readers, for entering. These competitions are very popular with our readers, but it would be impossible to run them without the generous co-operation of companies like AOR (UK) who very kindly donate these rather exotic prizes.* **Ed.**



**Dear Sir**

I have enjoyed reading *Short Wave Magazine* very much over the past ten years - as you are aware it is very popular here in Ireland. I have two suggestions for you, don't know if you'll like them or not!

No. 1: How about a few features on the Irish radio scene? There has been an explosion here over the last five years in the communications spectrum, like the opening of new local f.m. radio, MMDS TV, Community u.h.f. TV, the opening of two new proposed TV channels and the development of Search and Rescue.

No. 2: How about an article or column on f.m. radio reception? Here it's a big effort using high gain antennas trying to receive stations from N. Ireland and the UK.

**Name and address supplied.**

*We have, from time to time, covered the radio scene in Eire. To a large extent we are dependant upon articles being submitted by authors. So, Mr. Name and Address Supplied, why not get your word processor fired up?* **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.*

**IF YOUR LETTER IS PUBLISHED YOU WILL RECEIVE A £5 VOUCHER TO SPEND ON ANY SWM SERVICE**

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### Components for SWM Projects

In general all components used in constructing *SWM* projects are available from a variety of component suppliers. Where special, or difficult to obtain, components are specified, a supplier will be quoted in the article.

The printed circuit boards for *SWM* projects are available from the *SWM* PCB Service, Badger Boards, 80 Clarence Road, Erdington, Birmingham B23 6AR. Tel: 0121 - 384 2473.

### Photocopies and Back Issues

We have a selection of back issues, covering the past three years of *SWM*. If you are looking for an article or review, or whatever that you missed first time around, we can help. If we don't have the whole issue we can always supply a photocopy of the article. Back issues are £2.60 each, photocopies are also £2.60 per article, plus £1.00 for subsequent parts of serial articles.

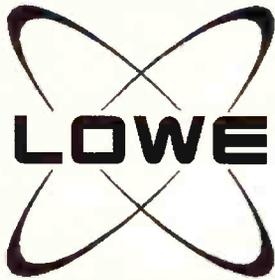
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### Technical Help

We regret that due to Editorial time scales, replies to technical queries cannot be given over the telephone. If you require help with problems relating to topics covered by *SWM*, please write to the Editorial Offices, we will do our best to help and reply by mail.



# Lowe Elec

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- Transmissions in English database included, courtesy World DX Club
- Airband database included, courtesy Photavia Press
- Access Klingenfuss Super Frequency List on CD-ROM
- Receiver can be tuned direct from any database
- On screen S-meter Spectrum display
- Off air record and playback sound files (needs SoundBlaster card)
- PlayList Function - up to 20 station times and frequencies can be pre-programmed for automatic listening

There's obviously a whole lot more which you can find out by asking for our datasheet or by downloading the manual from our Website!

Or you can just buy it! RCON only costs **£49.95 (plus £3.00 p&p)** which is great value for money compared with similar applications! RCON will set new standards in functionality and value for money!

Currently RCON will control the HF250, HF150 NRD535, R72E, R7100, AR3000A, AR8000, AR5000 and drivers for newer (and older!) receivers will be added according to demand.

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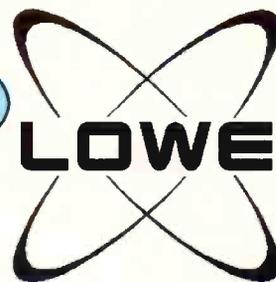
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# The AOR DDS-2a - What Every Collins Owner Wanted!



*John Wilson's partiality for the older valved receivers is well known. In his offering this month he looks at an interesting add-on unit designed without a thought for profit - just because it was needed.*

**I**t's reassuring to find that even amongst the dedicated market chasing manufacturers there are those who will produce something just for the hell of it, and to follow their own particular enthusiasm. The founders of AOR, Mr. Oshima and Mr. Takano fall into this category and because they are admirers and users of Collins equipment have decided to produce something which may not bring any profits but will bring a great deal of delight to all the other Collins enthusiasts around the world. I have been privileged to try out this new device, largely because I own two KWM-2 transceivers, but my comments will apply equally well to the 'S' line receivers and transmitters.

The KWM-2 and 'S' line equipments, for whatever design reason Collins may have had at the time, tune in bands only 200kHz wide, and because the first conversion oscillator uses a crystal to convert the incoming signals

down to a tunable i.f., a separate crystal is required for each 200kHz band covered. Whilst this may not be a problem for a purely amateur band receiver where 200kHz covers the bit you need at any one time, it's a real drawback if you want to have general coverage because you will need upwards of 130 crystals. Not only would 130 crystals cost a lot of money (I just had a quote for a single crystal at £13 per unit), there aren't enough spaces in the equipment to fit them, so it would be 'up with the lid' every time you wanted a band change. For *non-aficionados* of Collins, you should know that the r.f. sections of the KWM-2 and 'S' line are capable of operating anywhere between 3.4 and 30MHz, so only the first conversion crystal needs to be changed for operation between these limits.

What AOR have done is to design and manufacture a solid state external unit which generates all 132 spot frequencies at 200kHz intervals to replace the first conversion oscillator, and also a DDS v.f.o. which

replaces the 2.695 to 2.495MHz v.f.o. in the Collins. By clever electricrickerly and use of microprocessor magic, the DDS-2A effectively turns the KWM-2 and 'S' line units into fully tunable general coverage receivers/transceivers and at the same time introduces a range of modern features such as memories, twin v.f.o.s, digital readout to 10Hz and so on. Given the seemingly eternal appeal of Collins equipment, the concept of having continuous frequency coverage makes the DDS-2A a 'must have' accessory; I certainly want one for myself as soon as possible.

The DDS-2A is packaged in a rugged but stylish box measuring 80mm high, 180mm wide and 181mm deep, weighing 1.9kg. It's made to match Collins style and colour, and you can see from the photograph that AOR have done a good job. As with other AOR products, a great deal of thought has gone into the smaller details, such as the fact that the main dial shaft has been specially fitted with a quarter inch shaft rather than the commonly

encountered metric shaft so that the owner can replace the supplied knob by the classic Collins spinner knob to make the match complete. Taking a look inside reveals a beautifully made unit which oozes quality (and costly) manufacture, whilst wide use is made of surface mount techniques, and all sensitive sections are separately screened. The absence of flexible wiring shows a design awareness of the potential problems encountered when cable harnesses are used. Needless to say, I was eager to get the DDS-2A connected so I found a suitable 12V d.c. supply and got to grips with the handbook.

I couldn't have wished for anything easier: all I needed to do was take out the 'VFO Power' plug inside the KWM-2, connect a ready terminated lead from the DDS-2A and connect another ready made lead from the DDS-2A to the 'Ext VFO' phono connector on the rear panel. That took care of the v.f.o., but how were AOR going to replace the h.f. crystal oscillator, because Collins had made no provision for this in their design. The answer was brilliant; AOR supply a small tubular unit with a B9A plug on one end and a B9A valve socket on the other. Take out the first receive mixer valve, replace it by the little unit and plug the valve back into the socket on top. From the side of the unit comes another coaxial lead which goes back to the DDS-2A, and this carries the 132 different injection frequencies into the receive and transmit mixers in the KWM-2. How neat. I have to say that the 75S series of receivers have to have a tiny modification done to them but as Collins owners are probably competent to do this job there should be no problems since the modification instructions are clearly described in the DDS-2A manual and even the necessary bits are provided. If advice is needed, AOR UK

are on hand to answer any queries, but as far as I was concerned with my KWM-2 the job couldn't have been easier.

## The 'Eyes' Have It

Having connected the 12V d.c. supply, the DDS-2A switches itself on automatically when the main receiver or transceiver is switched on, and the display is one of those excellent back lit l.c.d. units which show black characters on a glowing amber



background. Tired eyes caused by age, drink, or both, really appreciate this type of display...I can vouch for that. Never mind the Tony Blair advert - I really do look like that! Frequency readout uses eight digits to give 10Hz resolution, and the DDS v.f.o. moves in 10Hz steps at the smallest tuning rate. An underline cursor is located under the frequency digits, and this can be moved left or right using two buttons located alongside the tuning knob. The tuning rate is determined by the position of this cursor, so if it sits under the 1MHz digit, the tuning steps are 1MHz, whilst under the 10Hz digit the tuning steps are 10Hz. This means that if you need to move swiftly from 4 to 28MHz it can be achieved in seconds, then revert to finer tuning steps for actual tuning of signals. I made comment in a previous review about my own disquiet with

automatic 'speed-up' on synthesiser tuning controls, but in the DDS-2A I have found my ideal. For me, the concept of selecting which digit to change and then whizzing the tuning knob without encountering any 'speed-up' is perfect, but I appreciate that it is only a personal preference and should not be taken as a definitive statement on which method is best.

The main display also shows memory channel number; which v.f.o., A or B, is in use; a 'remote' legend to show that the DDS-2A is

under computer control; and other information on the various operational functions. 100 frequency memories are provided with easy entry and recall, the memory channel being selected either by the main tuning knob or the two up/down buttons alongside it. When the v.f.o. is in use the memory channel number disappears from the display so that you know at a glance whether you are using the v.f.o. or a memory. The twin v.f.o. system gives the facility of being able to switch between two independently set frequencies, and for the transceiver user the further facility of split transmit/receive frequencies, although because of the exciter/preselector tuning control the two frequencies must be in the same band. Split band (cross band) transceive is not possible.

The functions of the control buttons on the panel

are obvious from the photograph, and represent the normal range of facilities provided on modern transceivers. One thing which may puzzle the non-Collins person is the arc of five l.e.d.s designated A to E alongside the control buttons. The letters refer to the five frequency ranges of the preselector control on the KWM-2 or 75S, and remind the user to select the correct band switch position and peak the preselector for the frequency range in use. This may seem an antiquated thing to have to do in these days of broadband receivers, but anyone who has read my previous articles will know that the presence of a preselector improves the receiver performance no end, particularly in rejection of second order intermodulation products, and that the lack of preselection has resulted in observable deficiencies in some very recent, and expensive, amateur radio transceivers - but as a Collins owner you know all that, don't you?

## What's On The Back?

Well, there are the expected things such as the power input connector; you need 12V d.c. at 600mA; two coaxial outputs for the v.f.o. and h.f.o. drive to the KWM-2/75S; a 9-pin connector for the inter-unit control (this is the lead which plugs into the 'VFO Power' socket inside the transceiver); and the inevitable RS-232C port for computer control. Any PC terminal emulation software should work with the DDS-2A and the control codes are all explained in the DDS-2A manual, basically being straightforward commands duplicating the front panel controls. The DDS-2A responds to computer instructions by returning frequency, memory channel number and so on, and frequencies can be sent from the computer keyboard and used as v.f.o. or written to a

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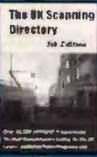
The Cub is ideal for communication, surveillance and recreational monitoring applications. From 10MHz-2.8GHz. The Cub has maximised sensitivity for detecting RF in the near field and displaying the frequency detected. The cub features a digital filter that reduces false counts and random noise, digital auto capture that acts like an intelligent hold button allowing any frequency captured to remain displayed as long as needed.

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BC-220XLT .....Special offer.....£159.95

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\*\*\*\*\* Wideband scanning receiver \*\*\*\*\*  
\*\*\*\*\* covers everything from 500kHz- \*\*\*\*\*  
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R-5000	VGC	£599.95
R-5000	With VHF converter	£799.95
IC-R71E	VGC	£499.95
FRG-100	Ex-demo	£399.95
FRG-7700	SW receiver	£299.95
FRT-7700	SW ATU	£59.95
AT-1000	SW ATU	£69.95
R-2000	With VHF converter	£399.95
R-1000	Communication receiver	£269.95

AR-3000A +	As new	£749.95
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AR-2500	Wideband scanner (all mode)	£349.95
AR-950	Wideband scanner	£169.95
AR-2800	Wideband scanner (all mode)	£329.95
SR-001	Scanner with remote	£199.95
PRO-2032	Desktop scanner	£169.95
PRO-2021	Desktop scanner	£149.95
PRO-2036	Desktop scanner	£199.95
IC-R7000	Base scanner	£749.95
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VGC		£229.95
Sony ICF-2001D	As new	£139.95
Sony ICF-7600E	VGC	£119.95
Sony SW-7600	VGC	£199.95
Sony PRO-80	VGC	£179.95
AR-1000	As new	£199.95
AR-2000	As new	£199.95
Icom IC-R1	As new	£269.95
Opto-Cub	As new	£99.95
Opto-Scout	As new	£299.95
PRO-43	As new	£169.95

selected memory. All very comprehensive and easy to follow from the manual.

However, there are also two slide switches on the rear panel labelled 'TX-RX' and 'ON-OFF' which require a mention. In any s.s.b. receiver or transceiver, the exact frequency you are receiving depends on the frequency of all conversion oscillators used in the signal path, including the carrier reinsertion oscillator (b.f.o.). Because the DDS-2A offers not only readout to 10Hz but also outstanding stability from the use of a TCXO master oscillator, it is essential to include the receiver carrier insertion oscillator in the readout calculation if the display is to be correct, and because this oscillator is often aligned to suit the particular mechanical filter within the transceiver it is not possible to use a standard offset value in the DDS-2A. AOR therefore have provided these two little switches on the rear panel which enable the DDS-2A to be adjusted by the user to suit any particular carrier oscillator setting thus ensuring that what the readout says is correct. All explained in simple terms in the manual, and done in a few seconds - very neat. The TCXO incidentally gives frequency stability of 5p.p.m. (0.005%) which is a distinct improvement on the '100Hz after warmup' specification for the original equipment (and you don't have to wait for warm-up).

## Other Technical Niceties

Collins instruction manuals include a note that the second harmonics of the v.f.o. and variable i.f. fall within the range 5 to 6.5MHz

### Specifications

<b>Frequency range:</b>	HFO	8.550 - 32.950MHz
	VFO	2.695 - 2.495MHz
<b>Stability:</b>		<5ppm (0.005%)
<b>Output level:</b>	HFO	2.0 - 2.3V r.m.s. @ 50Ω
	VFO	2.0 - 2.3V r.m.s. @ 100Ω
		1.5 - 1.7V r.m.s. through BPF
<b>Spurious &amp; Noise Attenuation:</b>	HFO	>70dBc @ 1 - 25kHz from carrier frequency >75dBc @ 26kHz - 1MHz from carrier frequency
	VFO	>80dBc @ 1 - 25kHz from carrier frequency >90dBc @ 25kHz - 250kHz from carrier frequency
<b>Phase noise attenuation:</b>		>130dBc/Hz @ 25kHz (v.f.o.) from carrier frequency
<b>Power source (external):</b>		12.0 - 13.8V d.c. @ 600mA with >5mV ripple content.
<b>Dimensions:</b>		80 x 180 x 181mm
<b>Weight</b>		1.9kg



and spurious responses will occur. The v.f.o. tuning range is 2.695 to 2.495MHz which is below the normal operating frequency range of the transceiver, but the second harmonic is 5.390 to 4.990MHz whilst the third (although not mentioned by Collins) tunes 8.085 to 7.485MHz. The reason for quoting the frequencies tuning high to low is that due to the system configuration in the KWM-2 or 75S, the v.f.o. tunes 'backwards'.

**Fig.1** shows how the second harmonic of the v.f.o. coincides with the receiver frequency in two places within the 5 to 5.4MHz bands, and at these points a

spurious signal will be heard.

**Fig. 2** shows the effect of the third harmonic in the bands between 7.5 and 8.1MHz. In the original Collins design no attempt was made to do anything about the v.f.o. harmonics and consequently they are very prominent (almost paralysing), but AOR have thoughtfully provided a band pass filter in the signal feed from the DDS-2A to the KWM-2 which knocks the v.f.o. 2nd harmonic down by almost 30dB and the third by about 45dB. When tuning across the points of coincidence using the DDS-2A, the harmonics are still there and reasonably strong,

but greatly improved on the original design. Someone at AOR in Tokyo certainly knows their Collins equipment.

## Never Mind The Technical Detail, How Did You Like It?

(as the Actress said to the Bishop).

Using the DDS-2A transforms the KWM-2, and also presumably the 75S, into an up to the minute piece of equipment. The sudden availability of the complete frequency range from 3 to 30MHz made me wander off tuning all sorts of frequencies I'd not heard before on the transceiver, and I revelled in the 'Collins sound' coming from aircraft and utility channels. The stability of the DDS-2A made ECSS reception of broadcast stations really easy, and although I would now like someone (are you listening John Thorpe?) to make a synchronous a.m. detector for me, I'm pleased enough with the performance as it is. Of course, for the owner of a 75S-3 series receiver, the addition of the DDS-2A makes a real difference, because the 75S already has a.m., s.s.b. and c.w.

modes provided together with a tunable i.f. notch and even a tunable b.f.o., so what a combination to have. For the radio amateur, the scene is even better because having the split v.f.o., 100 memories and everything else including a transmitted signal with low third order intermod products (due to the Collins p.a. and driver design, not the DDS-2A), brings the station right up to date without having to spend £3000 plus on a solid state replacement transceiver with possibly inferior receiver second order intermodulation performance.

As far as r.f. performance is concerned, the DDS-2A



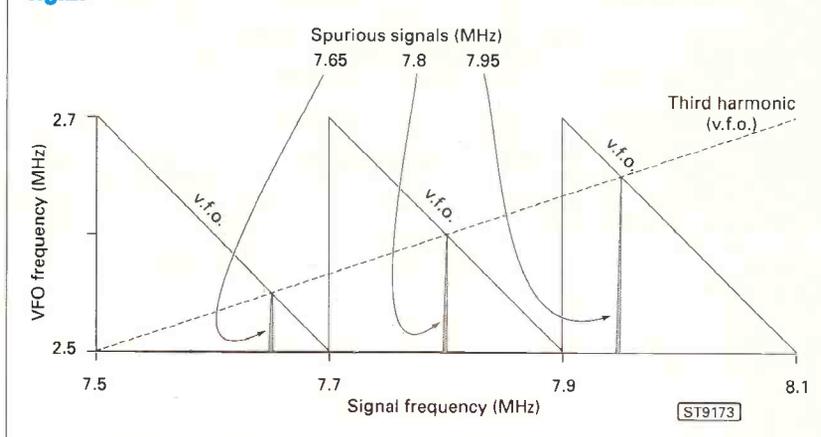
produced the same sensitivity and dynamic range as the original Collins oscillators, together with identical power output on transmit. The output from the DDS-2A v.f.o. was cleaner than the Collins PTO, probably due to the use of a DDS system, but the HFO (132 frequencies) was noisier than the Collins crystal oscillator in the KWM-2. This is not in the least bit surprising because there is still little to beat a good crystal oscillator for noise performance; in fact most engineers and reviewers (including me) use crystal oscillators as clean signal sources. That being said, the increase in reciprocal mixing noise using the DDS-2A makes little practical difference in use, and the combination is still on a par with most modern solid state equipment.

## Conclusions

For anyone owning Collins equipment the DDS-2A is manna from heaven, and AOR are to be congratulated for taking the time and effort to produce this unit. Sales will obviously be limited by the relatively small numbers of Collins owners, so for UK customers the DDS-2A will only be sold direct from AOR UK in Belper, Derbyshire. As I have mentioned, adding the DDS-2A to a 75S series receiver will make a wonderful general coverage unit, whilst the radio

amateur can revitalise his Collins station without difficulty. The unit is very well designed and constructed and a great deal of thought and knowledge has gone into its production. The slight degradation of reciprocal mixing performance is more than offset by the enormous benefits given by having full general coverage operation together with up to the minute memory and remote control facilities, and it's really refreshing to find genuine enthusiasm from a small (ish) manufacturer of communications equipment. Units such as the DDS-2A could never come from any of the 'Big Three' because they would never be profitable, so it's a big "Thank you" to AOR from the hobby in general and Collins owners in particular.

fig.2:



## And so to other things.

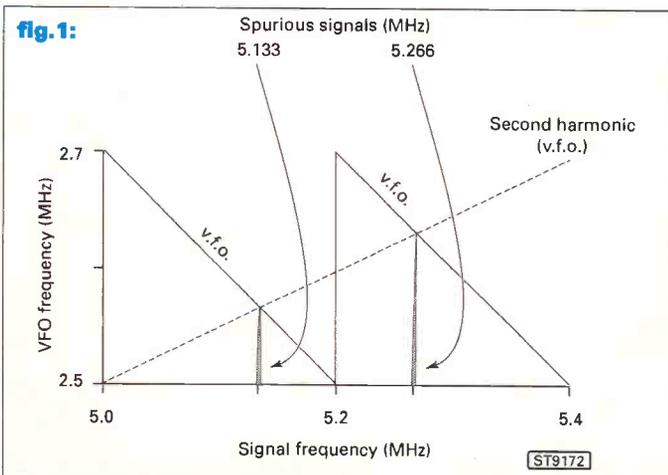
Had a nice letter from Ken Perfect G3FIK who, as many of you will know, was the founder of Amateur Electronics in Birmingham, and who made a significant contribution to the short wave hobby in the Midlands. He takes me to task about my comments in the August issue of *Short Wave Magazine* regarding the demise of Amateur Electronics UK and asks me to make it clear that this all happened after Ken sold the company to another well known amateur radio importer, and matters were out of his control. I personally believe that it's true to say that, in a hobby market, most successful companies become that way because they reflect the personalities of the founders, and so many fail after the founders leave the company.

Ken goes on to say that he has had to give up golf, rape and pillage, but that otherwise he is as keen as ever and still collecting radios which glow in the dark. If anyone reading this has any units from the Command (AN-ARC) radio system Ken would be pleased to know. I too started to put together a Command setup in an attempt to duplicate the radio installation from a PBY (Catalina), but that's another story.

This year, by the way, is the 25th Anniversary of the Leicester Amateur Radio Show, but it seems like only yesterday that Ken Perfect, Bill Lowe and I, and many others in 'The Trade' at that time got together and decided that in the absence for the second year running of the RSGB Exhibition in London, we would all put some money into the hat and fund an exhibition in the Midlands. It was an immediate success and has gone on from strength to strength ever since, probably because it was supported to the hilt by the Leicester Amateur Radio Society right from that very first show. If we all get together this year for a grand reunion we should have some heavy nostalgia hangovers, so for a special 'Leicester', keep a lookout for the dates and reserve your bus ticket (in Ken's case he gets one free because of his age.....).

Also had a note from Richard McLachlan of Lowe Electronics wondering if, in view of my caustic comments regarding receivers and computers, I would like to try the WinRadio for myself. Naturally I took up the offer on behalf of all the readers, and all being well my observations will appear in *Short Wave Magazine* next month - wonder what my conclusions will be?? Happy anticipation my little chickens.

fig.1:



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- Dual 10 segment bargraphs provide deviation and relative signal level indication
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Computer controlled interface for Realistic Pro 2005/6 series scanner  
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# Active Solution?

The use of wideband active antenna has become popular in recent years. Mainly for two reasons, planning constraints have restricted larger antenna erections and the availability of low noise solid state amplifiers has enabled the use of significantly smaller antenna elements. Andy Ikin compares three different solutions to the eternal antenna dilemma.

**A**ctive antennas are divided into two groups; the dipole and whip antenna which respond to the Electrostatic Field of the radio wave and the loop antenna which respond to the Electromagnetic Field. The basic theory of operation is that a low noise amplifier is used to increase the signal received from a relatively small antenna to level suitable for the receiver. The performance is generally as good as a full size antenna because the noise level of the amplifier is normally lower than the atmospheric noise. The operation of the active antenna may seem to be relatively easy, however there are potential problems. The main problem is that all amplifiers generate distortion and this can cause ghost signals to appear on certain frequencies causing interference. Another source of interference that is becoming an increasing problem especially on the lower frequencies is noise induced into the antenna/feeder from the mains. In most cases this interference exceeds the intermodulation products of active antennas. This noise can effect both passive and active antennas.

To reduce the local radiated noise and mains borne noise, it is usual to site the antenna away from noise sources and use a screened feeder to the receiver. This will only work if the following criteria are met; the antenna is perfectly balanced in respect to feeder and that the feeder is not being used as the antenna return path. To achieve perfect balance is very difficult in

practice using dipole antennas because of mutual coupling to surrounding objects, also it is possible for mains noise to radiate directly from the feeder to the antenna.

## Theoretical Differences

There are theoretical differences between the active whip/dipole antennas to active loop antennas. A short whip/dipole when used with a high impedance amplifier will produce a relative constant output voltage over a very wide bandwidth from a constant field strength. The output voltage of an untuned loop is directly proportional to the frequency for a constant field strength. Therefore a very wideband active loop antenna requires a high gain amplifier for the low frequencies and low gain for the higher frequencies in order to provide a constant voltage output for a given field strength. At first sight this may be seen as a problem, in that the high amplifier gain may increase the small thermal noise voltage of the amplifier to a point where reception is degraded. However, this is not the case because the atmospheric noise at low frequencies is generally higher than the high gain amplifier noise.

A balanced loop antenna is less susceptible to local noise and noise radiating from the feeder because the magnetic component of the noise is smaller than the electrostatic component when the noise source is a small fraction of a

wavelength from the antenna. This is why a ferrite rod antenna used on medium and long wave picks up less local noise than simple wire. The use of an active or passive antenna that use the feeder as the return path such as longwire or whips are most susceptible to mains noise. There is also the problem that the feeder can act as an antenna especially with whip antennas.

## Comparison

In this review I have compared three active antennas, the Forster Technology TL loop, Mydel AA1 Whip and the Datong AD370 Dipole with more conventional passive antennas. The TL loop with its unique broadband design will also be compared to a prototype loop antenna using a conventional broadband amplifier. This will allow the reader to assess the relative performance of broadband loop antennas.

The passive antennas used were, a 20m Longwire with an RF systems MLB and a 10m vertical dipole using broadband Balun (Universal Magnetic Balun, UMB130).

The receiver is a JRC NRD-525 with a calibrated 'S meter'. The 'S meter' calibration is 100µV ± 3dB at S9 200kHz - 30MHz, each 'S' point is approximately 5dB. The lower frequency limit of the receiver is approximately 50kHz, therefore the antennas are not assessed below 60kHz.

The performance of all the antennas are compared to the

relative signal strength, subjective noise level, rejection of local interference and susceptibility to mains borne noise.

An assessment of the supplied documentation was compared to the actual products and the mechanical suitability was considered. The comparison of intermodulation performance takes into consideration the differences in the output signal levels.

## Description

The TL Loop antenna consists of a amplifier housed in a small light grey ABS box with a length of RG58c coaxial cable to form a 900mm loop. The loop is supported by a child's Hula Hoop (not provided).

A 4m length of RG58c terminated with a BNC Jack is provided for the receiver (this cable can be extended up to 50m). The power supply is provided by an open frame case that houses three Alkaline D-cells. This connects to the amplifier by a 400mm twin lead. The current consumption is 50mA. The data sheet for the loop states that the amplifier/loop uses a special feedback technique to optimise the amplifier gain to compensate for the low output of the loop at very low frequencies.

The loop is designed for use from 10kHz to 30MHz and is capable of providing deep nulls for ground wave signals. The published intermodulation performance is equivalent to 46dBm (second order) and 20dBm (third order).

The Prototype Loop uses a 1m diameter aluminium loop connected to an integral broadband amplifier housed in an ABS box. The amplifier has a gain of 11dB and has typical second order and third order intercept points of

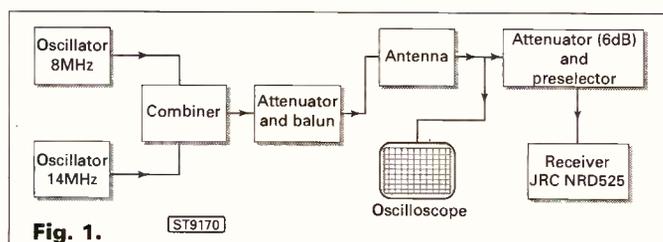
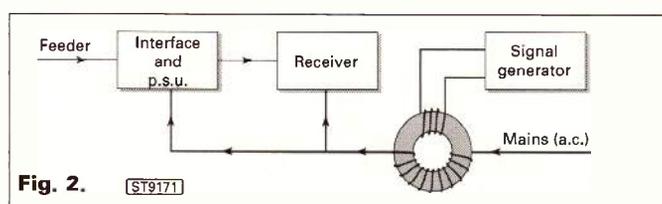


Fig. 1.

74 and 40dBm respectively. The 12V power supply is provided via the feeder cable from an interface unit. The interface unit has a 3dB pad to ensure a correct antenna impedance termination, an integral feeder isolating balun prevents mains borne noise from being coupled to the feeder. The frequency range of the loop is 3 - 30MHz. This loop was originally design for a phased array system.

The AD370 consists of a Head Unit, Interface Box and an 11V p.s.u. The AD370 comes complete with stainless steel antenna whips 8m of feeder cable and a receiver interface cable. The Head Unit amplifier is housed in watertight ABS box with the feeder cable entry via a Nylon cable gland. The feeder cables use IEC TV connectors. The Head Unit contains a differential amplifier using balanced push-pull J310 f.e.t.s and ZTX-327 bipolar transistors. Lossless transformer negative feedback is used on all the transistors to reduce intermodulation products. The amplifier is protected against overload and static discharge with four reverse biased diodes. Common mode rejection (feeder pickup) is provided by the balanced configuration and an integral transmission line Balun on the feeder. The Interface unit contains a 10dB single ended amplifier to boost the antenna gain. This amplifier is recommend only for use in low signal areas e.g. outside Europe. The current consumption of the active antenna is 120mA. The frequency range is 200kHz - 70MHz. The second order and third order intercept points are 66dBm and 36dBm respectively for the Head Unit only, using the interface unit amplifier, the second order and third order intercept points reduces to 46dBm and 27dBm respectively.

The Mydel AA1 antenna is a 900mm high capacitance whip antenna protected with a strong plastics sleeve, swivel mounted on a conical white plastics base. The plastics base houses the amplifier unit and a u.h.f. SO-



239 is provided on the underneath of the base for the feeder connection. The whole antenna is of a very sturdy construction. An interface unit is supplied to allow the 24V d.c. power to the amplifier via the feeder cable. The antenna will be supplied complete with a 24V power supply (no 24V power supply was provided with the review unit which is a pre-production model). Therefore I used two regulated 12V power supplies in series. The data sheet states "Distortion due to amplifier voltage limitation occurs at field intensities exceeding 5V/m" - this does not mean that the antenna will be intermodulation free at this field strength. The data sheet does not provide any intermodulation performance data. The operating range for the AA1 is 10kHz - 30MHz.

### Test Site

The site for the AD370 and AA1 was some 20m from the house at 1.5m above ground except for the loop antennas which were sited at ground level also 20m from the house. In order to make a fair comparison, all the antennas were positioned for vertical polarisation and installed in accordance to their provided specifications. The two passive antennas were sited nearer to the house and therefore were subject to a higher local noise level. The feeders from all the antennas were approximately 40m of RG58c. Each cable was connected to a multi-way antenna switch via an interface unit where necessary. The output of the antenna switch was connected to the receiver. A passive preselector was used to select the antenna intermodulation products in the 2-30MHz range.

At first a general listening assessment was made of all

the antennas. There was an immediate problem with the MyDel antenna, in that there was considerable interference (buzzing noise) from 50-500kHz. The TL loop appeared to be immune to this interference and there was only slight interference on the AD370. Eventually the problem was traced to spikes from the rectifiers on all the power supplies for the active antennas. Each power supply was dismantled and a 0.1µF 50V capacitor was soldered across the low voltage transformer secondary winding. This modification completely suppressed the buzzing noise.

Several days were spent listening to the radio and switching between antennas to assess for noise, intermodulation and relative signal levels. The relative signals level from 60kHz to 22MHz are shown in **Table 1**.

Because of the poor propagation conditions on the higher frequencies it was not possible to perform any listening tests from 22-30MHz, however I was able to simulate signals up to 30MHz by connecting a signal generator to a 10m dipole antenna over two wavelengths distant from the active antennas. The relative signal levels were:

	25MHz	30MHz
AA1	S9 +20dB	S9 +17.5dB
AD370	S9 +15dB	S9 +10dB
TL Loop	S8	S9 +10dB
Prototype Loop	S9 +12.5dB	S9 +10dB

The weak signal performance of the antennas was compared by listening late at night to HCJB's s.s.b. transmission on 21.455MHz. The AA1 was too noisy with intermodulation products; the MLB, UMB130 and the AD370 was readable with lower noise; the TL loop was unreadable because the antenna gain was too low to overcome the receiver noise;

the Prototype Loop provided the most readable signal with 15dB more gain than the TL Loop. A further test was conducted in the daytime on 1440kHz Radio Luxembourg). The AA1 was swamped by intermodulation from Radio 4 (198kHz); the Prototype Loop was unusable; the AD370 provided a slightly better signal than the TL loop; the MLB and the UMB130 provided lower noise reception.

The general listening revealed considerable intermodulation with the AA1 Whip antenna. None of the other antennas showed any intermodulation products. However, the general level of signals are lower than they were a few years ago at the height of the Sun Spot Cycle. Therefore it is possible that intermodulation may become a problem with antennas with lower intercept points as reception conditions improve over the next few years.

### Intermodulation

Intermodulation with active antennas is usually second order i.e. the sum and difference of frequencies and their harmonics of strong signals in the broadcast bands. Because the AA1 was producing intermodulation products, it was decided to measure the second and third order intercept points of all the active antennas using the configuration in **Fig. 1**.

The test equipment consisted of two crystal oscillators, 8MHz and 14MHz. Each oscillator is fitted with a crystal filter to reduce harmonics by 50dB and prevent oscillator interaction. The two oscillators are combined with a transformer combiner/splitter. The output of the combiner is connected to the antenna under test via 50Ω attenuator and a balun for the balanced antennas. The amplifier is connected to the receiver via a 6dB attenuator and a passive preselector. The combination of the 6dB attenuator and a passive preselector ensures that the antenna is terminated to a 50Ω load. The passive preselector ensures

that the 8 and 14MHz signals do not overload the receiver. An oscilloscope is used to measure the amplifier output level of the two oscillators. The receiver is used to measure the intermodulation products.

The receiver 'S meter' is calibrated in conjunction with the 6dB attenuator and a passive preselector.

The AA1 was capacity coupled to the combiner/attenuator and the antenna output signal level was set to -6dBm (114µV). The second order intermodulation products were -56dBm (355µV) at 22MHz and -59dBm (251µV) at 6MHz.

The second order intercept point IP2 was calculated using **Formula 1**:

$$IP2 = 2(\text{max signal output dBm}) - (-\text{intermodulation level dBm})$$

$$IP2 = 2(-6\text{dBm}) - (-57\text{dBm})$$

$$IP2 = -12\text{dBm} - (-57\text{dBm})$$

Therefore the average second order intercept point (IP2) was: +45dBm. This was repeated with output set to -2dBm so that the third order intermodulation could be measured.

The third order intercept point IP3 was calculated using **Formula 2**:

$$IP3 = \frac{3(\text{max signal output dBm}) - (-\text{intermodulation level dBm})}{2}$$

$$IP3 = \frac{3(-2\text{dBm}) - (-84\text{dBm})}{2}$$

$$IP3 = \frac{-39\text{dBm} - (-84\text{dBm})}{2}$$

$$IP3 = +7\text{dBm}$$

Therefore the third order intercept point (IP3) was +39dBm.

Examining the above it is clear that the AD370 and the Prototype Loop have very good intermodulation

performance and that both the AA1 and the TL Loop have poor performance. However it is easy to be misled by judging these figures alone, what has to be considered is the gain of the antennas relative to the same field strength. The AA1 whip and the TL Loop have nearly the same second order intercept of +40dBm but the relative gain of the AA1 whip is 15-20dB higher at h.f. Therefore the AA1 will produce 30-40dB more intermodulation than the TL Loop or the converse, the intermodulation of the TL Loop will be 30-40dB lower than the AA1.

Using the premis that the intermodulation performance of the AD370 is adequate, it would not be unreasonable to compare the other antennas

to the AD370 having made an adjustment for the different antenna gains. The MyDel antenna has 10dB more gain, therefore in order to achieve the same intermodulation performance would require IP2 to be +86dBm and IP3 to be +43dBm. The TL Loop has 8dB less gain than the AD370, Therefore in order to achieve

the same intermodulation performance would require IP2 to be +50dBm and IP3 to be +16dBm. Having made the adjustment for the relative antenna

gains it quite clear that the AA1's IP2 is totally inadequate, although the IP3 is satisfactory. The TL Loops IP2 only requires a slight improvement and there is no problem with IP3.

The Prototype Loop has a similar gain to the AD370 at h.f. and a slightly higher intercept points therefore the intermodulation performance would be comparable.

## Susceptibility to Mains Noise

This test consisted of winding the common mains cable of the receiver/antenna power supply onto a large ferrite ring (10 turns) to provide a transformer so that the output from a signal generator could be injected in series with the mains supply to simulate mains borne noise - see **Fig. 2**. This effectively puts the signal into the antenna feeders return path.

Under this test with a perfectly balanced antenna, the only signal to enter the receiver will be from direct radiation from the house wiring because the signal generator is effectively connected to the mains wiring. This test was conducted at three frequencies 123kHz, 1 and 5MHz. The level of the signal generator is measured with each antenna connected to the receiver in turn. Then the test is repeated with a broadband 1:1 feeder isolation transformer next to the receiver and a Antenna Feeder Isolator (multi-section transmission line Balun to allow d.c. feed to active antennas) fitted to the antenna side of the interface

isolators. The smaller the difference in signal indicates that the antenna has the lowest susceptibility to mains borne noise. The table below shows signal difference between the antennas.

The above results indicate that the longwire with the RF Systems MLB and all the active antennas except the Prototype Loop are susceptible to mains borne noise. The poor rejection of the RF Systems MLB is simply due to the fact that the antennas return path is the mains earth. Any other longwire and balun that uses a mains earth as the antenna return path would also have poor rejection. The Prototype loop was not tested at 123kHz because its lower frequency limit is 200kHz. The dipole with the UMB130 has low susceptibility simply because the UMB130 is a balun and isolation transformer combined into one component. The TL Loop however provided to highest rejection at 123kHz compared to the AA1 and the AD370.

## Observations

Loop antennas have distinct advantages over other antenna types, in that their broadside nulls can provide a considerable reduction in local interference. The TL Loop and the Prototype Loop were no exception to this and consistent nulls of 25dB were obtained with ground wave and local interference. The loops reception pattern is less affected by surrounding buildings and objects. The broadband design of the TL Loop works very well up to 12MHz with the gain dropping off up to 25MHz. The gain of the loop amplifier is approximately 28dB at

### Test Results - intercept averages.

	IP2 (dBm)	IP3 (dBm)
AA1	45	39
AD370	70	38
TL Loop	42	19
Prototype Loop	74	40

Frequency	Antenna			Signal Difference		
	AA1	AD370	TL Loop	Longwire	Dipole	Proto. Loop
123kHz	42dB	42dB	25dB	40dB	25dB	-
1.0MHz	40dB	25dB	30dB	27dB	5dB	0dB
5.0MHz	22dB	20dB	27dB	22dB	0dB	0dB

unit. The Antenna Feeder Isolator was necessary to prevent signal coupling across the active antenna power supplies. The level of rejection is the difference between the signal with the isolators and without the

300kHz, decreasing to 4dB at 10MHz. Also I noticed that the sensitivity of the loop appeared to be low at 60kHz (MSF Rugby), 112µV when compared to 198kHz 3mV (Droitwich). The approximate difference in power between **36▶**



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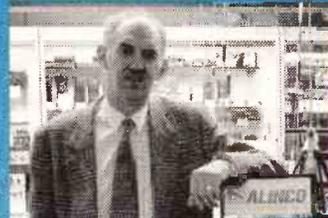
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# The Story of the Bombe

David White G3ZPA tells the story of how a British genius helped decipher the German Enigma messages.

**A**lan Turing was born in London in 1912 and in his teens won a mathematics scholarship that enabled him to enter an academical career at Kings College in Cambridge. In 1936 he published a paper that demonstrated that he was a modern day father of computing by mathematical analysis. In short, it showed that he was one of the few people that could possibly be called a genius!

His first love, however, had always been ciphers and because of his associations with Kings College, he was invited in the autumn of 1938 to attend a long seminar on cryptical analysis at the Foreign Office and yet another one in December of that year. This of course gave him his first contacts with an organisation called GC & CS (Government Code and Cipher School), which had recently moved into its new home at Bletchley Park in Buckinghamshire.

## Declared War

On the 3 September 1939, Britain declared war on Germany and on the very next day, Alan joined the rest of the cryptanalysts at BP or Station X as it became known during the war of 1939-45. In late July, the Polish authorities, realising that their country was likely to be soon overrun by the Germans, had invited the British and French to their secret research establishment at Pyry, near Warsaw in Poland, and gave them a copy of an actual German Enigma enciphering machine and technical instructions on how to construct a machine they had invented, called the 'Bombe'.

These instructions had arrived at Station X on 17

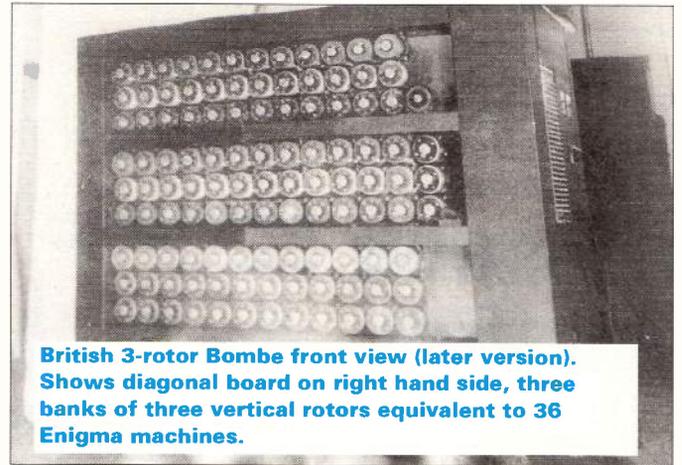
August and when Turing arrived, he was soon put to work on sorting out these instructions to see what he could make of them. The Bombe was constructed to try and emulate the German Enigma ciphering machine and to try and work out the initial basic settings it needed in order to bring it out into plain German.

## Vast Improvement

By the end of 1939, Turing had made such a vast improvement on the original Polish idea, that he felt that solutions could be speeded up ten times faster than the original Polish machine. Enter Gordon Welchman, who was a mathematician and also had come from Cambridge and had experimented with an idea with a plugboard with 26 vertical letters and 26 horizontal letters, which gave 676 contacts.

Gordon Welchman outlined his idea to Turing and it became known as the Diagonal Board. Turing and Welchman together decided to put their ideas to the deputy head of GCCS, who then contacted a commercial firm called The British Tabulating Machine Co Ltd of Icknield Way, Letchworth in Hertfordshire. They were asked to build a far superior experimental British version of the Polish Bombe, which now incorporated all Turings ideas and Welchman's diagonal board.

This was finally done and installed at Station X in July 1940 and was given the girl's name of Agnes. The reason for all this secret work was to try and construct a machine which could work out the initial rotor and plugboard settings for the top secret German cipher machine called the Enigma, which was constantly being refined to make it more difficult than it



**British 3-rotor Bombe front view (later version). Shows diagonal board on right hand side, three banks of three vertical rotors equivalent to 36 Enigma machines.**

already was for an enemy try and break its code, and on which the army, navy and airforce of the Germans relied totally to pass their messages and to stop them being read by any other country.

## Slow Progress

Turing had, on arrival at BP, secured lodgings in a large old country pub called *The Crown*, which was situated in the tiny village of Shenley Brook End. This overlooked the village green and a ford, which he had to negotiate on his untrustworthy bicycle in order to cycle the two miles to Bletchley Park every day, where by now he had been placed as head of the Naval section in Hut 8.

Progress was very slow in getting the Bombes built as was obtaining staff to run them. This was solved by recruiting ladies of the Womens Royal Naval Service (WRNS) who were specially selected for the work. By the time the Bombe No. 3 had been constructed, the basic design had been refined to such an extent, that it now stood seven feet high, four feet six inches wide and was three feet deep. It was now the equivalent of 12 enemy Enigma machines.

There were now three vertical banks of rotors, approximately five inches in

diameter and each set of three rotors represented one Enigma machine. The top six rotors in each bank would spin very fast and the second six would rotate at 1/26th of the speed of the top row. Likewise, the bottom row would all rotate at 1/26th of the middle row, which meant that they hardly seems to move at all. In the centre of each rotor was a number and round the perimeter of the rotor case were the 26 letters of the alphabet.

## Menu Layout

A menu was issued each day to the WRNS operator and her task would be to set-up each Bombe by placing each rotor in a certain starting order and then plugged in many cables at the rear of the machine according to this menu layout. The machine would then be switched on.

Obtaining a solution could take anything from one to four hours on average and could take up to 10 or 15 hours. As more Bombes were built, it was decided to send them to different locations around the countryside in Middlesex and Buckinghamshire, just in case enemy action should destroy these vital war winning machines.

First of all they were delivered to Wavendon,

which was only four miles from Bletchley and as more were slowly constructed, extra purpose-built buildings were erected at Crawley Grange, Gayhurst and Adstock in the grounds of the large mansions situated there.

### Black Period

In mid 1942, about 30 Bombes had been constructed and were in operation and new large venues were obtained at London Road, Stanmore and ultimately at Lime Grove, Eastcote, both in Middlesex. By the 1 April 1943, over 60 Bombes were now whirring away 24 hours a day as the amount of intercepts by the Y Service increased. These machines were extremely noisy and rendered conversation amongst the girl operators rather difficult.

One very black period for the codebreakers at Station X was on 1 February 1942 when the Germans introduced a new four rotor Enigma machine for the German navy, which effectively shut off the Allied authorities for ten and a half months in that year and which saw the British and American shipping losses rise dramatically.

Great modifications were made to the Bombe, which included clamping extra rotors onto the right hand side of the machine in an attempt to find the wheel settings of the new German code called 'Triton' and which the British called 'Shark'. The Americans had been given the secret of the Bombe at the end of 1941 and they turned their attention to building their machine specifically to be able to break the new four-wheel Shark code.

### American Bombe

The American Bombe was built by the National Cash Register Co. of Dayton, Ohio, and this two and a half ton monster was seven feet high, ten feet wide and two feet

deep and was found to be considerably faster than the British machines, as they had obtained all the benefit of the British experience with them. They had eight vertical stacks of four rotors and were operated by the young American ladies known as WAVES (Women Accepted for Voluntary Emergency Service).

In order to assist the hard pressed British government, the Americans sent over a large unit of their own Bombe group and these were eventually billeted in 1943 at Ruislip in Middlesex. More and more intercepts were being received as the Germans increasingly made more use of radio transmissions with the result that more Bombes were needed.

Production was stepped up by Harold Keen, the head of research at BTM, so that by March 1943, over 60 machines were in operation and May 1944 saw this figure increased to 116. By the day of the surrender of Germany to the Allied Forces on the 8 May 1945, 198 Bombes were in full operation and these were staffed by a total complement of over 2000 WRNS. This figure does not include all the male RAF technicians maintaining them.

### Four Rotor Operation

After the 1942 Enigma blackout of the new German naval codes, the first of the British four rotor Bombes was installed in June 1943, closely followed by the American four rotor machine in August 1943. While BTM concentrated on production of the three rotor Bombe, four rotor machines were constructed by Mawdsley Ltd. of Dursley, who eventually built 12 of this type and the Americans pushed production up so that in January 1944, at least 80 American Bombes were in operation at the US Navy's codebreaking unit in Washington, USA.

When the three rotor

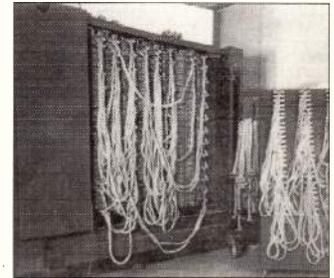
Bombes were converted to four rotor operation at BTM, it was called Cobra. It was connected to the separate 4th wheel rotor unit by a very fat cable consisting of hundreds of wires and these were all installed at the Eastcote site. The British Bombes used a system of angled wire brushes on their rotors and so could not be rotated backwards.

However, the American machines used carbon brushes and they could coast to a halt and be rotated backwards easily to the position of the likely matched settings as set out on the daily menus and then the printer would give a read out of the information. The British machine would almost frighten the operators because, if it detected a possible match, it would then suddenly crash to a halt and the girls would then read off the numbers of the dials to see if it matched their menus.

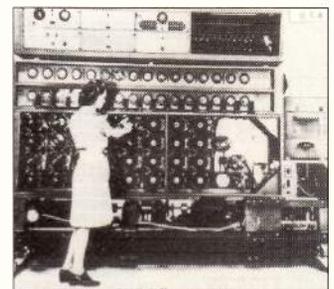
### War Shortened

Later in the war, most of the British machines were modified to give a printed read-out also. It must be emphasised that both types of machines were not computers in any sense of the word, but were electro-mechanical devices only with certain types of valves fitted in the later ones. This had been a massive and costly operation, but the Bombes gave the Allies the unprecedented opportunity to read all the German military messages and in doing so, helped to shorten the war by at least one and a half years.

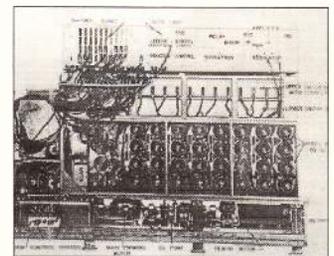
All this time, the Germans never discovered that their impregnable cipher machine, the Enigma, was in reality not so invincible as they thought, thanks mainly to the Poles and people like Alan Turing, Gordon Welchman and the other codebreakers at Bletchley Park.



Rear view of British 3-rotor Bombe, showing wiring of plugboard for daily changing.

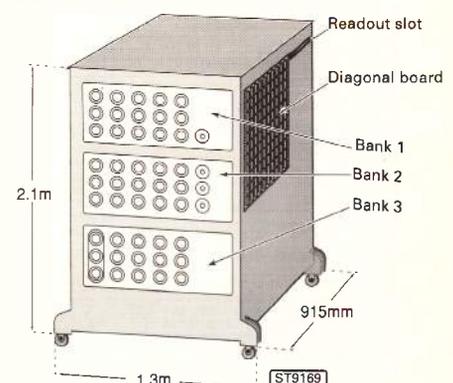


American 4-rotor Bombe (front view) being operated by a 'WAVES'.



Rear view of the American 4-rotor Bombe.

Three horizontal banks containing six vertical rows of three rotors equivalent to handling 18 Enigma machines at once.



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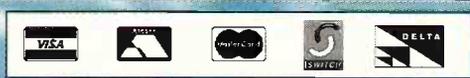
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# Snubbing MW/LW Broadcast Band QRM

## Part 2

In the first part of this two-part article, Joseph J. Carr K4IPV, explained the problems encountered with strong, unwanted signals on the medium and long wave broadcast bands. He goes on to show how the problems can be overcome.

### Wave Traps

A wave trap is a tuned circuit that causes a specific frequency to be rejected. Two forms are used: series tuned (Fig. 2.1a) and parallel tuned (Fig. 2.1b). The series tuned version is placed across the signal line (as in Fig. 2.1a, and works because it produces a very low impedance at its resonant frequency and a high impedance at frequencies removed from resonance. As a result, the interfering signal will see a resonant series-tuned wave trap as a short circuit, while other frequencies do not. The parallel resonant form is placed in series with the antenna line (as in Fig. 2.1b). It provides a high impedance to its resonant frequency, so will block the offending signal before it reaches the receiver. It provides a low impedance to frequencies removed from resonance.

The wave traps are useful in situations where a single station is causing a problem, and you don't want to eliminate nearby stations. For example, if you live close to a m.w. a.m. broadcast band

signal and don't want to interrupt reception of other m.w. a.m. broadcast band signals or l.w. a.m. broadcast band signals. The values of components shown in Figs. 2.1a & 2.1b are suitable for the m.w. a.m. broadcast band, but can be scaled to the l.w. broadcast band if desired.

If there are two stations causing significant interference, then two wave traps will have to be provided, separated by a short piece of coaxial cable. In that case, use a parallel tuned wave trap for one frequency, and a series tuned wave trap for the other. Otherwise, interaction between the wave traps will cause problems.

### High-Pass Filters

One very significant solution is to use a high-pass filter with a cut-off frequency between 1.7 and 3.0MHz. It will pass the short wave frequencies, and severely attenuate a.m. broadcast band signals in both m.w. and l.w. bands, causing the desired improvement in performance. Figure 2.2 shows a design used for many decades. It is easily built because the capacitor values are 1nF and 2nF (which some people make by paralleling two 1nF capacitors). The inductors are both 3.3µH, so can be made with toroid cores. If the T-50-2 Red cores are used (AL = 49), then 26 turns of small

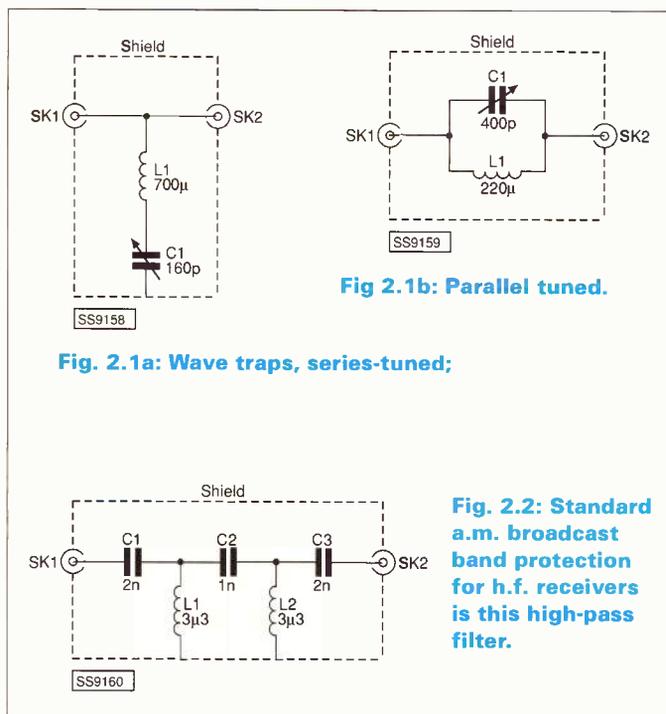


Fig. 2.1a: Wave traps, series-tuned;

Fig. 2.1b: Parallel tuned.

Fig. 2.2: Standard a.m. broadcast band protection for h.f. receivers is this high-pass filter.

diameter enamelled wire will suffice. Or if the T-50-15 Red/White cores are used (AL = 135), then 15 turns are used. The circuit of Fig. 2.2 produces pretty decent results for low effort. A number of readers contacted me with success stories when this circuit was published once before, a result that gives me pleasure. But there is a better way....

### Absorptive Filters

The absorptive filter (Orr 1996 and Weinreich/Carroll 1968) solves a problem with the straight high-pass filter method, and produces generally better results at the cost of more complexity. This filter (Fig. 2.3) consists of a high-pass filter (C4-C6/L4-L6) between the antenna input (SK1) and the receiver output

Table 2.1

C1	1.82nF	Use 1nF & 820pF in parallel
C2	1.27nF	Use 1nF & 270pF in parallel
C6	1.40nF	Use 1nF, 180pF & 220pF in parallel

Table 2.2

Coil	Value (µH)	Core	Colour	AL	Turns
L1	4.1	T-50-15	Red/White	135	17
L2	4.1	T-50-15	Red/White	135	17
L3	2.0	T-50-15	Red/White	135	12
L4	1.5	T-50-2	Red	49	18
		T-50-6	Yellow	40	20
L5	2.2	T-50-2	Red	49	21
		T-50-6	Yellow	40	24
L6	10.2	T-50-2	Red	49	46
		T-50-6	Yellow	40	51

**Fig. 2.3: Absorptive filter.**

(SK2). It passes signals above 3MHz and rejects those below that cut-off frequency. It also has a low-pass filter (C1-C3/L1-L3) that passes signals below 3MHz. What is notable about this filter, and from which it takes its name, is the fact that the low-pass filter is terminated in a 50Ω dummy load. This arrangement works a little better than the straight high-pass filter method because it absorbs energy from the rejected band, and reduces (although it does not eliminate) the effects of improper filter termination.

Some of the capacitor values are non-standard, but can be made using standard disc ceramic or mica capacitors using combinations in **Table 2.1**. The other capacitors are standard values.

The coils are a bit more difficult to obtain. Although it is possible to use slug-tuned coils obtained from commercial sources (e.g. Toko), or home-brewed, this is not the preferred practice. Adjusting this type of filter without a sweep generator might prove daunting due to interactions between the sections. A better approach is to use toroidal core home-brew inductors. The toroidal cores reduces interaction between the coil's magnetic fields, so simplifies construction. Possible alternatives are shown in **Table 2.2**.

All coils are wound with 0.511 to 0.255mm dia. (24 to 32 s.w.g.) enamel covered copper wire.

**Table 2.3**

Component	Reactance (Ω)
L1	28.8
L2	78.4
L3	38.0
L4	28.8
L5	42.0
L6	193.0
C1	28.8
C2	42.0
C3	193.0
C4	78.4
C5	78.4
C6	38.0

The dummy load used at the output of the low-pass filter (R1 in **Fig. 2.3**) can be made using a 51Ω carbon or metal film resistor, or two 100Ω resistors in parallel. In a pinch a 47Ω resistor could also be used, but is not preferred. In any event, use only non-inductive resistors such as carbon composition or metal film 0.25 to 2W resistors.

If you would like to experiment with absorptive filters at other cut-off frequencies than 3MHz, then use the reactance values in **Table 2.3** to calculate component values:

The exact component values can be found from variations on the standard inductive and capacitive reactance equations:

$$L = X_L / (2\pi F_c) \times 10^6 \mu\text{H}$$

and

$$C = 10^{12} / (2\pi F_c X_c) \text{ pF}$$

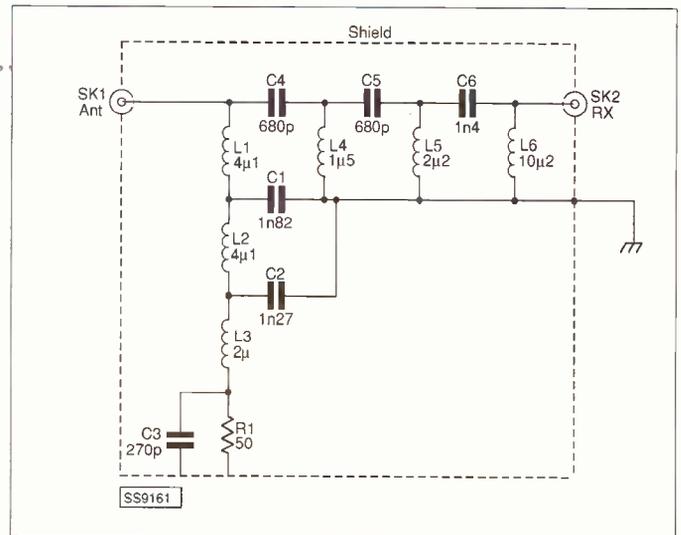
These component values are bound to be non-standard, but can be made either using coil formers (for inductors) or series-parallel combinations of standard value capacitors.

## Shielding

Shielding is a non-negotiable requirement of filters used for the QRM reduction task. Otherwise, signal will enter the filter at its output and will not be attenuated. Use a shielded aluminium box of the sort that has at least 5-6mm of overlap of the flange between upper and lower portions. I used a tinned steel r.f. box for this purpose when building the prototype for this filter.

## Expected Results

If the correct components are selected, and good layout practice is followed - which means separating input and output ends, as well as shielding the low-pass and high-pass sections separately - the absorptive filter can offer stop band attenuation of -20dB at one



octave above  $F_c$ , -40+dB at two octaves and -60dB at three octaves. For a 3MHz signal, one octave is 6MHz, two octaves are 12MHz and three octaves are 24MHz. My results were slightly less than these figures because some of my components were ill-matched (e.g. slug-tuned commercial inductors were used rather than toroidal core coils), but the results were consistent with expectations.

## And For Amateur Operators...

Amateur radio operators using the h.f. bands have to be sensitive to the problem of television interference. The absorptive filter will yield superior harmonic suppression than straight low-pass filters. Suitable filters can be built using the reactances of **Table 2.3**. In the case of a transmitter, however, the dummy load and output must be reversed. In other words, hang the dummy load from the junction of C6/L6 and connect the antenna to the junction of C3/L3. The transmitter is connected to the junction of L1/C4. The dummy load should be 50Ω, and rated for at least 50W, and can be of the sort normally used for amateur radio transmitters.

A design suitable for the US television bands is provided by Weinreich/Carroll (1968), and the same principles can be applied to UK/European bands. The same source also shows a number of other absorptive filter designs for

those amateurs and s.w.l.s who would like to experiment. Short wave listeners who consult that source should remember that the roles of the receiver and dummy load must be reversed for the filter to be useful.

## Conclusion

The problem of m.w./l.w. a.m. broadcast band interference to short wave receivers can be daunting, indeed, because of the high power level of signals encountered. Even good quality receivers will balk at handling those powerhouse sluggers. The use of either wave traps, high pass or absorptive filters will do the trick for all but the most severe cases. I've even seen it work inside the antenna/transmitter room of an a.m. station operating with 5kW (the on-duty engineer was an amateur, and was goofing off!).

## About the Author

Joe Carr K4IPV, is the author of *Joe Carr's Receiving Antenna Handbook* and *Practical Antenna Handbook 2nd Edition*, both of which are available by mail-order from the SWM Book Store (see page 80). Butterworth-Heinemann are about to publish a new book of his on wire antennas for both listeners and amateur operators.

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*You don't have to take the word  
of one reviewer...*



**AOR AR7030 - High dynamic range  
short wave receiver**

**Short Wave Magazine - John Wilson**

*"JT has wiped the slate clean on receivers as we know them and has rendered virtually everything else obsolete"*

*"If you can't get sensible audio out of even a rotten signal with the AR7030 then nothing will do it"*

**Ham Radio Today - Chris Lorek**

*"...I immediately thought how clean the signals sounded"*

*If you're not technically minded just read (the measurements) as superb. The blocking performance was so good that I found it was simply noise limited by the signal source..."*

**Monitoring Times & Radio Japan - Larry Magne**

*"Blocking and phase noise measurements are both excellent. Dynamic range is excellent at both 5 and 20kHz separation points, and third order intercept measurements at 5 and 20kHz separation points are superb" "...overall audio distortion is good-to-excellent... it becomes excellent-to-superb when the synchronous detector is used, and in the SSB mode is nearly nil"*

**DX ONTARIO - Guy Atkins**

*"AM synchronous detection: This mode has the tenacity of a mountain goat and clings to signals weak and strong..." "Kiwa Electronics performed their IP3 tests at 12MHz which resulted in measurements very close to AOR's specifications". "The AR7030 is certainly the quietest solid-state receiver I've ever operated. In comparison with a Japan Radio NRD-525 receiver, the difference is dramatic." "I wouldn't be surprised to learn of cash-conscious organisations in industry and government choosing the AR7030 over other, more expensive commercial receivers."*

**AWR Europe broadcaster for 10 years and contributor to many other DX titles - Gordon Bennett**

*"Is it an excellent DX machine? Yes!"  
"Is it an excellent receiver for SWL's? Yes!"  
"Can it be used with an indoor loop? Yes!"  
"...the audio is superb"*

**RSGB RadCom - Peter Hart**

*"The excellent RF performance of the AR7030 is certainly most apparent in on-air tests.  
"The intermodulation measurements are at the limit of my measurement capability and the close-in result by far the best I have ever measured on any general coverage receiver".*

A photocopy of these reviews and others are available, just forward a SAE and enclose 4 x 1st class stamp for each review - thanks!

**Congratulations to Philip Mitchell the SWM winner of the AR7030 competition**

A nice letter has been received since he collected the prize and it looks as if the receiver has already been put to good use...

*"...I have now replaced my previous receiver, a Lowe 125 with the AR7030 and am in the early stages of finding out all latter's capabilities. Initial reaction has confirmed all the nice things said about it by John Wilson in his Short Wave Magazine review and others appearing in your recent advertisement in that magazine. Of course it is early days and, in view of my advancing years it will take me some time to acquire real proficiency in getting the best out of the receiver. My interests lie in utility stations and the reception of weather facsimile maps and the vastly improved performance has produced some superior detail in these and related data. It is really amazing how a small number of front panel controls can effect so many changes to enhance and refine the outgoing signal..." P.M.*

**Short Wave Column - Number Stations**

**"For you, Tommy, zer vor iz over..."**  
Competition Time. What have 5.301, 5.630, 5.745, 10.180, 5.205, 4.270, 5.130, 5.371, 7.871, 12.167, 13.533, 17.410, 10.715 (not another one of his lists) 6.849, 6.688, 4.822, 14.750, 10.125, 13.920, 7.740, 14.622, 10.970, 9.130, 10.820, 6.853, 10.255, 15.682, 6.270, 4.665, 4.880, 6.959, 8.127, 11.545 and 11.072 have in common? They are all Number Stations, so we get to keep the prize.  
Fine, but what are they? After years of speculation as to what the endlessly repeated chains of numbers mean, it can now be revealed that the codes are for the benefit of "agents in the field",

## AOR DDS-2A

A new Local Generator Unit  
designed for the Collins  
KWM-2, 75S & 32S

The association between AOR and Collins has gone on for a long time (both the AR7030 & AR5000 featured on this page have also been designed to accept Collins mechanical filters) and continues with the introduction of the new DDS-2A.



The DDS-2A from AOR is a microprocessor-controlled external VFO for the Collins KWM-2(A) and S-Line, including 75S-3B and 32S-3. The DDS-2A uses the latest DDS and PLL technology to produce accurate and clean local signal injections for the Collins radio.

The DDS-2A combines the latest device architecture to bring many additional features:

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- BFO shift compensation
- Computer control
- Easy installation
- Traditional finish

*As reviewed in  
this issue of  
SWM*

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## AR5000 high performance in a single wide band receiver...



The AR5000 advances the frontiers of performance providing excellent strong signal handling, high sensitivity and wide frequency coverage with microprocessor facilities to match. A great advancement in wide band front end design has been made, partly due to the introduction of automatic electronic preselection between 500kHz - 999.999999MHz with low pass, band pass and high pass filters for other bands. The preselection may be "manually tracked" when monitoring spot frequencies to help reduce any potential effects of interference caused by nearby monster transmitters. 'True receive' throughout its range, not an up-converter above 1GHz.

- Very wide frequency coverage 10kHz - 2600MHz
- All mode reception: AM, FM, USB, LSB & CW
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- Extensive RS232 command list
- Sleep timer / alarm
- SDU ready

Descriptive leaflet available, please call

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*the decode coming from a "one-time" pad, no doubt to be got rid of in the time-honoured fashion with a little salad and a pert white wine. So it is according to Spycatcher, the book that rocked the world a few years back. The return of the number stations may have a lot to do with conditions, but the routines suggest mere testing of old equipment, a lot of transmissions being in AM and riddled with modulation hum, a sure indicator of superannuated kit.*

*So, please, don't blame AOR if they sound rough or off-channel. We can only faithfully reproduce the audio they send. Classics include "The Lincolnshire Poacher" on 9,251 and 11,545. The old folk tune interrupted by groups of numbers, heard here in*

*the early evenings. Some other explanations include weather information expressed in five-figure groups. These transmissions are disappearing as NAVTEX on 518KHz becomes the standard. I first heard Number Stations around 4MHz on a 52 Set in the early Sixties. They came with a stage German accent, all I needed to get the impression I was Onto Something Big. Whatever they are for, the spy theory is my favourite and by far the most evocative.*

*Have you got any thoughts on radio matters? Whether nostalgic or at the leading edge, you can find me at bob@aor.co.uk. Get surfing and good listening!*

© 1996 Bob Ellis

24▶ Rugby and Droitwich is 50 to 500kW i.e. 10-13dB. The receiver showed a difference of 28dB.

However, this should not be considered as a criticism but rather as necessary feature, other wise to maintain an constant output relative to the field strength down to the very low frequencies would require excessive amplification. Judging by the performance of the loop, the designer has been very clever to balance certain constraints to achieve acceptable performance. For example, the amplifiers output intermodulation intercept point is low compared to some other antennas. Therefore the gain of the amplifier has been reduced to take this into consideration so that the intermodulation is reduced to acceptable levels. However, the 'trade off' is possibly not enough gain at the higher frequencies. Also when reception conditions improve with higher signal levels, there is a possibility that intermodulation may be a problem considering the relatively low intercept points. There is however now doubt that the sensitivity of the TL Loop at the lower frequencies is better than a loop without a gain/frequency optimised amplifier. When using this antenna I would recommend that the amplifier should be housed in water proof box and all the cables clamped to provide additional strain relief. The battery power leads should be extended so that the open battery case can be placed near to the receiver so the user can disconnect the battery when the antenna is not in use. The portability of the TL Loop may have some considerable advantages to the traveller, in that the loop can easily be erected in a hotel or apartment and provide lower noise reception than a wire antenna.

Also the loop is less affected by the screening of buildings. Considering the high cost of alkaline cells, my own personal preference would be for the loop to be changed so that a low cost mains power supply could be used even if the low frequency performance is reduced (There must be very few s.w.l.s that listen below 150kHz). My only real criticism of this antenna, is its general appearance, with the use of a open frame battery box and the flimsy construction of using a

child's Hula Hoop to support the loop. A rigid loop with an integral amplifier would have been far more acceptable. *(Strange isn't it, I thought the Hula Hoop was a great idea - KN)*

The MyDel AA1 antenna in comparison to the other antennas is a high gain antenna. This causes several problems, in that the listener will soon become fatigued by the amount of noise when tuning between stations especially on the medium to low frequencies. Also the gain was so high that the antenna output was up to 50mV on 1440kHz Radio Luxembourg. These sort signal levels will drive most receivers into considerable intermodulation. This is the only antenna were intermodulation was apparent during normal reception. However the data sheet states that "the large dynamic range ensures excellent cross and intermodulation properties". This intermodulation is easily identified, usually by hearing two or more stations together and is sometimes accompanied by low pitch tone. Reception on the Marine Bands 2-4MHz was plagued with intermodulation products from the medium wave band. Intermodulation was also noticed on 13, 15.9 and 21.355 MHz. What was even more insidious, was intermodulation in the gaps in the 41m Broadcast Band. This intermodulation was still present when using a passive preselector and a 20dB attenuator on the receiver.

A reduction in intermodulation between 2-3MHz was found when the power supply was reduced from 24 to 12V. But, the intermodulation increase at the higher frequencies, also IP2 dropped from +45dBm to +34dBm using the 8-14MHz test frequencies.

The susceptibility to mains borne interference meant it was necessary to use a feeder isolator. Even then the very low frequencies suffered from considerable noise.

These sort of antennas are not really suitable for low frequency use. Ideally an active whip antenna should only be used with a ground plane if signal pickup on the feeder is to be avoided, also to reduce mains borne noise the receiver would be required to have a low

impedance earth bond to the ground plane. This may be possible to achieve on board a ship but is clearly out of the question for the average s.w.l. This antenna requires a redesign to improve the second order intermodulation, and the susceptibility to mains borne noise. However, some listeners may find the performance acceptable by using a 10dB attenuator between the interface unit and the receiver. This would reduce the noise due to the high gain and reduce the intermodulation slightly by providing a proper 50Ω termination. A properly designed active whip antenna would use an isolated ground plane such as short radials or a small disc so that there is no coupling between the antenna to the feeder.

The Datong AD370 Dipole antenna has been around since 1978/9 and is the successor to the AD170. The AD370 has stood the test of time and is probably one of the best and most popular active antennas on the market. This antenna has been reviewed in the past several times and received critical acclaim in a Peter Hart review in June 1982 issue of *RadCom*. However the *WRTH* review in 1988 did not do it justice, because the antenna was reviewed with the pre-amplifier enabled thus degrading the intermodulation performance when it was not necessary to do so. The overall performance of this antenna is very good and compares favourably with conventional dipole antennas with a broadband balun at m.f. and h.f. The antenna is also capable of providing excellent reception down to 150kHz.

The build quality of the Head Unit is excellent and it has a low visual impact. However the absence of a mounting bracket can be a slight problem. The fact that the whole antenna, interface, unit, power supply and connecting leads are supplied as a complete system for less than £100 is tremendous value for money considering the component cost and the complexity of the amplifier.

My only real comments are to do with the interface unit. The connectors for the receiver and the antenna are identical and there is a reasonable chance of accidental connection of the 12V side to the receiver, However

there is a warning label advising of this problem. Maybe the connection to the receiver could be a fixed lead. The pre-amplifier's second order intercept point of 46dBm is clearly too low and can introduce intermodulation. The simple design change to a push-pull amplifier would increase IP2 to 70-80dBm, although I doubt that the pre-amplifier is really necessary. The removal of the pre-amplifier would allow for improved filtering of the power supply and a integral feeder isolator at a lower production cost than with the present unit.

## Recommendations

This is really a 'Horses for Courses' decision, if your requirement is for a fixed antenna installation and the frequency range is 150kHz to 30MHz, then the Datong AD370 is a good choice. However if reception down to v.l.f. is required and the antenna is to be used for portable operation and local direction finding then the TL Loop antenna will be satisfactory. Where there is sufficient space to use a passive dipole or longwire antenna, the use of a broadband Balun should be considered as a low cost alternative to an active antenna. The use of the AA1 whip is only recommended if used with an attenuator.

The use of some form of antenna feeder isolator is a must, if mains borne interference is a problem.

The current cost of the AD370 is £93.94, the TL Loop is £79 and the MyDel AA1 is £149.95.

Many thanks to **Datong Electronics Ltd., Clayton Wood Close, West Park, Leeds LS16 6QE. Tel: 0113-274 4822. Forster Radio Technologies, PO Box 2356, Reading RG6 7FQ. Te: (01734) 261972.** and **Martin Lynch & Son, 140-142 Northfield Avenue, Ealing, London W13 9SB. Tel: 0181-566 1120**, for the loan of the review models.

If you are confused with all the references to IP2 and IP3, what they mean and how to make sense of them then see next month's *SWM* for some explanation from Andy.

# ENIGMA

Switch on your radio in any part of the world at any time of the day or night on any day of the year and in a few minutes you're almost guaranteed to hear them, even with the most modest of equipment. They transmit in English, German, Czech, Spanish, Serbo-Croat, Russian, Chinese - practically every language of the world. They use voice, Morse and digital modes to send out their information, mostly in five letter or five number groups. Some have been around for many decades using the same operating schedule, others have only just become active. Just about every country operates one. Some are regular as clockwork, others just seem to appear at random, but you can find them almost anywhere across the short wave spectrum and beyond.

With all these characteristics, isn't it strange that these stations are amongst the most mis-understood occupants of our beloved short wave bands?

Welcome to the world of the Numbers Stations!

## One ENIGMA For Another

It was with a mission to answer these questions that ENIGMA - the European Numbers Information Gathering and Monitoring Association formed in 1992. Today, we've grown to over 300 members in over 30 countries all sharing a common aim of trying to discover more about this fascinating, but least understood, area of short wave listening.

Our journal ENIGMA finds its way into the monitoring facilities and embassies of many governments and by way of this *Short Wave Magazine* special issue, we'd like to introduce you to the Numbers Stations scene, too.

We can promise that we won't pull any punches - just a good, honest appraisal of these stations, what they do, how to identify them, and where to find them with your radio.

There's something for everyone, too, since numbers stations can be found at almost any time of the day or night sending messages in voice, Morse and digital modes.

So let's start...

## What Do Numbers Stations Actually Do?

"Kilo Papa Alpha Two, Kilo Papa Alpha Two, Message, Message"

"One Two Three Four Five Six Seven Eight Nine Zero, Four Five Five, Four Five Five"

There are probably few regular short wave listeners yet to hear something like this on their travels up and down the bands. The inquisitive listener's question of "What's that?" will usually be answered with a plain "Oh, that's one of those numbers stations things". That's probably about as far as most listeners' knowledge about these stations extends.

Sadly, there's not too much information in the press, either, if you want to know more about these stations. Many frequency guides skip them completely, or tend to be rather simplistic about reporting them. Even the respected Klingenfuss *Guide to Utility Stations*, the listener's 'Bible', says in its introduction "Not listed are... numbers stations and similar other non-identifiable nonsense". We find it a shame that such attitudes prevail. After all, without real investigative work, utility stations, and especially most diplomatic communications, would similarly have remained 'non-identifiable nonsense'. Inevitably, what usually results is a more confused, rather than a more informed listener.

But don't despair. Read on and hopefully all that will change.

## Numerous Explanations

Over the years, there have been numerous explanations as to the purpose of these stations. People have speculated that they are weather reports (it must be all those five digit groups!), or that they are connected to movements in stocks and shares across the world's markets. Some have even claimed that the stations are part of an earth-based network communicating with UFOs!

Enough of the mythology, we'll tell you what they're for right now. The numbers stations are run by intelligence services throughout the world and provide a lifeline between agents in the field and their masters. There is now enough evidence in the public domain to support this assertion beyond doubt - see the 'Reading List' at the end of the Numbers Special.

As you can imagine, with intelligence still very high on the agendas of most major and not-so-major governments, just about everyone is represented by a numbers station. The US CIA, Britain's MI6 (SIS), Israel's MOSSAD and Germany's

For this special SWM issue, the ENIGMA group have produced this highly enlightening feature.

BND - to name just a few of the operators of some of the major Numbers Stations networks.

## Messages to Spies?

Having answered the "What is a Numbers Station?" question, our inquisitive listener will most probably gather the significance of what they are hearing and move on to their second question. "If all these five letter or five figure groups are messages to spies, can I decode them?"

The answer that we'd have to give is a most emphatic NO! It's pretty likely that a very high proportion of the traffic is coded using a so-called 'one time pad' which means that unless you hold the key to the pad (which is never re-used or repeated), you have very little chance of decoding the messages.

Of course, having said this assumes that most of the traffic actually has a meaning - which may not be true. It is quite likely that some traffic (perhaps a lot of it!) is in fact just 'disinformation' designed to keep the monitoring facilities and cryptography departments of other governments occupied on a fruitless exercise.

## Numbers Stations in the Nineties

Perhaps one of the most surprising aspects of the Numbers Stations scene is that it still exists! During the mid and late-Eighties, many commentators both here in the UK and in other countries were confidently predicting a massive reduction in activity following the end of the Cold War, the break-up of the old Soviet Union and the fall of the Berlin Wall.

It is a testament to the important function that these stations perform within the intelligence community that there has been no such drop in activity. We continue to see a regular ebb and flow of activity within the big networks such as those run by the CIA and MOSSAD, but there are several new stations that have joined the

airwaves since 1990. Only a few well-known numbers stations have disappeared altogether as a result of the changes in Eastern Europe, Germany and the USSR.

In discussing Numbers Stations, an often forgotten fact (particularly in books about the subject) is that for every Numbers Station heard on voice, there is probably another operating in Morse. Through the work that ENIGMA has done over the past few years, we have established that most of the major voice networks also run Morse equivalents but there are many more Morse-only networks that function quite independently. The last few years have also seen the emergence of a number of intelligence networks using digital modes of transmission. Many of these stations started life years ago as Morse operations but have recently begun to utilise systems such as ARQ-E and normal Baudot RTTY to send their traffic. In most cases, this movement appears to be in direct response to the number of users involved and also the lengths of messages required to be sent. We can no doubt expect this trend to continue over the coming years, providing both Numbers Stations and Utility listeners with yet more investigative work.

Today, there are well over forty voice Numbers Stations regularly active, and somewhere around the same number of operations using Morse. There are at least two extensive intelligence networks using digital modes. The scale of some networks is impressive, with operation around the clock for all 365 days of the year with at least a dozen transmitters in operation at any one time.

Overall activity levels are such that it is virtually impossible to not bump into a numbers stations within a few minutes of tuning around any 500kHz section of the short wave bands. There aren't many parts of the listening hobby where you can have that sort of instant access, are there?

## What's In It For Me?

Having now answered the two most common 'beginner's' questions, you are probably wondering what the fascination of numbers stations is. For most of us, the excitement lies in trying to unravel the stations bit by bit. We want to know their habits, their schedules, what events in the world they respond to, where they are being transmitted from, and ultimately, we want to know who's behind them.

For most of the stations, this is a long and very laborious process. There are ENIGMA members who've listened to the same station for decades and who still don't understand its operating schedules completely. So, the more people who take these stations seriously, the quicker the pieces of the puzzle can come together, and the faster we can answer the questions! Taking a holiday in a suspected area of activity and doing a bit of do-it-yourself direction finding is just one way of adding another piece to the puzzle.

# NUMBERS STATIONS FREQUENCY DIRECTORY

To make identifying those new Numbers Stations heard easier, here is a Numbers Stations frequency directory.

Frequency(MHz)	Call	Station	Frequency(MHz)	Call	Station	Frequency(MHz)	Call	Station	Frequency(MHz)	Call	Station	Frequency(MHz)	Call	Station
2.120	???	E10	5.531	BAY*	E10	10.125		MX24	12.239		MX24	15.7215	CJL	MX43
2.270	JSR	E10	5.560	YHF	E10	10.162		E6	12.275		S16, M6	15.722		MX24
2.515	CIO, VLB	E10	5.629	SYN, CIO	E10	10.170		G16, E16	12.276	6XM8	MX43	15.734		MX24
2.628	FTJ	E10	5.715	ZWL*	E10	10.177		G16, E16	12.283		M16	15.735		MX24
2.690		G16, E16	5.732		G16, E16	10.183		MX24	12.314		G16, E16	15.826		MX24
2.707		G16, E16	5.746		E3	10.202		MX24	12.332		MX24	15.835	WJI	MX43
2.743	ULX	E10	5.748		G2, M4	10.218		MX24	12.603		E3	15.836		MX24
2.745		G16, E16	5.770		G16, E16	10.244		MX24	12.747	SYN	E10	15.980	EZI	E10
2.955	MIW	E10	5.775		MX24	10.245		E4	12.950	MIW	E10	16.008		MX24
2.957	SYN	E10	5.775		S16, M6	10.248		M16	13.016		MX24	16.018		MX24
3.099		G4, M29A	5.820	YHF	E10	10.260		MX24	13.073	C37A	MX43	16.032		MX24
3.127		G4, M29A	5.834	MSA	E15	10.262		E5, V5, G5	13.362		G16, E16	16.054		MX24
3.150	PCD, ART	E10	5.834	USP	E15	10.287		MX24	13.375		E3	16.055		G16, E16
3.176		G4, M29A	5.850/8.143		E5, V5, G5	10.348	6XM8	MX43	13.387	WJI	MX43	16.064		MX24
3.199		G4, M29A	6.200		G2, M4	10.352	VLB	E10	13.393		MX24	16.081		MX24
3.227		G4, M29A	6.270	ULX	E10	10.410		MX24	13.400		MX24	16.084		E3
3.228		G16, E16	6.282		S16, M6	10.426		E3	13.419	6XM8	MX43	16.108		MX24
3.262		G16, E16	6.370	MIW	E10	10.426		MX24	13.420		MX24	16.129	M4W	MX43
3.270	KPA	E10	6.485		E3	10.452		E4	13.423		MX24	16.153		MX24
3.276		G4, M29A	6.500	PCD	E10	10.453		MX24	13.425		MX24	16.154		MX24
3.280		S16, M6	6.598	NDP*	E10	10.460		G16, E16	13.444/11.072		E5, V5, G5	16.155		MX24
3.289		G4, M29A	6.660	SYN	E10	10.482		MX24	13.506		MX24	16.214		MX24
3.309		G4, M29A	6.685	SYN	E10	10.485		MX24	13.507		MX24	16.217	WJI	MX43
3.319		G4, M29A	6.715	NAS	E15	10.500		G16, E16	13.520		MX24	16.220		G16, E16
3.389		G4, M29A	6.745	CIO, VLB	E10	10.526	VLB	E10	13.527		G7	16.225		MX24
3.409		G4, M29A	6.765		G16, E16	10.582		MX24	13.533	EZI	E10	16.232		MX24
3.417	ART	E10	6.780/8.085		E5, V5, G5	10.584		MX24	13.752		G16, E16	16.242		MX24
3.419		G4, M29A	6.785		S16, M6	10.586		MX24	13.775		G16, E16	16.244		MX24
3.495	MIW	E10	6.798		MX24	10.648	YHF	E10	13.866		E4	16.247	RK2	MX43
3.640	VLB	E10	6.813/8.070		E5, V5, G5	10.672		MX24	13.880		MX24	16.252		MX24
3.825		G2, M4	6.840	JSR, EZI	E10	10.735		MX24	13.890		G16, E16	16.273/18.240		E5, V5, G5
3.835		G4, M29A	6.853		G16, E16	10.740		G16, E16	13.921	CIO	E10	16.273		MX24
3.840	YHF	E10	6.862		MX24	10.744		MX24	14.000	FYP	E15	16.274		MX24
3.935		G4, M29A	6.900		E3	10.749.5	C37A	MX43	14379	C37A	MX43	16.277		MX24
3.960	VLB	E10	6.912	OEM*	E10	10.760		MX24	14386.5	C37A	MX43	16.285		MX24
4.065		G4, M29A	6.959		E3	10.762		MX24	14390.5	C37A	MX43	16.305		MX24
4.130	MSA	E15	6.970/8.143		E5, V5, G5	10.767		MX24	14.398	C37A	MX43	16.312	C37A	MX43
4.130	SAR	E15	6.970		E5, V5, G5	10.820	VLB, SYN	E10	14.427		MX24	16.320		MX24
4.165		G4, M29A	7.115	ART	E10	10.915		MX24	14.433		M16	16.324		MX24
4.165	SYN	E10	7.323	KPA	E10	10.970	MIW	E10	14.447	WJI	MX43	16.332		MX24
4.168	SYN	E10	7.337		E3	11.000		E15	14.469		E4	16.339.5	CJL	MX43
4.195		G2, M4	7.372	GBZ*	E10	11.002		S16, M6	14.487		E3	16.342		MX24
4.240		G4, M29A	7.404		G16, E16	11.008		G16, E16	14.496		E4	16.344		MX24
4.270	PCD	E10	7.446	KPA	E10	11.043	WJI	MX43	14.496		E4	16.414		G16, E16
4.340		G4, M29A	7.469/12.221		E5, V5, G5	11.072/13.440		E5, V5, G5	14.577		MX24	16.457		E3
4.360	CIO	E10	7.525		MX24	11.108		G16, E16	14.587		MX24	16.457	6XM8	MX43
4.384		G4, M29A	7.532	(German)	E5, V5, G5	11.132		MX24	14.605		MX24	16.559	MX43	MX43
4.463	FTJ	E10	7.532		G16, E16	11.170	MSA	E15	14.608		MX24	17.387	6XM8	MX43
4.465	FTJ	E10	7.540	JSR	E10	11.270		S25	14.622		G16, E16	17.410	EZI	E10
4.470/5.046		E5, V5, G5	7.573	C37A	MX43	11.412		MX24	14.622		MX24	17.430		G16, E16
4.481		G4, M29A	7.605	SYN, CIO, VLB	E10	11.416		S16, M6	14.625		MX24	17.499		E4
4.484		G4, M29A	7.661		G16, E16	11.421		MX24	14.630		MX24	17.503	WSU	E15
4.543	YHF	G16, E16	7.668		M16	11.433		MX24	14.632		MX24	17.526	WJI	MX43
4.560		E10	7.692		MX24	11.434		MX24	14.640		MX24	17.533		MX24
4.572		G2, M4	7.740		G16, E16	11.434	C37A	MX43	14.736		MX24	18.000		MX24
4.581		G4, M29A	7.752		G16, E16	11.436		MX24	14.750	CIO, MIW	E10	18.092	BEC	E15
4.594		G16, E16	7.755		E3	11.440		MX24	14.7815	CJL	MX43	18.178	VLB	MX24
4.601		S16, M6	7.760	ULX	E10	11.468		MX24	14.820		MX24	18.195		G16, E16
4.665	VLB	E10	7.858		G16, E16	11.477		MX24	14.830		MX24	18.225		MX24
4.730		E3	7.866	SYN	E10	11.487		MX24	14.832		MX24	18.250		MX24
4.766		E4	7.918	YHF	E10	11.491/13.450		E5, V5, G5	14.834		MX24	18.303		S16, M6
4.773		G16, E16	8.025	CIO	E10	11.507		MX24	14.842		MX24	18.332		MX24
4.779		G2, M4	8.059		MX24	11.541		MX24	14.852		MX24	18.415		M16
4.779		G2, M4	8.063		G16, E16	11.545		G16, E16	14.854		MX24	18.420		MX24
4.779		G2, M4	8.084		MX24	11.545		E3	14.863		MX24	18.424		MX24
4.780	KPA, ULX	E10	8.085/10.247		E5, V5, G5	11.565	EZI	E10	14.866	VLB	E10	18.440		MX24
4.821/4.888		G16, E16	8.127	CIO, MIW	E10	11.617		G16, E16	14.870		MX24	18.575		G16, E16
4.832		G2, M4	8.142		S16, M6	11.627		G7	14.890		S25	18.585		MX24
4.873		MX24	8.165		MX24	12.075		M16	14.894		MX24	18.610		MX24
4.880		MX24	8.173		G16, E16	12.092		G16, E16	14.925		M16	18.752		MX24
4.880	ULX	E10	8.185/10.162		E5, V5, G5	12.124		MX24	14.931		M16	18.835		MX24
5.015		G16, E16	8.188		G2, M4	12.130		MX24	14.945		G16, E16	19.452	EZI	E3
5.046		E5, V5, G5	8.464		E3	12.132		MX24	14.947		MX24	19.715		E10
5.091	JSR	E10	8.465	SYN, CIO	E10	12.134		MX24	14.950		MX24	19.755		G16, E16
5.133		G4, M29A	8.488		G2, M4	12.137		MX24	14.971		MX24	20.042		MX24
5.153/7.473		E5, V5, G5	8.641	MIW	E10	12.144		MX24	14.973		MX24	20.240		G16, E16
5.170	GBZ*, CIO	E10	9.040		G16, E16	12.146		MX24	14.974		MX24	20.340		MX24
5.182		G16, E16	9.070/11.072		E5, V5, G5	12.151		MX24	14.977		S16, M6	20.350		G16, E16
5.230	MIW, SYN, VLB, CIO	E10	9.070		E5, V5, G5	12.152		MX24	14.977		MX24	20.360		E3
		E10	9.130	EZI	E10	12.157		MX24	14.980		MX24	20.474		E4
5.233		G4, M29A	9.208.00	6XM8	MX43	12.170		M16	14.985		MX24	20.675		G16, E16
5.284		G16, E16	9.219/11.491		E5, V5, G5	12.174		MX24	15.610		G16, E16	20.690		MX24
5.301	OEM*	S16, M6	9.237		MX24	12.180		MX24	15.612		E3	20.740	SYN	E10
5.339		E10	9.251		E3	12.193		MX24	15.678		MX24	20.946		M16
5.340		G2, M4	9.270	KPA	E10	12.193		MX24	15.682		E3	22.885		G16, E16
5.371/7.430		E5, V5, G5	9.320		S16, M6	12.194		MX24	15.688	6XM8	MX43	23.411		E4
5.371		E5, V5, G5	9.325		G16, E16	12.197		MX24	15.696		MX24			
5.422		E3	9.357/11.072		E5, V5, G5	12.210		G16, E16	15.702		MX24			
5.437	ART	E10	9.402	YHF*	E10	12.221		E5, V5, G5	15.707		MX24			
5.530	CIO	E10	9.450		G16, E16	12.223		MX24	15.708		MX24			
5.530	NAS	E15	10.125	CIO, KPA	E10	12.224	C37A	MX43	15.710		MX24			

\*(occasional)

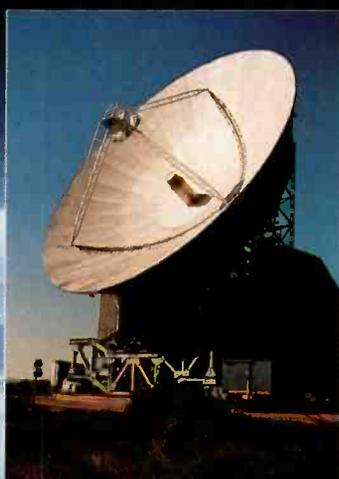
# THE RF SPECTRUM TERMINATOR HAS ARRIVED

and it's available from  
**Martin Lynch & Son**

RRP: £1695, with FREE 5 year warranty, Icom FL-52A CW/Data Filter  
and AD-55 Mains PSU...worth £250!

Deposit £295, and 24 payments of £70.14.

Total cost of loan £283.36. (APR 19.9%)



COMMUNICATIONS RECEIVER  
**IC-R8500**

**MARTIN LYNCH**  
& Son  
THE AMATEUR RADIO EXCHANGE CENTRE

To place your order for a new IC-R8500, call the  
Martin Lynch & Son sales team on 0181 - 566 1120

Martin Lynch & Son is a Licensed credit broker. Full written details are available upon request. E&EO

## DANMIKE DSP-NIR



Manufactured by Danmike of Denmark, the DSP-NIR is a premium grade noise reduction unit directly competing with the DSP-599+

**INTRODUCTORY PRICE £329.95**

## BULK PURCHASE!

**AOR 2700 Scanner**  
RRP: £269

**SALE PRICE: £169**

Due to a massive commercial order we are able to offer this brilliant new scanner at a fraction of normal cost! **But hurry, supplies are very limited!**



## uniden ONLY BC 9000XLT £319.95

Recently supplied to a government department, the new base scanner from Uniden is a professional tool offering serious performance at an affordable price.

- 500 memories
- 25-1300MHz (550-760MHz TV video band blocked)
- Keypad entry
- VFO tuning knob for frequency control
- "Turbo scan" - 300 steps per second
- 100 channels per second
- Selectable modes: AM/NBFM/WBFM
- Line output - ideal for "off air" recording
- Selectable attenuator
- Alpha numeric display
- CTCSS available as option

**QUALITY GOES THE DISTANCE**

### Noise reduction?

Suffering from power line noise? Got a noisy street lamp or thermostat clicking away? Slip in line the ANC-4 and see it disappear. If not send it back and get a refund! **RRP £195 incl. p&p.**

## NOW AVAILABLE FROM STOCK

### Welz WS-1000

**NEW**



This amazing little unit is a full blown scanning receiver capable of covering everything from 500kHz to 1300MHz with no gaps. Not only is it the smallest scanner you've ever seen, it's the lightest too. Closer in size to a box of matches rather than a pack of cigarettes, the new WS-1000 from Welz-Diamond is technology in its extreme. Take a scanner with you where you wouldn't have bothered before.

### specification

- ▶ 500kHz-1300MHz
- ▶ AM/NBFM/WBFM
- ▶ 1/5/6.25/9/10/12.5/15/20/25/30/50/100kHz steps
- ▶ 400 memories ▶ Skip search
- ▶ Power voltage from only 2.2-3.5V DC
- ▶ Dimensions in mm: 58(w) x 97(h) x 24(d)
- ▶ 16mA power save 1 sec.
- ▶ Weight: 200 grams incl. batteries & antenna



**FREE NICADS AND CHARGER**

**Price: £349.95 incl. VAT & FREE postage**  
**Available on FREE FINANCE:**  
**£49.95 deposit & 12 payments of £25.00**

### AR-8000 UK



The best scanner on the market. Don't argue. My scanner man Graeme said so. To find out why, give him a call. Even if he does spell his name rather strangely.  
**RRP: £410.**  
**ML PRICE: £379.**  
**Super low finance available from only £27.50 per month!**

### The New AOR AR-7030



Probably the best engineered receiver in the world. Including a **FREE FIVE YEAR WARRANTY**, only available from **MARTIN LYNCH.**  
**RRP: £799.**  
**Deposit: £99.**  
**12 payments of £64.28.**  
**Cost of loan: £71.45**

**FREE 5 year warranty**

### Yaesu FRG-100



**USED EXAMPLES AVAILABLE FROM ONLY £399**  
Call for availability

Retailing at £599, the new receiver from Yaesu takes some beating. At £469, its an even better buy!  
**RRP: £599.**  
**NEW LOWER ML price CASH/SWITCH £469.** Super low cost finance available from only **£36.66 p/m!**

### Drake R-8A



One of our best selling shortwave receivers and one that you do not have to spend hundreds of pounds on additional filters. It has them all fitted!  
**RRP £995. Deposit £195, 12 payments of £73.47. Cost of loan £81.66**

### Global AT-2000



A superbly built SWL antenna tuner for improved receive performance. Built in Q selector. **£95.**

### Opto Electronics Scout



The most innovative product for scanners of 1995? Connect this little frequency counter up to your AR-8000 and see it make the scanner jump onto a frequency that its literally just "sniffed" out of the air! Termed "Reaction Tune", it has many uses both for the hobbist and commercial user.  
**RRP: £449. ML Price: £369 Super low cost finance available from only £27.50 p/m!**

### The New AOR AR-5000



For those who take the entire radio spectrum very seriously. The AR-5000 covers 10kHz through to a staggering 2600MHz! All mode base receiver, setting new standards in all band performance.

**RRP: £1749. Lynch Price: £1569.**

**Deposit £269, 12 payments of £119.39.**  
Cost of loan: £132.70 or  
**Deposit £269, 24 payments of £65.13.**  
Cost of loan: £263.12. (APR 19.9%)

**MARTIN LYNCH & SON, 140 - 142, NORTHFIELD AVE**

# A DATE FOR YOUR DIARY

Lynch 40th (yes 40th) Birthday Party at the store on 2nd November!

## NEW... Icom ICR-8500



RRP: £1695. Deposit £295, and 24 payments of £70.14.  
Total cost of loan £283.36. (APR 19.9%)

Covering 100kHz-2GHz, all mode, IF Shift, APF and direct RS-232C compatibility. Icom have once again set a "standard" to which all other base station scanners must be judged.

Available with 5 years parts & labour warranty FREE of charge, and if you order during October or November you'll also receive an Icom FL-52A CW/Data Filter and an AD-55 Mains PSU...worth £250!



## NEW...Opto Xplorer...NOW AVAILABLE, Only £799

Scan the entire FM spectrum between 30MHz & 2GHz in less than 1 second and hear it, see it decode it, map it and record it! It's bloomin' amazin'! Call our FaxBak service for more information.

## Lowee PR-150



Matching the HF-150, a preselector can greatly enhance reception of weaker signals, that would

otherwise be lost in the noise caused by stronger signals. They really do work. Suitable for most other receivers. Ask for details.

NEW LOW PRICE: £199.

## AOR AR-3000A



Lots of different versions being offered, but make sure you are buying one sourced through the U.K.

distributor. We only sell this model supplied by AOR U.K. Ask before you buy elsewhere!  
RRP: £949. Lynch Price: £849

Deposit £149, twelve payments of only £64.28. Cost of loan: £71.45 (APR 19.9%)  
Also available the "PLUS" version. Please add £46.

## Timewave & MFJ DSP Filters



DSP 9+  
DSP 59 \*  
DSP 599zx \*  
MFJ-784B

### NEW LOW PRICES

Digital Signal Processing will enhance any receiver performance by removing one main ingredient - NOISE! If you haven't heard a DSP unit work, then call into the London Showroom for a demo.

Alternatively, order by mail order and if it doesn't impress you, return it for a full refund of the purchase price. How's that for confidence?

MFJ-784B All mode Tunable DSP .....£249  
DSP 9+ All mode DSP at only .....£189  
DSP 59+ As above but more features .....£249  
DSP 599zx NEW! Hyper speed processor, alpha display and more .....£349  
DANMIKE DSP-NIR .....£329.95

## Lowee HF-150



We sell as many to commercial users as we do to enthusiasts. The best built, best performing receiver under £500.

RRP: £419. Deposit £59, 12 payments of only £30, ZERO APR.  
why not add a keypad for fast frequency access? only £44.95.

## MVT-7200



The alternative to the AR-8000. If you liked the old MVT-7100, this new enhanced version should fit the bill.

RRP: £449. ML PRICE: £399 and FREE FINANCE!  
deposit £99, 12 payments of only £25, ZERO APR.

## Look-alikes

### Pelico look-alike Lapel speaker

Suitable for most scanners on the market.  
Only £11.50 incl. delivery.



### Pelico look alike Earpiece MyDEL P-300

As used by many government establishments throughout the world, the new MyDEL P-300 easy to wear "over the ear" earpiece is available now, including FREE P&P. (State which scanner the P-300 is for when ordering).

ONLY £9.95 p&p FREE!



### Garmin GPS-45XL

#### Includes Active Compass

Due to an overwhelming demand, we've decided to stock this important device. Locate your latitude/longitude national grid to within an amazing 49ft accuracy! Lots more besides, only £259.



NEW MODEL

# MARTIN LYNCH & Son

THE AMATEUR RADIO EXCHANGE CENTRE

0181 - 566 1120

TEL: 0181 - 566 1120  
FAX: 0181 - 566 1207  
CUSTOMER CARE: 0181 - 566 0 566

Web Site: <http://www.martin-lynch.co.uk>  
E-mail address: [sales@martin-lynch.co.uk](mailto:sales@martin-lynch.co.uk)

OPENING HOURS MON-SAT 9.30 - 6.00  
Late night Thursday by appointment

Please NOTE prices & monthly payments are based on 17.5% VAT & no more price increases! E&OE. £10 p&p on all major items.

## Win Radio

Designed and built by Rosetta Labs in Germany, the WinRadio PC card is a complete scanning receiver which actually fits inside your PC!

- Covering 500kHz - 1300MHz
- All-mode including SSB
- Tuning steps 500Hz - 1Mhz (fine tune with b.f.o.)
- Supplied with Windows software, with impressive graphics and on-line help



AS REVIEWED BY MR. BOB TOMALSKI

System Requirements: PC with minimum 386 processor, DOS 3.3 or higher, Windows 3.1, 640k of RAM, (4MB for Windows).

ONLY £399.00 including VAT & Carriage

## MARTIN LYNCH WEB SITE

<http://www.martin-lynch.co.uk>

E-mail address: [sales@martin-lynch.co.uk](mailto:sales@martin-lynch.co.uk)

## MyDEL Optima ACARS receiver

Designed exclusively for Martin Lynch, this new receiver releases your expensive scanner from monitoring 1 frequency for reception of ACARS.

All that is required is 12 volts DC input, and an external antenna. The Optima will then give you audio direct into either ACARS decoding software, or our Universal M-400/M-1200 decoder. It's that simple!

RRP: £129.95

## Datong Active antennas

AD-370/270 The pair of Active Aerials were originally designed for the Royal Navy several years ago and to date, no other manufacturer has been able to offer such performance from a compact design.

If you are stuck for space and need a good high performance SHORTWAVE ANTENNA then order yours today!

Datong AD-270 (internal) £59.95 AD-370 (external) £79.95 p&p £10.

## CASIO QV-10A LCD DIGITAL CAMERA



NEW MODEL

A neat palm size digital storage camera which can store over 90 full colour digital images. Import the picture into your PC with the supplied interface cable & software for either IBM compatible or MAC machines. Ideal for reprinting images on the Internet, SSTV via JVFAX and lots more. Outputs include direct video and serial for PC connection. Supplied with all accessories including Software & Cables.

RRP £799 Lynch Price £479

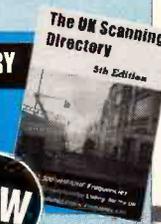
Deposit: £99, 12 payments of £36.73. Cost of loan: £40.83 (APR 19.9%)

## 5th EDITION UK SCANNING DIRECTORY

Available from stock. Order yours now, before they ban it from sale!

ONLY £18.50 P&P FREE

NEW

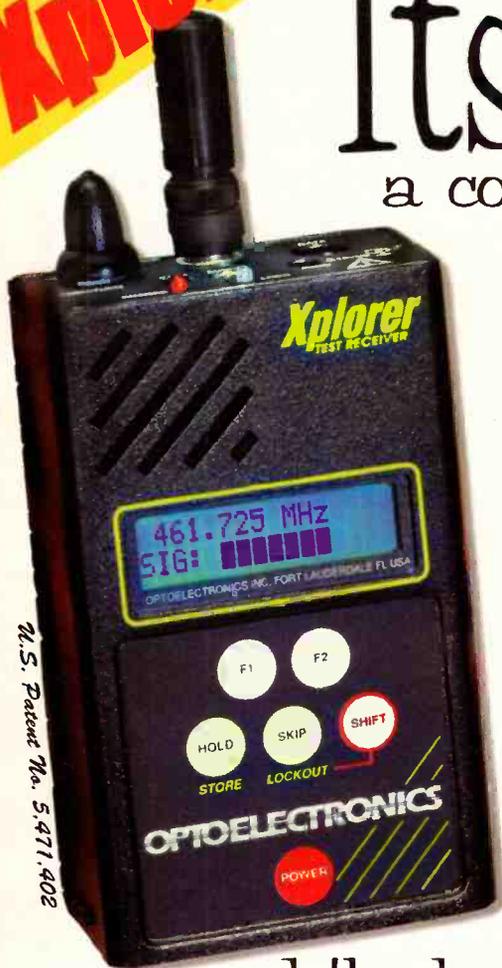


UE, EALING, LONDON W13 9SB

**NEW Xplorer**

# It's a receiver

a counter, a recorder, a decoder....



U.S. Patent No. 5,971,902



•Two-Line LCD display, first line displays frequency. Second line switches between either CTCSS, DCS, DTMF, Signal Strength, or Numerical Deviation.

NMEA-0183 GPS Interface-Connect your GPS to the Xplorer for Mapping applications. (GPS and Mapping Software not included)

**The New Xplorer Test Receiver.** Ideal for any two-way communications testing or monitoring. The Xplorer is a value packed performer integrating the functions of a CTCSS, DCS, and DTMF Decoder, Frequency Recorder, Nearfield Receiver and more into one hand-held unit. No more guessing when programming a frequency for monitoring-the Xplorer captures nearfield frequencies off the air from 30MHz - 2GHz in less than 1 second. The New Xplorer; providing the power of handheld portability with state of the art functionality and performance.



•Built-in Speaker: All frequencies received are demodulated for instant monitoring.

...and the last instrument you will ever **NEED.**

## Features & Specifications

- Frequency Lock Out, Manual Skip, and Auto or Manual Hold
- Internal Speaker, Audio Earphone/Headphone Jack
- Built-in PC Interface, PC Connection Cable and Download Software included
- Relative ten segment Signal Strength Bargraph
- Optimum Maximized Sensitivity for increased nearfield distance reception
- Tape Control Output with Tape Recorder Pause control relay and DTMF Encoder for audio data recording
- High speed FM Communications Nearfield Receiver, sweeps 30MHz - 2GHz in less than 1 second
- Two line LCD displays Frequency and either CTCSS, DCS, DTMF, Deviation or Signal Strength
- NMEA-0183 GPS Interface provides tagging data with location for mapping applications
- Frequency Recording Memory Register logs 500 frequencies with Time, Date, Number of Hits and Latitude/Longitude. (Latitude & Longitude coordinates are only displayed in memory when used with GPS)
- Real-Time Clock/Calendar with lithium battery back-up
- Built-in Rapid Charge NiCad Batteries with 5 hour discharge time and Power Supply included
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# Listening To Numbers Stations

**S**o we've discovered what Numbers Station do. Now it's

time to look at what you need to hear them, how to classify and identify each station.

## Equipment

Without a doubt, one of the most attractive aspects of Numbers Stations monitoring is that the equipment required is extremely modest. A very basic receiver and telescopic or small random wire antenna is all that's needed to listen to 99% of the networks, be they voice or Morse. Why should this be the case? Well, what could be more innocuous and attract so little attention than a small 'world band' radio with which to receive your next instructions from HQ?

Most networks continue to use high-quality a.m. or m.c.w./c.w. broadcast transmitters with a proportion now using s.s.b. It is quickly evident from listening to these transmissions that a lot of power is involved thereby guaranteeing that messages get through. It is not at all uncommon to be able to unplug the antenna from the receiver and still continue to hear a signal at a more than comfortable listening level!

Of course, if you want to investigate the digital networks, you'll need something a little more sophisticated. But even here, a 75baud RTTY decoder for example, comes relatively cheap these days if you have a computer to hand.

## Identifying Stations

As with most aspects of the short wave listener's hobby, we Numbers Stations monitors have a sort of language with which to describe the various characteristics of the stations. If you're considering a serious foray into this part of the hobby, then it's worthwhile investing some time in learning the 'lingo'.

At ENIGMA, we're constantly asked questions by new, excited monitors that are along the lines of 'I heard an English language Numbers Station on 5.874MHz. What is it?'. Unfortunately, unless the frequency given is well-known (and a lot of

stations don't have regular operating frequencies) we can only reply with 'Can you tell us anything more about the station you heard!'.

So, here is a quick guide as to just how to write bomb-proof reception reports of numbers stations.

## The Essentials

The essential information in any report should be: Date and Time, Frequency, Mode of Transmission, Station Name (if you know it already), Key Characteristics, Gender and Language.

Let's look at each in more detail...

## Date and Time

Record dates in an unambiguous way. Monday 2nd May 1995 is unambiguous to whoever may be reading the report and whatever country in which they might live. The day of the transmission is often just as important to someone trying to decipher a report since many stations operate a schedule which is based around the day of the week or the day number in the month.

Always quote times in UTC (GMT).

That way, you'll be able to find out whether a station keeps to UTC during Summer/Winter schedule changeovers or whether it keeps to some other local time. If you know that a station keeps to a local time, this often helps narrow down the country of origin. Also be aware that most Numbers Stations start transmissions on the hour. The next most popular times are ten minutes past, twenty minutes past and half past the hour.

## Frequency

Always try to be accurate with frequency and quote it to the nearest kilohertz if possible. If we notice that a transmission is being carried on more than one frequency at the same time, we use '/' to denote parallel frequencies. Some networks use more than one frequency at a time to send the same message since they are under attack from jamming by hostile nations. For example, the Lincolnshire Poacher might transmit on three frequencies simultaneously, which we would write as 11.545//14.487//16.084MHz.

Like other short wave users, most Numbers Stations will take account of prevailing propagation conditions. This means that frequencies will generally be lowest in Winter, begin to climb in Spring, reach a peak in Summer and decline again in Autumn.

Daytime frequencies are generally higher than those used at nighttime.

## Transmission Mode

We record modes as follows:

a.m. Amplitude Modulation (Full carrier)

u.s.b. Upper Side Band (suppressed carrier)

l.s.b. Lower Side Band (suppressed carrier)

c.w. Carrier Wave (Morse)

m.c.w. Modulated c.w. (Morse keyed as a tone on an a.m. transmitter)

If you have time, check to see if, in the case of an a.m. transmission, one of the sidebands is reduced. This is often a good indicator of a particular transmitter in use by the same station.

For Morse stations, try to note whether it is keyed by hand or machine generated, or in the case of m.c.w. whether the carrier or modulation is keyed. Experienced Morse Numbers Stations listeners can even recognise the 'fists' of different operators within networks!

## Gender

Always record the sex of the announcer, and whether the speech is live or uses a synthesiser. There are only a handful of stations still sending traffic with live announcers. Male and female are most conventionally denoted by their Amateur Radio derived shortened forms of OM (Old Man) and YL (Young Lady).

## Language or Accent

For voice transmissions, record the language used by the station. Most common languages are denoted by two letter codes:

EE English

SS Spanish

RR Russian

GG German

FF French, and so on.

If you note a particular accent or pronunciation then record that too. For example, a US accented English voice. If you don't recognise the language being used, then note it's pronunciation phonetically.

Lastly, the gender of the voice and it's language are usually combined in reports, so that OM/RR denotes a male voice using Russian, or YL/SS denotes a female voice in Spanish.

## The Anatomy of a Message

Nearly all numbers stations send their traffic in the same basic way. They spend some time sending a call-up

signal which often includes some special signature tune, followed by a preamble. Then comes the message, which is followed by the ending.

Each of these four phases (call-up, preamble, message, ending) is distinctive for each station, and it is important to get these details right to fully identify a station and to track and record its traffic. We'll look at each of these phases in detail below...

## The Call-Up

Nearly all stations call their agents with a distinctive signature, usually for five or sometimes ten minutes before the message is sent.

In a lot of cases the call-up is a rousing or patriotic piece of music, a series of electronic tones, or a count from one to zero.

A large number of stations also intersperse the call-up with an identifier of some sort like the station's callsign, a number which indicates the recipient or tells the receiving agent if this is valid traffic or a dummy message, or whether no traffic is forthcoming (often called a null message).

For example, Israeli Phonetic Alphabet stations send their callsign followed by a '1' or a '2' for five minutes if no traffic is to be sent after the call-up. If there is no figure after the callsign, say 'Mike India Whiskey', you know that traffic is on it's way.

By contrast, in one of its message formats, the English Man family of Numbers Stations will send the 3-figure identifier of the message recipient three times followed by '0 0 0' for five minutes if there is no traffic to be sent. If however, you hear the same station sending '123 123 123 (pause) 1' for the first five minutes, you'll know that it is about to send one message to agent 123.

Where Morse Numbers Stations are concerned, the majority have a call-up which consists of a repeated ID, the standard 'VVV VVV VVV DE' or 'CQ DE' morse calling procedure. Some follow exactly the same format as their voice counterparts if they are part of the same network.

## The Preamble

Most, but not all Numbers Stations will give you extra pieces of information before the actual traffic is sent. These are usually the number of groups that will be sent and/or a decode key. The decode key is often a positional indicator which allows the message to be correctly decoded

# LISTENING TO NUMBERS STATIONS

by the recipient using a one-time pad.

Only a few stations do not give a group count as part of the message. In some cases this is because fixed length messages are sent. In other cases there must be some other means that allows the recipient to determine the message length, or it is pre-arranged. Morse Numbers Stations sometimes denote group counts with 'GR'.

Some stations don't bother with either a group count or decode key and just identify messages with some sort of incrementing sequence number.

The last part of the preamble generally gets the agent ready to receive the message. In the case of the Lincolnshire Poacher, this signal is some notes played on a glockenspiel. With the Morse Numbers Stations, it is often some combination of procedural break signals such as slash '/' or the message separator BT (dah-di-di-dah).

For example, the Russian Man voice station pauses after the call-up and then announces the key and group count twice. It's Morse sister station also pauses after the preamble and sends the key and group count twice but then separates this from the message by sending "BT BT" before the five figure groups begin.

## The Message

The message itself is usually composed of groups of five letters or numbers. Sometimes each group is repeated to provide an extra measure against corruption or

interference. The way in which each group is delivered is usually noted in the following ways:

5F	Five Figure groups
4L	Four Letter groups
3/2F	Three Figures (pause) Two Figures groups

The 3/2F format is sometimes called a 'dictionary' code, and is spoken with a distinct pause between the third and fourth digits of a five figure or five letter group. Why a dictionary code? Well, a group of '123 (pause) 45' may indicate the 123rd letter or word on the 45th page of some pre-arranged decoding book.

Be aware that some stations repeat the whole message either within the same transmission, or on a different frequency, perhaps at a different date or time. For example, a certain German Lady Numbers Station has a habit of repeating the same message three times on different frequencies where the last two digits of the frequency are the same. So, if you've just heard the German Lady at 2000UTC send "123 123 123 0 0 0" for five minutes on one frequency, tune upwards or downwards from this frequency in 100kHz steps, and at 2005 or 2010UTC you'll probably hear her again somewhere else.

Also note that some Morse Numbers Stations use 'cut' numbers to speed transmission. There are numerous schemes of cut numbers for example, 1=A, 2=U, 3=V, 4, 5, 6, 7=B, 8=D, 9=N, so if you see message only using nine or ten different letters, you may actually be listening to cut numbers. Even if the station in question doesn't use cut numbers, most denote a zero with a

dash ('T') rather than the regulation 'dah-dah-dah-dah-dah'. The Morse delivery speeds (word per minute) of stations also varies widely, with the lowest at about six groups/minute and the highest well over 30 groups/minute. No doubt there is a big variety in the ability of agents to read Morse!

## The Ending

This is one of the most important pieces in the puzzle of identifying a particular numbers station, but it is one that is often forgotten.

Some stations finish politely with 'End', 'Ende' or 'Final', others with another stirring rendition of their signature tune. Some others remind the recipient of the decode key and group counts before denoting the end of the transmission with a number of zeros.

For example, the Russian Man family of Numbers Stations have two different message endings. One ends with a repeat of the key and group count followed by five zeros, the other has no key or group count and just ends with six zeros (three plus another three).

In the case of Morse Numbers Stations, a similar procedure is usually adopted with the 'message separation' or 'end of work' signals BT, AR, VA or SK being sent. This is then often followed by a number of long dashes to represent the zeros ending the message.

## Station Names

You will notice that Numbers Stations have tended to be called by mysterious names such as The

Lincolnshire Poacher, The Three Note Oddity or Magnetic Fields.

At ENIGMA we're still using these names wherever possible, but we've also classified each station by a code which goes as far as providing a clue to the language used by the particular station and a sequence number. For example G2 is Swedish Rhapsody and E9 is Magnetic Fields. We had to do this since there are many more than one English Lady or German Lady. It's much less ambiguous to receive reports of E6 than just OM/EE or English Man.

Morse stations are designated similarly, with the prefix M and a sequence number.

## Putting It All Together

So, now we have a concise way to describe and identify Numbers Stations and their traffic. Here are some examples

**Russian Man (ENIGMA designation S6) with no traffic (null message) for agent 235: (S6) 235, 00000**

**English Lady (ENIGMA designation E17) with 223 groups of traffic for agent 715 and decode key of 123, five figure groups sent twice with five zero ending: (E17) 715, 123, 223, 5F x 2, 00000**

But enough of the theory! It's time to switch on the receiver and take a look at some of the stations that can be found around the short wave bands at this very moment...

# The Numbers Stations Guide

**W**ith nearly a hundred active stations to choose from, and a great deal more that have since passed into history, a complete guide to the Numbers Stations scene would be enough to fill a large book!

In the following pages, you will find detailed 'fingerprints' for some of the most common Numbers Stations using voice, Morse and digital modes. We've chosen these stations because they each exhibit a different set of operating habits that in total represent an excellent cross-section of the phenomenon. In addition, for the listener wishing to try their hand at investigating Numbers Stations, these transmissions are easy to find, operate on well known frequencies and at reasonably predictable times.

We think that armed with this guide, you should be able to identify a reasonable percentage of Numbers Station traffic. Some of our chosen stations are small operations obviously designed for use by field agents working in areas bordering their country of origin. Others are vast networks with dozens of transmitters and locations at

their disposal and a frequency usage that indicates a large army of intelligence gatherers working in far-flung places.

It is our hope that this guide will provide any listener with enough information to accurately identify and report on stations heard and indeed, begin to follow their schedules. Once accustomed to the characteristics of one particular station or network of stations, we are confident that any listener should be able to investigate what else is out there. As we've mentioned a number of times before in this article, new stations arrive all the time.

Each fingerprint also provides a thumbnail sketch of the station's history and habits, describes precisely the format and content of its messages and, wherever possible, as much as we know about the schedules as is possible. If we know, we even reveal who the user is, where the transmitters are located, and where the likely recipients of its messages will be operating. The code shown in brackets following each station name is the ENIGMA station designation.

# OUR GUIDE STARTS HERE!

## 1) The Lincolnshire Poacher (E3)

So called because of the highly distinctive Old English Folk song which it uses as a signature tune, the Lincolnshire Poacher (or LP for short) has been around since the 1970s. Many were expecting it to go off-air following the Gulf War, but the station continues its usual habits to this day.

Although it now uses a speech synthesiser, the software is quite unusual in that it provides inflexion to make the voice seem more life-like. This is in contrast to most other stations who just use the same taped numbers for all groups of the message, leaving the delivery stilted and robot-like. LP's synthesiser provides this inflexion (or raising of the voice's pitch) by delivering the last digit of a group at a higher pitch than the preceding four.

The careful listener will also notice that the number three is always delivered with high inflexion, whilst the number nine is always low.

LP is always heavily jammed, usually on all of the three frequencies simultaneously in use.

### Identifying Characteristics

Mode: u.s.b.  
 Voice: Female  
 Language: English  
 Pronounced: 1=One, 2=Two, 3=Three, 4=Four, 5=Five, 6=Six, 7=Seven, 8=Eight, 9=Nine, 0=Zero  
 Call-up: Three repeats of; Opening bars of *The Lincolnshire Poacher* twelve times 5F Message Identifier given 10 times.  
 Preamble: Two glockenspiel chimes (one high, one low pitch) three times  
 Message: 200 random 5F groups, each repeated.  
 Ending: Two glockenspiel chimes (one high, one low pitch) three times  
 Opening bars of *The Lincolnshire Poacher* six times.  
 Schedule: Each H+00, 15hrs/day, on three parallel frequencies  
 Location: Cyprus (BEMRS Station Zygi & Cape Gatta).  
 User: Royal Air Force (RAF) Foreign and Commonwealth Office (FCO)

### Detailed Schedule

Due to heavy jamming, transmissions are nearly always carried simultaneously on three frequencies from the list below.

1000 - 1700UTC  
 16.457, 16.084, 15.682, 14.487, 13.375, 12.603, 11.545, 10.426MHz  
 1700 - 2345UTC  
 9.251, 8.464, 7.755, 7.337, 6.959, 6.900, 6.485, 5.746, 5.422MHz  
 Tests have also been noted on 4.730, 15.612, 19.452 and 20.360MHz.

## 2. Cherry Ripe (E4)

Cherry Ripe is the Lincolnshire Poacher's sister station and uses an identical set-up although at a much reduced level of activity. Whereas LP serves the Middle East, Cherry Ripe is beamed towards mainland China and other countries nearby. Hence the reasons for such weak reception of this station in the UK and Europe.

This station uses a signature tune that at first sounds very similar to the *Lincolnshire Poacher*, but it is in fact another old English folk song *Cherry Ripe*.

### Identifying Characteristics

Mode: u.s.b.  
 Voice: Female  
 Language: English  
 Pronounced: 1=One, 2=Two, 3=Three, 4=Four, 5=Five, 6=Six, 7=Seven, 8=Eight, 9=Nine, 0=Zero  
 Call-up: Three repeats of; Opening bars of *Cherry Ripe* twelve times 5F Message Identifier given 10 times.  
 Preamble: Two glockenspiel chimes (one high, one low pitch) three times.  
 Message: 200 random 5-digit groups.  
 Ending: Two glockenspiel chimes (one high, one low pitch) three times.  
 Opening bars of *Cherry Ripe* six times.  
 Schedule: About six times/day, on three parallel frequencies.  
 Starts: H+00  
 Location: Guam (US facilities).  
 User: Foreign and Commonwealth Office (FCO).

### Detailed Schedule

Time (UTC)	Frequency (MHz)
1100	10.452, 14.496, 17.499, 20.474
1200	13.866, 14.469, 17.499
1300	13.866, 14.496, 17.499, 20.474
2000	4.768

The use of 23.411 and 10.245MHz at other times have also been noted.

## 3. The ICAO Phonetic Alphabet Stations (E10)

These stations form what is probably the most widely reported and well-known of all current Numbers Stations and are probably operated by the Israeli Intelligence Services, including the infamous MOSSAD. A 24hrs/day, 365days/year operation, they have been on air since the early 1980s and continue to use largely the same procedure and pool of frequencies to the present day.

Their name comes from their predominant use of five-letter groups, all of which are pronounced phonetically using the standard ICAO alphabet. All stations have a three-letter callsign (probably more likely a network identifier) which is also announced phonetically such as "Juliet Sierra Romeo" at the beginning of each message. But not all stations are the same. There are subtle variations between the speech synthesisers and delivery speeds of a number of the stations.

Although the identifying characteristics below show the standard operating procedure, pay attention to a number of frequencies only activated on significant occasions. Also, look out for unusual messages during times of heightened tension in the Middle East when some stations revert to peculiar messages such as: "Mike India Whiskey One Four Zulu One Five Zulu Two Seven Bravo"

The recent Israeli Elections brought just such activity from a number of stations in the network, with these messages lengthening each hour.

The network is also probably the most well furnished, able to operate over a dozen transmitters on over 50 frequencies from as low as 2MHz to as high as over 23MHz. Signal strengths appear to be excellent the world over indicating that a number of transmitters are located inside friendly countries.

### Identifying Characteristics

Mode: a.m. (with reduced l.s.b.).  
 Voice: Female.  
 Language: English.  
 Pronounced: Standard ICAO Phonetic Alphabet  
 Call-up: [Traffic follows]  
 Three Letter Phonetic callsign  
 [No traffic follows]  
 Callsign followed by '1' or '2' (usually).  
 Preamble: "Message(s), Message(s)"  
 "Group nn" "Group nn" (nn = Number of Groups)  
 "Text, Text".  
 Message: Random 5L groups, given phonetically "End of Message"  
 (Repeated message) "End of message".  
 "End of transmission".  
 Ending: "End of transmission".  
 Schedule: 24hrs/day, H+00, H+15, H+30, H+45.  
 Location: Tel Aviv (and others world-wide).

Frequency (MHz)	Callsign	Frequency (MHz)	Callsign
2.120	???	6.685	SYN
2.270	JSR	6.745	CIO, VLB
2.515	CIO, VLB	6.840	JSR, EZI
2.628	FTJ	6.912	OEM (occasional)
2.743	ULX	7.115	ART
2.955	MIW	7.323	KPA
2.957	SYN	7.372	GBZ (occasional)
3.150	PCD, ART	7.446	KPA
3.270	KPA	7.540	JSR
3.417	ART	7.605	SYN, CIO, VLB
3.495	MIW	7.760	ULX
3.640	VLB	7.866	SYN
3.840	YHF	7.918	YHF
3.960	VLB	8.025	CIO
4.165	SYN	8.127	CIO, MIW
4.168	SYN	8.465	SYN, CIO
4.270	PCD	8.641	MIW
4.360	CIO	9.130	EZI
4.463	FTJ	9.270	KPA
4.465	FTJ	9.402	YHF (occasional)
4.560	YHF	10.125	CIO, KPA
4.665	VLB	10.352	VLB
4.780	KPA, ULX	10.526	VLB
4.880	ULX	10.648	YHF
5.091	JSR	10.820	VLB, SYN
5.170	GBZ (occasional), CIO	10.970	MIW
5.230	MIW, SYN, VLB, CIO	11.565	EZI
5.339	OEM (occasional)	12.747	SYN
5.437	ART	12.950	MIW
5.530	CIO	13.533	EZI
5.531	BAY (occasional)	13.921	CIO
5.560	YHF	14.750	CIO, MIW
5.629	SYN, CIO	14.866	VLB
5.715	ZWL (occasional)	15.980	EZI
5.820	YHF	17.410	EZI
6.270	ULX	18.178	VLB
6.370	MIW	19.715	EZI
6.500	PCD	20.740	SYN
6.598	NDP (occasional)		
6.660	SYN		

# THE NUMBERS STATION GUIDE

## 4. Nancy Adam Susan (E15)

A few years ago, we began to notice a number of stations using a very peculiar alphabet indeed. Here it is in full:

Adam, Baker, Charlie, David, Edward, Frank, George, Henry, Italy, John, King, Louis, Mary, Nancy, Otto, Peter, Queen, Robert, Susan, Thomas, Union, Victor, William, X-Ray, Young, Zebra.

Although we still haven't determined the operator of this network, a number of reliable source have indicated that it is North African, possibly Libyan.

Unlike the phonetic alphabet network run by the Israeli Intelligence Services, these stations operate a much reduced schedule but still have a tremendous range of frequencies involved.

Note also the use of phonetically spoken Q-Codes such as QRU (Queen Robert Union) - "I have no traffic for you".

### Identifying Characteristics

Mode: u.s.b.  
 Voice: Female.  
 Language: English.  
 Pronounced: 1950s Phonetic Alphabet.  
 Call-up: [No Traffic to Send]  
 Three Letter Phonetic callsign  
 "Queen Robert Union" for five minutes  
 [Traffic to Send]  
 Three Letter Phonetic callsign  
 "Queen Thomas Charlie" (three times).  
 Preamble: "Nancy Adam m" (three times - message key is m)  
 "George Robert nn" (three times - group count is nn).  
 Message: Random 5L groups, each repeated.  
 Ending: "Robert Adam" (twice).  
 Schedule: H+00, H+30.  
 Location: North Africa (Libya possibly).

### Detailed Schedule

Time	Frequency	Call
1100	18.000	BEC
1200	17.503	WSU
1230	11.170	MSA
1300	11.000	BEC
1400	14.000	FYP
1630	6.715	NAS
1700	14.000	FYP
1730	5.834	MSA
1800	5.834	USP
1900	4.130	SAR
2000	5.530	NAS
2100	4.130	MSA

## 5. 8BY (M16)

This is the first of our chosen stations that uses Morse and has been on air for many years. Eagle-eyed readers will note that the callsign would indicate Indonesia as the country of origin, indeed a number of respected frequency guides still have the station listed as Indonesian. However, 8BY has been tracked down to a transmitting facility just on the outskirts of Paris, France.

8BY, although active at the same time, never quite reached the notoriety of another Morse-only Numbers Station which used the bogus callsign of EC3Y. This particular station was traced to a facility in Husum, Northern Germany and was promptly reported to the German Authorities by the intrepid Radio Amateur who hunted the station down. A few weeks later the station reappeared, this time sporting a regulation German callsign of DEA47. Sadly, DEA47 is now no more but 8BY soldiers on.

### Identifying Characteristics

Mode: c.w.  
 Call-up: "VVV VVV VVV 8BY 8BY 8BY".  
 Message: 3F groups separated by "/".  
 Ending: AR  
 Schedule: Daily, 24hrs, H+40 for 20 minutes on the frequencies below. Two, three or four frequencies may be active simultaneously.  
 Location: Paris, France.  
 User: Unknown.

### Frequencies (MHz)

20.946 18.415 14.931 14.925 14.433 12.283 12.170 12.075 10.248 7.668

## 6. Swedish Rhapsody - G2 (Voice), M4 (Morse)

Along with the MOSSAD-run Phonetic Alphabet stations, the Swedish Rhapsody is another very famous Numbers Station. The station is named after the piece of music, played on a child's music box, which is used as the station's signature tune.

Swedish Rhapsody has been active since the 1950s, even a number of its frequencies remain the same to this day. This is certainly an 'old age pensioner' of Numbers Stations!

As you will see from the Swedish Rhapsody's identifying characteristics below, it is one of a few stations that does not include a group count in its messages. In this case, it is because each message is, and always has been, 100 groups in length.

The station has a second message format (G2A) in which the message is preceded by a repeated count from one to zero in between each three plays of the music-box tune.

Swedish Rhapsody has another surprise up its sleeve too. It also operates in Morse using the unusual, and instantly recognisable message preamble of LOLO - presumably a friendly "Hello, Hello" from the station to its agents.

### Identifying Characteristics

Voice Operation (G2)  
 Mode: u.s.b. and a.m.  
 Voice: Female (often described as a child's voice).  
 Language: German.  
 Call-up: [Type 1]  
 Ten minutes repeating tone  
 Five minutes consisting of  
 23 renditions of the tune *Swedish Rhapsody*  
 [Type 2]  
 Three renditions of the tune *Swedish Rhapsody*  
 Counting from One to Zero.  
 Preamble: "Achtung" (Attention).  
 Message: 100 5F groups, each repeated.  
 Ending: "Ende" (End).  
 Pronounced: 1=Eins, 2=Tswo, 3=Drei, 4=Vier, 5=Funnef, 6=Sechs  
 7=Sieben, 8=Acht, 9=Noy-in, 0=Null.  
 Schedule: Complex, based on weeks after 1st Saturday in month, H+00, H+30.  
 Location: Possibly Switzerland or Poland.  
 User: Unknown.

### Morse Operation (M4)

Mode: Morse in m.c.w.  
 Call-up: Ten minutes of the letter 'U' starting ten minutes to the hour.  
 Preamble: Five minutes of "LOLO LOLO LOLO / 5F x 2" (Identifier)  
 'BT BT'.  
 Message: 100 5F groups, singly  
 "LOLO 5F x 2" (Sequence Number)  
 Repeat of 5F Message.  
 Ending: 'AR SK AR SK'.  
 Schedule: H+00, H+30.

### Detailed Schedule

Saturdays		Sundays		Mondays		Tuesdays		Wednesdays		Thursdays	
Time	Freq	Time	Freq	Time	Freq	Time	Freq	Time	Freq	Time	Freq
0900	8.188	0000	4.779	1300	6.200	1800	4.195*	0900	4.195*	1800	4.195
1100	8.488	0100	5.748	1700	6.200	1800	4.195	1300	6.200	2000	5.340
1200	8.488	1000	8.188	1730	6.200	2000	4.195*	1700	6.200	2000	5.340*
2000	3.825	1100	8.188	2000	5.340*	2100	4.572	1730	6.200	2100	5.340*
2100	4.779	1200	8.488	2200	6.200	2100	3.825*	2000	5.340	2100	5.340
2200	3.825	2000	3.825	2230	6.200	2100	5.340	2100	5.340	2200	5.340
2230	3.825	2100	5.340	2300	6.200	2130	5.340	2200	6.200	2300	4.779
2300	5.340	2200	4.832	2330	6.200	2300	3.825	2200	5.340	2300	3.825
		2200	3.825					2230	6.200	0000	5.340*
								2300	6.200		
								2330	6.200		

There are no transmissions on a Friday. \* indicates transmission in Morse

## ENIGMA

ENIGMA continues to monitor the Numbers Stations today and, as far as we know, is the only group of people dedicated to this aspect of short wave listening. Our magazine *ENIGMA* features all the latest developments in the field. A book on the subject is also being planned. You can contact us at: **ENIGMA, 17 to 21 Chapel Street, Bradford West Yorkshire BD1 5DT, United Kingdom.** FAX:+44 (0) 12.74 390725, E-mail: [mikec@praxis.co.uk](mailto:mikec@praxis.co.uk)

A sample copy of ENIGMA can be obtained by sending £2 or 2IRCs to the address above. A year's subscription to ENIGMA (four issues plus specials) is currently £6 (within UK) and £10 (outside UK).

## 7. The English Man and Family (E6, E7, S6, S7, E17, G6, G7, G19, S25)

This is an extremely complex and extensive network of stations run by the Russian Intelligence Services. Both male and female voice synthesisers are used and messages are transmitted in the same two basic formats by stations using Spanish, English, Russian and German. The English and Russian Men are most active, followed by the German Lady. The Spanish Man and Lady, English Lady and German Man are heard very sparingly and we have also had unconfirmed reports of a Chinese language variant.

If this wasn't enough variety, the network also has two very active Morse operations again using exactly the same message formats and procedure as their voice counterpart. Generally, one format of message is sent by stations using m.c.w., the other by ones using normal c.w.

The operating schedule of the network is extremely long and complex giving the impression of almost random behaviour. But the station's activity levels are such that a day never goes by without hearing several transmissions from the network. Because of the pseudo-random nature of the schedule it is not possible to print an extensive list of frequencies - they would be practically useless!

However, there are a number of examples that do appear regularly and can hence be used to train the listener's ear to this fascinating network.

### Identifying Characteristics

Mode: a.m.  
Voice: Female or Male.  
Language: English, Russian, German, Spanish.  
Call-up: [Type 1 (Traffic to follow)]  
3F ID repeated for five minutes.

[Type 1 (No Traffic to follow)]  
3F ID three times (pause) 0 0 0 0 0 Repeated for five minutes.

[Type 2 (Traffic to follow)]  
3F ID three times (pause) 1F (=number of messages)  
Repeated for five minutes (The number of messages is nearly always 1, rarely 2).

[Type 2 (No traffic to follow)]  
3F ID three times (pause) 0 0 0  
Repeated for five minutes.

[Type 3 (Special)]  
615, 615, 615 (pause) First 5F group, given twice.  
Repeated for ten minutes.  
615, 615, 615 (pause) Second 5F group, given twice.  
Repeated for ten minutes (Note that the first and last digits of the two 5F groups are always the same).  
0 0 0 0 0

Pronounced: [English]  
1=One, 2=Two, 3=Three, 4=Four, 5=Five, 6=Six, 7=Seven  
8=Eight, 9=Nine, 0=Zero.

[German]  
1=Eins, 2=Zwei, 3=Drei, 4=Vier, 5=Funf, 6=Sechs  
7=Sieben, 8=Acht, 9=Neun, 0=Null.

[Russian]  
1=Adein, 2=Dva, 3=Dri, 4=Cheteria, 5=Biad, 6=Shest  
7=Shim, 8=Vojim, 9=Devyed, 0=Noll.

[Spanish]  
1=Uno, 2=Dos, 3=Tres, 4=Quatro, 5=Thinko, 6=Sayz 7=Siete,  
8=Ocho, 9=Nueve, 0=Thero.

Preamble: [TYPE 1]  
Key, Key.  
Group Count, Group Count.  
[TYPE 2]  
Key, Group Count  
Key, Group Count.

Message: [TYPE 1] 5F groups, each repeated.  
[TYPE 2] 5F groups, singly.

Ending: [TYPE 1]  
Key, Group Count  
Key, Group Count  
0 0 0 0 0.  
[TYPE 2]  
0 0 0  
0 0 0.

Schedule: Any five minute interval but H+00, H+20, H+40 most common.

Location: Moscow, Cuba and ex-Soviet States.  
User: Russian Intelligence (ex-KGB and GRU).

### Regular Transmissions

Russian Man (S25)  
Daily at 0800 on 14.890MHz to ID '615'.  
Daily at 0820 on 11.270MHz to ID '615'.

English Man (E6)  
Mondays at 1910 on 10.162MHz to ID '715'.  
Tuesdays at 1910 on 10.162MHz to ID '715'.  
Wednesdays at 1910 on 10.162MHz to ID '715'.

German Lady (G7)

## 8. OLX - S16 (Voice), M6 (Morse)

OLX is another interesting dual operation mixing voice with Morse in its schedules. This station is operated by Czech Intelligence from a site on the outskirts of Prague, and as you will no doubt note, actually uses an ITU-registered callsign. However, the callsign is in fact registered to CETEKA, the Czech Press Agency!

The schedule of this station is very extensive and ventures high into the short wave spectrum which indicates a need to reach agents far removed from the Czech Republic.

OLX is probably the only numbers station to have QSL'd a listener's reception report.

### Identifying Characteristics

Voice Operation (S16)

Mode: u.s.b.  
Voice: Female.  
Language: Czech.  
Pronounced: 1=Yedna, 2=Dva, 3=Shi, 4=Shetiri, 5=Pyat, 6=Shest, 7=Sedum, 8=Osum, 9=Devyet, 0=Nula.  
Call-up: Five minutes consisting of 3F schedule numbers (1 of 20)  
Preamble: Group Count.  
Message: 5F Groups, singly.  
'(Unidentified word)' (Repeat)  
5F Groups, singly.

Ending: 'Konet' (End).  
Schedule: 23hrs/day at H+55 (except 2300).  
Location: Prague.  
User: Czech Intelligence.

### Morse Operation

Mode: c.w.  
Call-up: "VV VV VV DE OLX OLX OLX".  
Preamble: 3F Schedule Number (1 of 20) for five minutes  
'BT'  
011 repeated three times  
'BT'

Message: Random 5F groups  
'BT'

3F or 2F (group count)  
'BT'

Message repeated  
'BT'

Ending: 'BT BT'.  
3F Schedule Number sent three times.

Frequencies (MHz)  
3.280, 4.601, 5.301, 5.775, 6.282, 6.785, 8.142, 9.320, 11.002, 11.416, 12.275, 14.977, 18.303.

## 9. The Two Letter Stations (G16, E16)

These stations, operated by the German Intelligence Service (BND or Bundesnachrichtendienst) have a long history having first started life alongside two related stations 'Papa November', DFC37/DFD21 all of which were probably transmitted into the then East Germany. The network was widely tipped to disappear following re-unification, however, transmissions from this network continue.

All stations have a characteristic series of random electronic tones as call-up which is followed by the particular station's two letter callsign given according to the ICAO Phonetic Alphabet.

The vast majority of transmissions are in German, but some callsigns transmit only in English. The station seems to have suffered a dramatic reduction in activity after 1st January 1996, but continues to be heard on a regular basis.

By careful monitoring of this network, it has also been established that each callsign transmits to only a few 3-figure identifiers, which most probably represent the intended agents. For example, 'Kilo Whiskey' sends messages to IDs 884, 091 and 908 only, whereas 'Hotel Kilo' sends to IDs 393 and 621.

### Identifying Characteristics

Mode: u.s.b. (a.m. rarely).  
Voice: Female.  
Language: German or English.  
Pronounced: [German]  
1=Eins, 2=Zwei, 3=Drei, 4=Vier, 5=Funf, 6=Sechs,  
7=Sieben, 8=Acht, 9=Neun, 0=Null.  
[English]  
1=One, 2=Two, 3=Three, 4=Four, 5=Five, 6=Six,  
7=Seven, 8=Eight, 9=Nine, 0=Zero.

Call-up: Random electronic tones.  
Two letter ICAO phonetic callsign e.g. "Yankee Sierra"  
for five minutes.

Preamble: [German]  
"Es folgen Mitteilung fuer" (There follow messages for)

# LISTENING TO NUMBERS STATIONS

3F ID given twice (Destination/Agent).  
 nn "Gruppen" (nn=Number of groups to be sent).  
 "Achtung"  
 [English]  
 "Messages for"  
 3F ID given twice (Destination/Agent)  
 nn "Groups" (nn=Number of groups to be sent)  
 "Attention".  
 5F groups, given singly  
 [German] "Ende".  
 [English] "End".  
 Germany.  
 Any H+00, H+30 possible, 24hrs/day.  
 BND.

Message:  
 Ending:  
 Location:  
 Schedule:  
 User:

## Frequencies (MHz)

2.690, 2.707, 2.745, 3.228, 3.262, 4.543, 4.594, 4.773, 4.821/4.888,  
 5.015, 5.182, 5.284, 5.732, 5.770, 6.765, 6.853, 7.404, 7.532, 7.661,  
 7.740, 7.752, 7.858, 8.063, 8.173, 9.040, 9.325, 9.450, 10.170,  
 10.177, 10.460, 10.500, 10.740, 11.008, 11.108, 11.545, 11.617,  
 12.092, 12.210, 12.314, 13.362, 13.752, 13.775, 13.890, 14.622,  
 14.945, 15.610, 16.055, 16.220, 16.414, 17.430, 18.195, 18.575,  
 19.755, 20.240, 20.350, 20.675, 22.885.

## Active Calls

German  
 AB, CD, CT, DM, EG, EL, GK\*, HK, JW, KW, NZ, PZ, RD, RK SB, VO,  
 WL\*

English  
 AU\*, MD\*

\* appear to be the only active callsigns in 1996

## 11. The Counting Stations (E5, V5, G5)

As you've probably been wondering, we've yet to hear from the CIA! Not wanting to left behind in the Numbers game, the US Intelligence Services operate a very distinctive and active network. Activity levels are not what they used to be, this network like so many others suddenly reduced operations at the beginning of 1996.

The stations earn their name from a very characteristic call-up which consists of a longer than usual ten minutes where a count from one to zero is interspersed with a three figure identifier. The station used to be heard in English, German and Spanish until recently, but now the Spanish version appears only sparingly and the German may have disappeared from air altogether.

Like the Lincolnshire Poacher, the Counting Stations are frequently jammed and also try to overcome this problem by sending the same message on two different frequencies. It is often quite a challenge to come across one frequency and then begin the hunt for the parallel. With the exceedingly long messages sent by the station, often up to 225 groups, it is usually possible to find the parallel within the forty minutes available. The twinned frequencies are usually within a few MHz of each other, and sometimes as close as a few tens of kHz.

Counting Station use the so-called 'dictionary code' with 5F groups given as 3F (pause) 2F. They also appear to make regular use of 0.5kHz offsets, which is rather unusual considering that nearly all Numbers Stations are to be found on a kilohertz point.

## Identifying Characteristics

Mode: a.m. or u.s.b.  
 Voice: Female  
 Language: Spanish, German, English (with heavy US accent)  
 Call-up: 'One, Two, Three, Four, Five, Six, Seven, Eight, Nine, Zero'  
 3F ID, given twice (The destination/agent) for ten minutes.  
 Preamble: Ten rough, electronic beeps.  
 'Count 204, Count 204' (number of groups)  
 Message: 3/2F groups, singly (maximum of 225 groups)  
 'Repeat, Repeat'  
 3/2F groups repeated.  
 Ending: 'End'  
 Schedule: H+00, 24hrs/day.  
 Location: World-wide, transmitted from US-allied countries.  
 User: US Intelligence (CIA/NSA).

## 10. The Three Note Oddity - G4 (Voice), M29A (Morse)

Here's a very interesting, but also extremely elusive station (until you know how it works that is!). The station is named after its signature which consists of a rough, three note rising scale. If you've misdialled a telephone number, the three tone signal that the exchange sends you in between the recorded 'number not recognised' announcement is quite similar.

The Three Note Oddity always seemed to be one of those stations that never appeared in the same place twice. ENIGMA always received the odd reception report now and again, but never any clue that allowed a schedule to be devised. The station has been active since at least 1988, and despite its German voice synthesiser, it is actually broadcast from a site on the outskirts of Budapest in Hungary.

Some in-depth monitoring of the station since 1993 has revealed some very unusual behaviour. The same message is broadcast on the same day of each week for a month. The next month, the message changes along with the frequency. After a year of following this pattern, the station returns to the same frequency it used a year ago, albeit with a different message! The station appears to use the same yearly cycle of frequencies for about three years, before it moves on to a new cycle. The Three Note Oddity is also unusual for other reasons; it is one of only a few Numbers Stations not to give group counts before messages are sent, messages do not appear to be random (the same 5F group is often seen four or five times in a single message), and each message appears to favour a certain combination of digits in a large number of groups for example '48' in '54848 75448 30102 48754'.

Like a number of other stations, the Three Note Oddity drastically reduced operations on the 1st January 1996 leaving only two known, regular transmissions on-air. However, it was around this time that ENIGMA was able to connect a well-known Morse Numbers Station using the bogus callsign of 'VDE' to the Three Note Oddity. Around the beginning of 1996 VDE began to behave in exactly the same way as the Three Note Oddity. We can therefore assume that VDE is the Morse arm of this operation.

All in all, the Three Note Oddity certainly lives up to its name!

## Identifying Characteristics

### Voice Operation

Mode: a.m. (often with either l.s.b. or u.s.b. reduced).  
 Voice: Femal.  
 Language: German.  
 Pronounced: 1=Eins, 2=Zwo, 3=Drei, 4=Vier, 5=Funef, 6=Sechs,  
 7=Sieben, 8=Acht, 9=Neun, 0=Null.  
 Call-up: Electronic 'tune' of three tone rising scale with rough note for five minutes.  
 Preamble: "Achtung, Achtung" (Attention, Attention).

Message: Up to 40 'random' 5F groups, given twice.  
 "Ende, Ende" (End, End).  
 "Achtung, Achtung" (Attention, Attention).  
 Message Repeated.  
 Ending: "Ende, Ende" (End, End).  
 Schedule: Sundays (and other days rarely).  
 Location: Budapest, Hungary.  
 User: Hungarian Intelligence.

## Morse Operation

Mode: c.w. at 18w.p.m. (machine generated).  
 Call-up: "VVV VVV DE VDE VDE VDE" for five minutes.  
 Preamble: 'AR' (pause)  
 "VVV VVV DE VDE VDE VDE".  
 'BT BT'.  
 Message: Up to 40 'random' 5F groups, given twice.  
 Ending: 'AR'.

## Voice Schedule

	2105	2135
Spring UTC	2005	2035
January	3.227	3.127
February	3.409	3.309
March	3.419	3.319
April	4.581	4.481
May	4.165	4.065
June	4.340	4.240
July	3.935	3.835
August	5.233	5.133
September	4.484	4.384
October	3.389	3.289
November	3.276	3.176
December	3.199	3.099







# There's a New Sound on the Terraces

## Part 2

**L**ast month Alan Gale explained how Blackburn Rovers Football Club made radio history three years ago by launching Radio Rovers. He concludes the story by describing how other clubs have followed Rovers' example and the equipment used.

### Turn On, Tune In, Sit Down

The advent of the all-seater stadium has led to a change in the habits of a lot of supporters, and many of them now choose to arrive at the ground several hours before the kick-off. Rather than leave them hanging around outside the ground kicking their heels, the clubs began to realise that not only would it make sense to give the fans something to keep them occupied, but providing them with forms of entertainment other than just the game itself could prove to be commercially rewarding, too.

Manchester United, undoubtedly Britain's most famous soccer club and one of the best supported, already had its own Superstore, Museum, and stadium tours, and wasn't slow off the mark in exploiting the desire by fans to get more out of their match days. It didn't take long for many

of the other league clubs to see the benefits of doing this and follow suit.

When all of these factors are taken into consideration the idea of a club having its own radio station makes a great deal of sense, and not only in economic terms. Nowadays supporters can take their seats in clean, modern stadia, light years removed from the grubby old terraces so common just a few years ago. Now they can be entertained and informed about all manner of relevant information such as: team news, ticket information for forthcoming matches, interviews with team members or ground staff, travel information for away matches, before and after match 'phone-ins, competitions and, not forgetting of course, listening to music.

Not only is this form of Matchday Radio an excellent way of entertaining fans already inside the ground, or even those who may be listening at home or at their place of work, but is also especially of great benefit to those fans who may be travelling to the match and are in vital need of information about public transport, or traffic problems anywhere in the vicinity of the ground. Traffic reports are of major benefit to the travelling fan who is desperately trying to reach the ground without getting caught up in traffic jams, or held up by

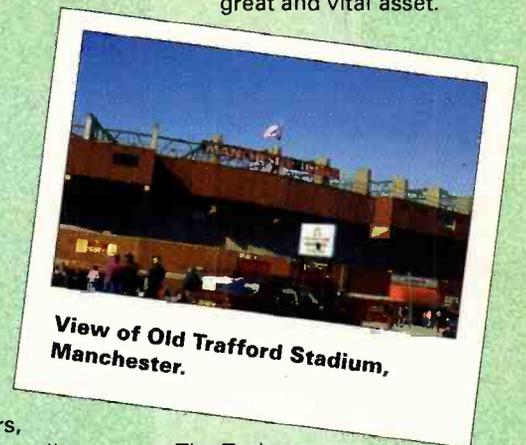
major road works - a problem which is sadly all too common in most of our towns and cities nowadays.

Fortunately for the travelling supporter this type of information can be supplied directly by the local Police force. The Police will generally have an officer available that can be put live 'on-air' to give the latest information the moment it becomes available. Likewise, the prospect of having thousands of cars, buses and coaches all trying to leave the area around the ground at the same time could easily turn into a nightmare. Imagine the consequences if large numbers of uninformed fans were to find themselves stuck on a road which was blocked by an accident or some other mishap.

### Safety First

Another benefit to the supporter which should be borne in mind is that of safety. Most people will remember the terrible Hillsborough disaster when many supporters were tragically killed after an overcrowding situation got out of hand. Also, not forgetting other similar incidents such as the ones at Bradford and

Glasgow, there is always the risk of possible future unforeseen 'situations' arising. A club which has the means to communicate quickly with supporters, both inside and outside the ground, has in its possession a great and vital asset.



View of Old Trafford Stadium, Manchester.

The Taylor report was designed to improve safety at football grounds, and looked at in this respect, a club that operates its own radio station has the means to make a valuable contribution to the general overall safety level within the stadium.

It has often been stated that the most crucial moments in any major disaster are the ones immediately afterwards, and one can only wonder how differently the above incidents may have turned out if more instant information could have been made available to the people involved. People are more likely to panic if they have no idea what is happening, and anyone who has been in the midst of a large crowd of people will be only to





aware of how easily things can get out of hand.

Thankfully, events such as these are quite rare. I wouldn't want to paint too gloomy a picture of what could happen during a day out at the local football ground, I only raise this point to illustrate the advantages that could be gained in the unlikely event that something did go wrong. The main function of club radio will always be one of entertainment and information, and in this respect this is a function that they perform very well.

Many of the clubs which have followed the lead of Blackburn Rovers and set up their own radio stations have been ones with a progressive outlook, I'm quite sure they will continue to carry out this task with great success for many years to come. Hopefully the clubs who don't yet have a station, whether big or small, will eventually come to see the advantages to be gained by becoming broadcasters and join this ever increasing league.

### Equipment

As I said previously, the introduction of the 1990



**Phoenix Comms. AM5 Transmitter at Radio Latics.**

Broadcasting Act brought in a lot of the changes which helped to make

the development of Football Club Radio Stations possible. Prior to the introduction of this bill, and the subsequent abolition of the body which had previously been in charge of Independent Radio in this country, the Independent Broadcasting Authority, all transmitters were usually supplied and operated by the IBA Engineering Division.

After the changes the Radio Authority would take over the responsibility for development and expansion of Independent Radio, whilst the Engineering Section was to be privatised. The new private company which emerged was called National Transcommunications Limited (NTL), but unlike its predecessor it no longer had the monopoly on the supply of transmitters to customers.

Thanks to this new ruling, competition was created in this sector and a number of smaller companies were now able to compete in the market place for the first time, good news for the radio stations.

Two of these small companies were able to take advantage of the new system and supply equipment at more competitive prices. One of these was Phoenix Communications, who supplied and fitted out not only the Radio Rovers studio, but also the transmitter and Monopole antenna. Many of the other stations following Radio Rovers onto the airwaves would use the services of this company.

Another company which provided

equipment was the Wireless Workshop of Brighton, who for a number of years, had been responsible for fitting over 24 inductive loop systems at various hospital radio stations throughout the country. Wireless Workshop had also supplied a number of other temporary RSL stations with mobile transmitters and antennas (including the Wimbledon Lawn Tennis Championships!), and so had considerable experience in this field.

It seems that these two companies co-operated with each other a great deal, and it wasn't unusual to find that a permanent antenna installation at one of the Football Club Radio Stations consisted of: a 10 metre high Altron tilt over lattice tower (as used by many Radio Amateurs!), a Wireless Workshop Antenna Tuning Unit, and a Phoenix Communications AM5 Transmitter.

Bearing in mind the close co-operation of these two companies it came as no surprise to many when in late 1995 they announced that they were to join forces and form a brand new company called Radica Broadcast Systems. Between them they can boast a wealth of experience in the supply and installation of equipment for many RSL stations, and are able to take credit for having made the first a.m. and f.m. transmissions in this field.

### A Sporting Challenge For Listeners

Stations operating with a Restricted Service Licence on medium wave

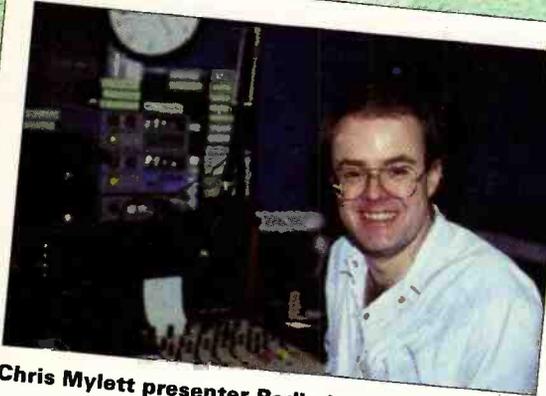
are limited to radiating power levels of no more than 1W effective monopole radiated power (e.m.r.p.). What this means in effect is that because the antenna systems are very inefficient eg. a Monopole, one of the favourite antennas for Medium Wave RSL stations, is nothing more than a capacity hat sat on the top of a tapped loading coil at the top of a 10m high mast. Compare this with a quarter wavelength vertical antenna which would need to be at least 50m high to radiate anything like efficiently at medium wave frequencies, and you can see the problem.

To get just 1W of power to actually radiate out of one of these antennas it is necessary to have around 16W of r.f. leaving the transmitter. Losses occur through the a.t.u., which is necessary to match such an electrically short system, and the loading coil at the top of the antenna. The power that actually does manage to radiate out of the system is only around one sixtieth of that used in a domestic light bulb!

You may wonder why a more efficient system is not used, but this is in fact done quite deliberately so that the range of the signal will be restricted. This is necessary since the transmission is only intended to effectively cover an area of around 8km or so during daylight hours, which will fall to around 5km after dark when it will have to compete with skywave signals from the Continent or other parts

Continued on page 46





Chris Mylett presenter Radio Latics, in studio.



Top of Monopole Antenna showing capacity hat and loading coil.



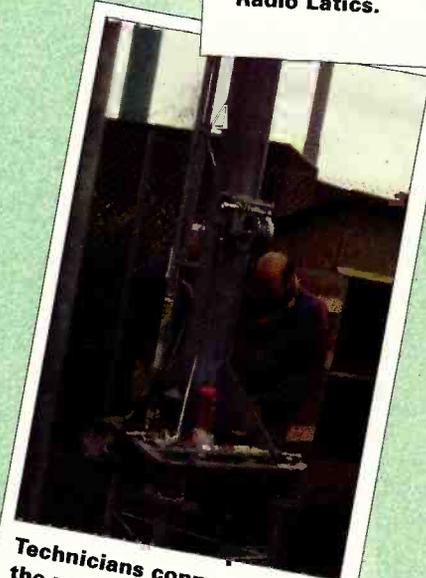
Antenna tuning unit at Radio Latics.



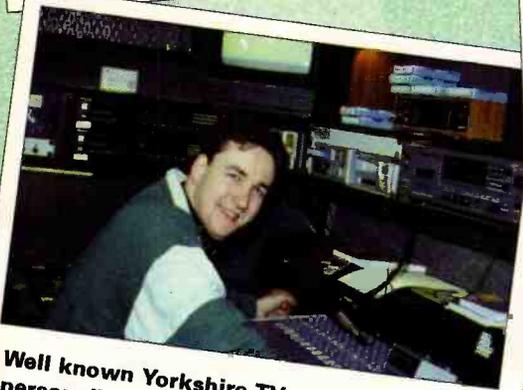
Radica Broadcast Systems 'mobile' TX and antenna, as used by a number of stations.



Outside view of the Radio Latics commentary box at the back of the main stand at Boundary Park, Oldham.



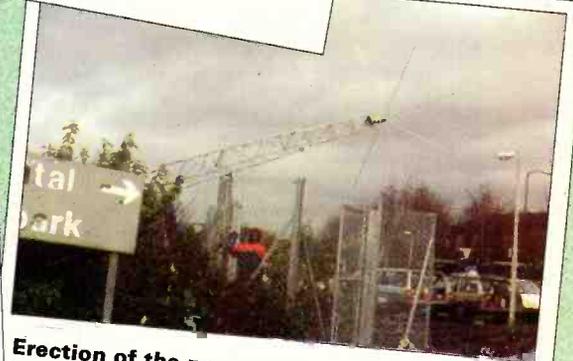
Technicians connecting up the new antenna system at Radio Latics.



Well known Yorkshire TV and Radio personality, Jon Hammond (presenter) and the man behind Radio Leeds United in the studio at Elland Road.



Inside view of the Radica 'mobile' unit showing p.s.u., a.t.u., TX and pump-us mast.



Erection of the new aerial mast at Radio Latics by Radica Broadcast Systems.

Continued on page 48



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of the UK. It should be remembered that in most cases listeners in the target area will only be using fairly basic domestic portables or car radios, so the level of incoming interference from the continent will not be as strong as that experienced by a DXer using a communications receiver and long wire.

What chance, then, does the radio enthusiast have of hearing these stations outside the area? Well the answer to that is a good one. With a good receiver such as the kind of communications receivers found in many radio shacks, and the addition of an antenna such as a medium wave loop (articles for these have appeared in *Short Wave Magazine*, and *Wires and Waves!*) reception can be greatly improved and interference reduced.

It's a fact that propagation conditions do vary greatly, and the chance of hearing something unexpected makes the hobby of radio listening so interesting. It may surprise many listeners to know that UK Football RSL stations are frequently heard at distances up to about 80km during daylight hours, and have been received in such far away places as: Finland, Norway, Sweden, Denmark, Holland, Germany, and most parts of the UK after dark by

DXers with equipment such as that listed above. Hearing a station only radiating 1W of r.f. at these sort of distances can be the ultimate challenge for the radio enthusiast, and probably worthy of the attention of the Reverend Dobbs and the G-QRP Club!

## Plenty More Where That One Came From

That was how Radio Rovers and British Football Club Radio came into being, but that was not the end of the story. By the end of the 1993/94 season they had been joined by another station - Manchester United



Monopole Antenna Man. United Radio.

Radio, which also broadcast on 1413kHz. The following season another seven football clubs, and one Rugby League club joined the original two on the airwaves, these were:

Radio Leeds United (1323kHz), Radio Canary (Norwich City - 1602kHz), Radio Magpie (Newcastle United - 1413kHz), Radio Latics (Oldham Athletic - formerly on 1386kHz, but due to move to a new frequency - most probably 1566kHz. This is due to the arrival of Asian Sound Radio on 1377kHz), Extra Buzz AM (Barnet - 1404kHz), Radio Headingley (Leeds Rugby League - 1413kHz), Radio Everton (1602kHz), and

Radio Killie (Kilmarnock - 1602kHz).

The 1995/96 season saw the disappearance of one station (Extra Buzz AM, Barnet), and the arrival of Radio Diamonds at non-league Rushden & Diamonds FC in Northants - (1503kHz, formerly 1512kHz), Radio Wolves (Wolverhampton - 1575kHz), and Riverside Radio (Wigan Rugby League Club - 1584kHz).

It is impossible to predict how many more stations will appear during the 1996/97 season, but I would expect numbers to continue to grow. At this moment Alan Yardley, through his company CREATV continues to bring radio to a number of new fields which include the supply of the Kit-Kat studio at the Blackpool Pleasure Beach, and a mobile station for the Racecourse at York during race meetings (York Raceday Radio - 1602kHz).

I'm sure that the future will see Alan and a number of other organisations bringing this style of radio to a wide variety of places and events, and already we are seeing a lot of stations at motor racing and show jumping events, and even cricket matches. If your favourite team or sport doesn't already have its own station perhaps you should be asking the management why!

## The Final Whistle?

When I started writing this article there were just two club radio stations on the air. As more began to arrive I felt that something

interesting was happening, and thankfully I was fortunate enough to be able to visit a number of them during their development.

During a visit to the Radio Latics studios at Oldham Athletic FC, I was invited to go on air and give advice to listeners about improving their reception. As a result of this I was invited to join the station, and for the last one and a half seasons have been involved in all their broadcasts. This has given me a unique inside view of how these stations work and the amount of effort involved, and also the chance to see just what it's like to be on the receiving end of reception reports from DXers. It is not really within the scope of this article to go into this in any depth, but I hope to show just what it is like to be a part of one of these stations in a further article at some future date.

It has been a privilege for me to be involved in this new form of radio, so I couldn't end this look at Football club Radio without saying thank you to all the people who gave me valuable assistance during the production of this article, thanks especially to Alan Yardley, the Radio Authority Development Office, and Alan Roberts of British Telecom, Dave McGealy of Radio Latics, and Ray Cossey former Commercial Manager of Norwich City Football Club.



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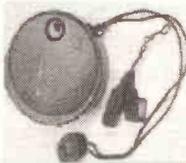


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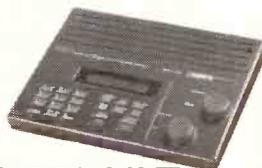
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the listeners, to 'exchange' your interesting frequencies. These frequencies could be anything - an unidentified service that you would like to find out more about; a channel that has come to your attention and you feel merits wider attention; frequencies that you know are linked to those in a previous 'Frequency Exchange'.

The direction that the Exchange takes will, to a large extent, depend on the way in which it grows and develops in the next few months. This, in turn, depends entirely on your support. If you do not send in your frequencies, the 'Exchange' will close! It's as simple as that.

The 'Exchange' is not just for scanner users - every listener has interesting frequencies that they would like others to know about. So, to start with, there are no limits on the frequencies you can send into the 'Exchange' - with two exceptions. No cellular telephones and no pirate radio stations.

Please try to conform with the way in which the information is presented in the 'Exchange'. If you want to use a pseudonym or remain anonymous your wishes will be respected. But, you must also let us know your name and address.

**Dick Ganderton, Editor**

## Key

a.m.	Amplitude Modulation
c.w.	Morse Code
EE	English language
FAX	Facsimile
HRPT	High Resolution Picture Telemetry
l.s.b.	Lower Sideband
n.b.f.m.	Narrow
NATO	North Atlantic Treaty Organisation
OB	Outside Broadcast
p/p	Phone Patch
Picc	Piccolo
stby	Standby
u.s.b.	Upper Sideband
VFT	Voice Frequency Telegraphy
wkg	Working
tfc	Traffic
wx	Weather
dpx	Duplex
xmsn	Transmission
YL	Female Op.

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MHz	Mode	Time	Call	Location	Monitor	Notes
0.1473	Baudot	1253	DDH47	Hamburg	ab	Meteo,D 1253 50bd RYRYRY
0.438	c.w.	1113	DXZ		ab	Lyngby Radio,DNK w/various vessels
0.945	a.m.	0933	EastCoast Radio	E.Sussex?	pb	Sounds of Seagulls and "Test"
3.485	u.s.b.	0053			kw	Gander Radio Volmet civil air wx //6604//10051.
4.417	u.s.b.	1853	ZSC	Cape Town	rg	Shore station
4.426	u.s.b.	0830	YIM	Aus	aw	Melbourne Radio w/wx ftc to the area.
4.612	u.s.b.	0700	HERKY 107		gt	wkg METAPHOR w/an hourly radio check. Ops normal pass to Command Post.
4.612	u.s.b.	0659	HERKY 01		gt	wkg METAPHOR. radio checks. "01 has METAPHOR loud & clear"
4.741	u.s.b.	0146	HAVEN		jm	wkg ASCOT 3201 req wx for Ascension.
5.110	u.s.b.	0656	Unid		rb	w/ANDVT ftc.
5.245	u.s.b.	1030	MCRO1		lm	Army Cadet Net.
5.393	u.s.b.	2301	UBA		ll	NATO exercise located in North Sea.
5.505	u.s.b.	0404			kw	Shannon Volmet aviation wx.
5.610	u.s.b.	0400	Leisure 602		to	wkg Portishead LDOC/pp to Ops, ETA late 0730.
5.680	u.s.b.	1222			ab	Kinloss Rescue, w/Rescue 11 giving coordinates to look for a missing vsl.
5.709	u.s.b.	2018	I3L		lm	NATO exercise, English, US, French, and Dutch accents.
6.730	u.s.b.	0149	NAVY 50511		ch	Andy confirmed 50511 was on freq.
7.9055	Link11	2010	unid		lm	u.s.b. only.
7.962	VFT	2030	GXQ		lm	50baud/260 "test de GXQ yiriyiriyir 123456789 lazy dog.."
8.020	VFT	2335	unid		lm	Sch of 75baud/281 online crypto.
8.3965	c.w.	1249	DVTQ		jsm	m/v CHANNEL ENTERPRISE w/JNA w/JASREP/17°00N/118°57E 77304 GWT Bulker.
8.574	c.w.	1902	LGB		dg	Rogaland Radio CQ
8.803	u.s.b.	0340	5BA54	Cyprus	aw	Cyprus Radio p/p unid vessel in Greek.
8.828	u.s.b.	0807		Hong Kong	aw	w/Volmet weather.
8.828	u.s.b.	0810		Tokyo	aw	Volmet
11.4761	FAX	1159	HMF52	Korea	BW	Press
12.428	c.w.	1822	3FAK5		lm	m/v Alligator Strength 1 w/KPH @ 47°22N/143°8W
13.270	u.s.b.	2235		New York	rb	Volmet (NAT-VOL) w/terminal forecasts, ID.
13.507	u.s.b.	1632	unid		rm	w/rolling code speech inversion.
14.282	u.s.b.	2226			rb	Caribbean Health & Welfare Net wkg amateur in Bahamas reporting damage from hurricane Bertha; reports damage to east side of island & he is on a generator.
14.367	Baudot	0719	xinhua	China	lm	Press from Beijing RTTY in EE.
14.375	u.s.b.	1217	unid		rm	OM/SS in dpx xmsn w YL on 14390. Strong sig on both ends.
14.580	Picc 6	2045	unid		lm	0.51 and 0.91 stby.
14.593	Picc 6	2005	unid		kn	2ch VFT 0.51 & 0.91 both crypto.
14.593	Picc 6	2010	unid		kn	2010 VFT 2ch Picc 6 tone 0.91 crypto 0.51 stby.
15.862	u.s.b.	1105	unid		ms	Heavily jammed Number station -EE-fem voice 5FG.
17.038	c.w.	2030	WNU55		rb	Slidell Radio, La, US 2030 CW w/CQ, QSX marker.
69.8375	n.f.m.	1321		Manchester	pc	OB Talk-back
70.5875	a.m.	0327	?	Hants	gj	Fire Brigade?
71.100	f.m.	1854		Oxon	wp	Fire Control?
80.7865	f.m.	1020	unid	Glasgow	cg	?
81.075	f.m.	1113	unid	Glasgow	cg	?
82.1375	f.m.	0505		Humber-side	sp	Snow plow
86.225	f.m.	1017		Humber-side	py	Motorway Maintenance
122.750	a.m.	1423	?		py	Danger Area Activity Information Service (for ranges
122.950	a.m.	1657	G-HEMS	Dover	mh	Helio?)
141.031	f.m.	0721		Manchester	pc	Signal Radio studio talk-back
143.4125	a.m.	0352		London	rh	Emergency Service?
146.600	n.f.m.	0050		Space	sm	MIR
161.325	f.m.	0010	unid	Glasgow	cg	?
161.855	f.m.	2020	unid	Glasgow	cg	?
165.350	f.m.	0950	unid	Glasgow	cg	?
166.425	a.m.	1502	unid	Kent	mh	Marine?
169.812	f.m.	1503		Aston Villa	Anon	Football stewards
206.100	n.f.m.	0811		Swindon	Anon	British Rail
274.325	a.m.	1603		Portland	mw	Portland Ops
313.000	f.m.	0802		London	py	Military Air?
357.475	a.m.	1157	TOTAL	Brize Norton	py	Tactical traffic - French accent.
369.050	a.m.	1017		Fairford	ec	AC?
379.125	a.m.	1427		Brize Norton	md	
453.530	a.m.	0929	?	Humber-side		
455.475	n.f.m.	1711		Airport	py	Helio
455.9875	n.f.m.	1147	unid	B'ham Airport	tt	Ground staff
456.300	a.m.	1952		Easington	mh	Sounds like emergency services
1968.000	HRPT	1200		Space	py	General chat, gas terminal?
					dj	NOAA

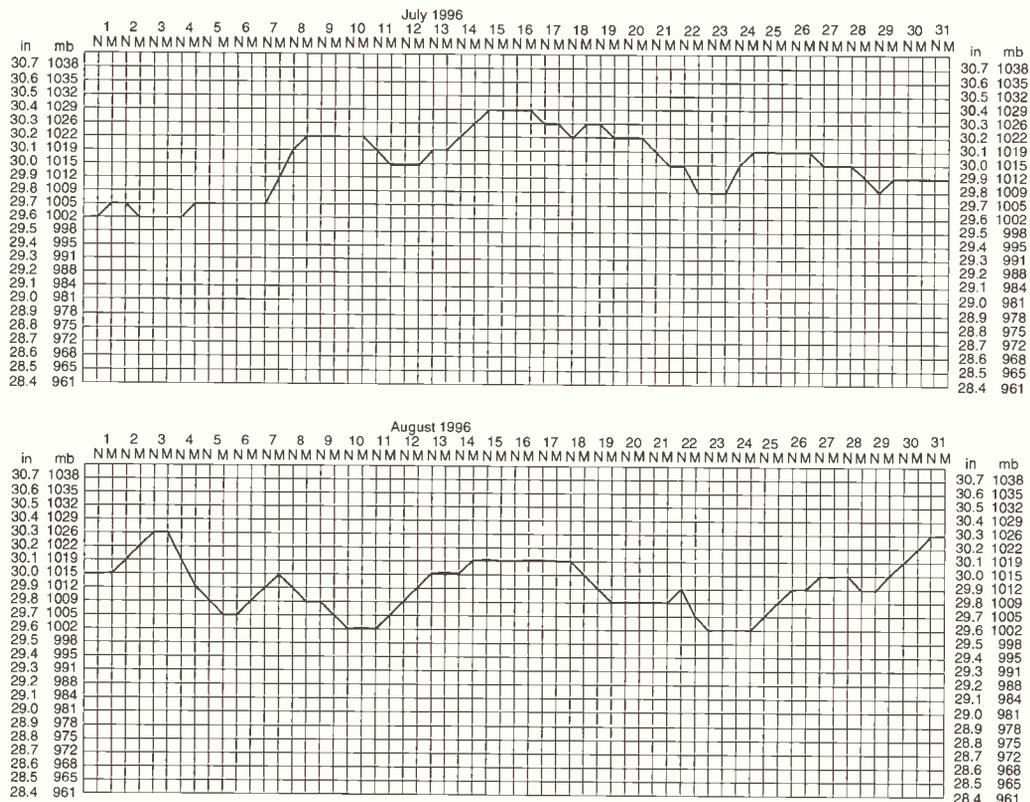
# Propagation Extra

Fig. 1: Barometric pressure chart for July 1996 taken by Ron Ham at Storrington, E. Sussex.

I believe that it is still essential that those readers who have an ongoing interest in propagation still have access to the various pieces of information collated by Ron Ham. I have asked Ron to continue to provide his monthly barometric pressure charts in the same format as before. In the meantime I am trying to arrange for a regular supply of sunspot charts and other similar information. If there are any readers who would be prepared to provide such information on a regular basis, please get in touch with me at the Editorial Offices, Broadstone.

Ron has provided two barometric pressure charts for this issue, Fig. 1 covers the month of July 1996, Fig. 2 covers August 1996.

Fig. 2: Barometric pressure chart for August 1996 taken by Ron Ham at Storrington, E. Sussex.



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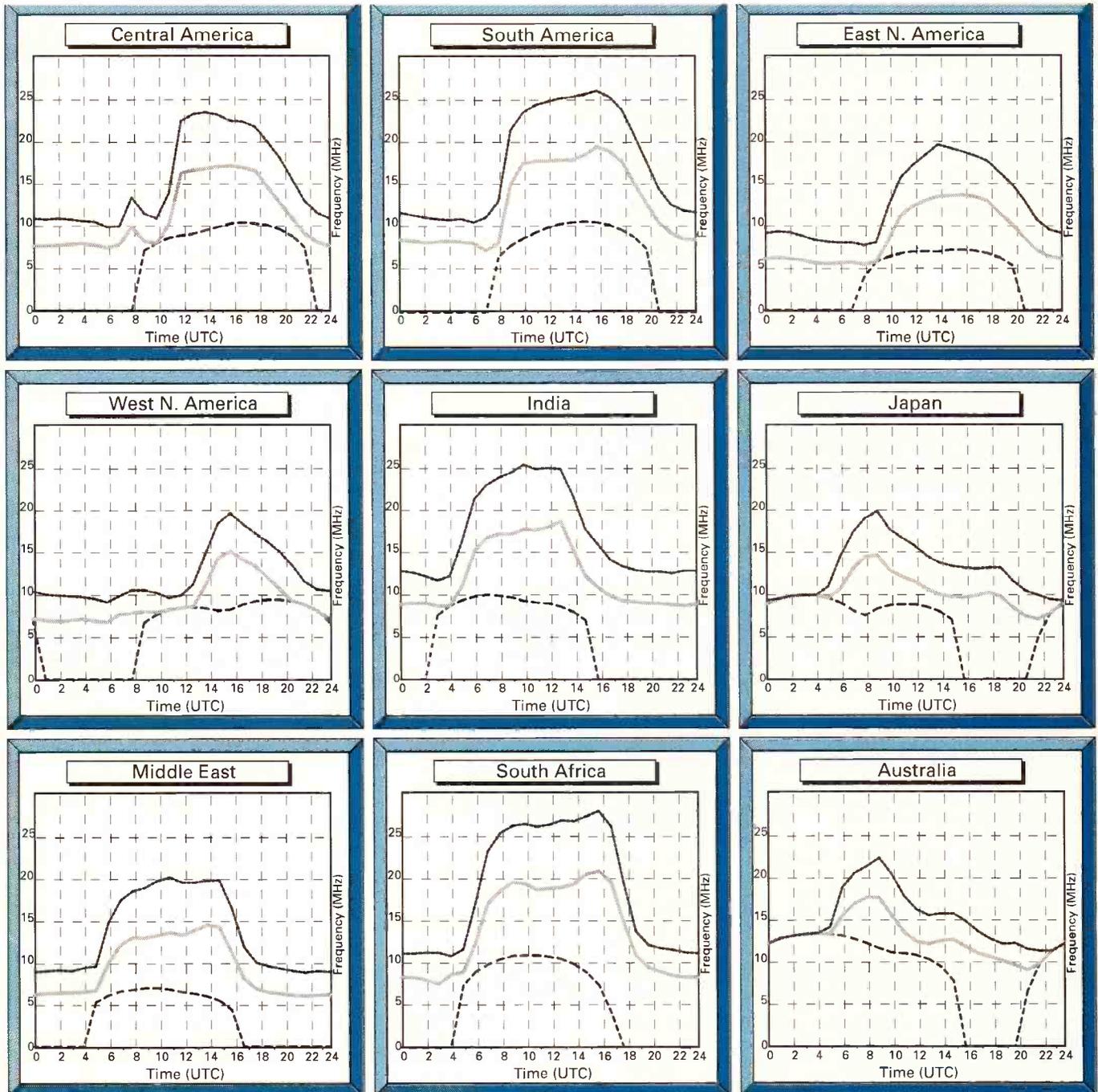
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**73 from Dave G4KQH, Technical Manager.**

# Satellite TV News

## Heavenly Sightings....

The satellites were packed with Olympic '96 signals throughout the Atlanta games. With several venues running events simultaneously, broadcasters with their own dedicated satellite circuits (unilaterals) and general EBU output circuits (multi-laterals), sport loving sat-zappers had much to choose from. I logged Ku-Band feeds East-bound ex-USA on PAS-1 @ 45°W; PAS-3R 43°W; Orion-1 37°W; Intelsat 603 34°W; Hispasat 30°W; Intelsat 601 27°W; Intelsat K 21°W as primary feeds, secondary feeds for European distribution were noticed on Telecom 2C @ 3°E and the main EBU distribution bird - Eutelsat II F4 @ 7°E. Plentiful as these signals were, the major players used C-Band (4GHz) - **Ian Waller** (Lincoln) and **Bob French** (West Midlands) listed another nine C-Band circuits. Interesting that the EBU multi-laterals 1,2,3 were on Intelsat 512 @ 21.3°W, the EBU-4 multi was carried via TDRS-4 @ 41°W. The circuits offered a mix of 625-line PAL/525-line NTSC.

Olympic drama erupted the night of July 31st when a bomb exploded in Centennial Park with two killed and many injured. All networks ran special news reports into Saturday and Intelsat K carried live coverage of a suspect's house being searched. The output of WAGA-TV ch. 57 (*Eyewitness News*) was relayed to the studio using a 2.5GHz terrestrial microwave link.

Lots of US political antics mid-August with speeches by presidential candidate Bob Dole dutifully carried over Orion-1 (37°W) and Intelsat K (21°W) ex-San Diego. Unable to sleep at 0300 on the 15th, I staggered downstairs for a cup of tea and checked the air waves. Several birds were carrying Dole's live address. I went back to bed!

The Watford train crash on August 8th featured in UK news broadcasts. Next morning, SNG truck UKI 40 (*Uplynx*) was feeding live reports into GMTV via Intelsat K from alongside the railway embankment. Intelsat K has been the link platform for *Holiday in the Sun*, GMTV's annual Spanish excursion with fun, games and saying 'hello' to the Brits on the beach. The morning satellite offerings run from 0800-0845ish.

**John Locker** (Wirral) suggests checking out the new TURKSAT-1C at 31°E. John saw the first test signals on 11.450GHz. Nearby the two Russian GALS are on 11.912 and 12.160GHz from 36°E with the NTV programme, signals are weak in the NW UK.

From Malaga, Spain, **Fred Pilkington EA7FSF**, previously active with TVDX, has become involved with satTV, using a 1m dish with 0.7dB Cambridge Universal LNBs feeding Maspro and NEC receivers. The dish tracks the Clarke Belt with ease via a retrofit Omnistar motor system. A picture postcard (of Southend!) with an indecipherable name advises that MED-TV is now on Intelsat 603 @ 34°W with strong signals at 11.069GHz v.

**Bandula Gunasekera** (Sri Lanka) was the first in Colombo to receive PAS-4 (68°E) in Ku, using a 600mm offset dish. Signals were the NHK news feed Paris-Tokyo - noise free at 12.591GHz with two audio carriers. Interestingly, Bandula's observed quality reception was maintained in monsoon-like rains, he feels that the receiving angle of 78° (almost vertical) minimises rain attenuation. In the news department, CNN news feeds pop up anywhere and **Ken Suddes** in Welwyn can add Intelsat 603 with Spanish commentary on 11.638GHz v to the list.

A long letter from *SWM* reader **Dave Hawley** (W London), active with TVDX since 1970 and recently migrated to satellites. His experience with dishes over the years has resulted in a magnificent system. A 1.8 metre Wineguard mesh dish equipped for C and Ku-Bands atop a 4-storey house offers an unobstructed view of the sky from 70°E to 70°W! The dish tracks via a Jaeger H to H mount, the Chaparral Co-Rotor C/Ku feed system offers a triple band 0.7dB Ku and ultra low noise C-Band. Dave's results are amazing! Ku-Band can be received from PAS-4 @ 68°E with good signals round to 69°W and the American Spacenet-2, which beams mainly C-Band cable programming into the States. Many of these feeds are just visible, remarkable for C-Band on a dish that's small as C-Band goes! PAS-4 transmits with linear polarisation rather than circular. Linear - ie. vertical and horizontal - is used by SE Asian satellites and is common practice across N America. Intelsat generally adopts circular polarisation (left or right hand) for international feeds and programme downlinks, most European C-Band downlinks use circular rather than linear.

Whilst in C-Band mood, **Bob French** (W. Midlands) is awaiting delivery of a larger IRTE dish for C and Ku. Earlier problems came from using an American mesh dish. OK for C-Band, but not so good at Ku - the mesh holes let too much

signal through. Inspecting the American C-Band dishes at the annual London Satellite Show revealed much less precision than we expect at Ku - at 4GHz you can live with slight surface errors, at Ku there can be no compromises! Bob also comments on a loss of performance at 11.5GHz. Both LNB and tuners were checked, but with no improvement. A change of coaxial feeder completely cleared the problem. Bob doesn't know why - perhaps a kink or a pinching staple upset the characteristic impedance, producing standing waves and the resulting signal loss. Bob's about to try a German 'Digitex' threshold extender that should result in a drop of 1.5dB compared to the usual 5-6dB on a normal satellite tuner. We await his comments...

A technical query from **Malcolm Dewis** (Nuneaton) concerning outbound Stateside pictures and test cards. Though many news feeds are colour, others are black and white, probably using the American NTSC 525-line standard, which on modern TVs will show full picture scan with full sync lock. Geriatric TVs (like I use) lock NTSC with reduced height and twitchy frame/field hold.

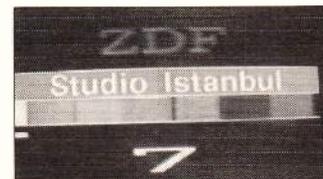
I've been testing out samples of two relatively inexpensive, upper performance, DX receivers. One is the Chaparral M60e, the other, the Provision V, both badged units from SE Asia. I will report back on how practical they are for TVDXing.

## Satellite News

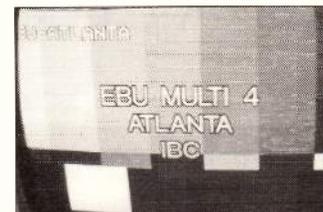
Karaoke rules OK in SE Asia - Channel KTV proved a great success in Singapore/Malaysia and is expanding coverage to include Taiwan, Hong Kong and several cable systems in mainland China this Autumn.

Hong Kong's Star-TV had been rumoured to be moving into India ahead of mainland China's take-over of the colony. Star denied this, though Rupert Murdoch had extended talks and visits with the Indian authorities. Star have announced a £13 million deal with India and is to open a Bombay studio (+post) production centre this Winter to provide original home grown programming for the 'Star India' satellite service.

There's a new Arabic language entertainment channel opening shortly - *Showtime* - provided by Viacom to complement the existing Gulf DTH channel package, which includes movies, kids and musical offerings though none of these are dedicated Arabic produced



German TV feed from Turkey via Eutelsat II F4 @ 7°E.



One of the EBU Multilateral Olympic feeds into Europe.



The Outside Broadcast identification test card during the Tour de France cycle race 1996 via Telecom 2C @ 3°E.



Eutelsat II F4 relays a NASA space flight video package.



Orion-1 @ 37°W relayed this unidentified caption, where is the Garrigan Sea?



A futuristic design for a 3.7m C/Ku-Band dish from Miralite, California.

channels. It's likely that *Showtime* will open a production centre in Lebanon to produce material for the 7-channel package. The monthly subscription for the full package, including the Arabic special, is £65! Elsewhere in the Middle East the satellite distributed 'BBC World' TV service is gaining cable carriage in Pakistan, the UAE and Sri Lanka. Orbit TBV has just transferred all their digital TV channels to Intelsat 703 @ 57°E from Intelsat 704 @ 66°E.

# DX Television

Reception conditions improved dramatically during July. This was a most welcome situation after a dismal June! Signals originated mainly in Central Europe and from the south-east, although double-hop reception from the Middle East did occur more than once.

## Exotics

Signals from Saudi Arabia, Egypt, Iran, Dubai, Syria and Jordan have all been identified by enthusiasts in Europe, some on a regular basis. In the United Kingdom there have been several sightings of weak-to-average strength Arabic signals fluttering up on channel E2 from an east-south-east direction, especially when channel R1 has been active during openings to the Ukraine and Moldova. However, the exotics have tended to come in when they were least expected, so it pays to monitor blank channels regularly, especially when reception is already established on higher frequencies.

### Ian Johnson

(Bromsgrove) witnessed a 6-metre (50MHz) transatlantic Sporadic-E opening at midday on July 14th. Unfortunately, the m.u.f. did not make it to the higher US channel A2 vision frequency of 55.25MHz, but no doubt Spanish and Portuguese TV carriers were being monitored by US amateurs. Incidentally, many US 6-metre enthusiasts are monitoring the Italian private station 'VIDEO' on 47.872MHz for any improvement in transatlantic conditions.

## Channel E2 News

The exciting news is that Syria has established a high-power channel E2 transmitter broadcasting its second network leading to speculation that the former low-power Homs relay has increased its e.r.p. (Effective Radiated Power). This station has been identified many times since late May in Europe and at least twice recently in Derby. The on-screen logo reads 'syria' down the screen

in the lower left-hand corner with Arabic writing running horizontally below, thus forming an 'L-shape' logo.

So far, there haven't been any reports of the Spanish TVE-2 transmitter on channel E2 (Santiago transmitter), so maybe this has now been taken out of service.

## Impressive Day

July 16th was the most impressive day of the month with a wide selection of interesting catches for DX-ers throughout the UK. In Derby, an opening to Syria (second network) on channel E2 was already in progress at 0725UTC with traces of the signal being present some two hours later. **Vincent Richardson** (Conwy) and **Stephen Michie** (Bristol) both resolved a channel E2 signal during this period but were unable to positively identify its source.

The opening intensified at around 1730UTC with many Central European transmissions flooding the band. At 1800UTC, fairly weak video was fading in and out of the OIRT FM splatter on a frequency corresponding to the Chinese channel C2 (57.75MHz). The same programme could not be tuned in anywhere else in Band I, so the likelihood of spurious mixing effects was eliminated. It is interesting to note that an unusual signal on this frequency was seen in June 1995. The language on that occasion sounding similar to Russian. There are no official listings of CIS transmitters using such a frequency. During the same opening on the 16th, the Italian private station 'TVA' was showing colour bars on a frequency 200kHz above channel IA. In fact the RAI UNO signal could be tuned separately, using a narrow video i.f. bandwidth.

## Icelandic Catch

**Peter Barber** (Coventry) reports two instances of Icelandic reception. The first was on the 11th at 0844UTC and the second on the 28th at around the same time. The latter opening was watchable

with strong steady pictures over a long period, commencing with the test card followed by programme schedules, the station opening sequence then cartoons. Peter advises that the test card now displays the date and time across the centre. The identification 'RUV' and 'ISLAND' is smaller than before. In Derby the signal was almost tropospheric-like. Needless to say, US channel A2 was as inactive as expected!

## Test Transmissions

The new Norwegian test card with 'NRK-1' at the top has been well received this season although it is often replaced by sample teletext pages and programme schedules. The stylised '1' logo makes the identification resemble 'NRK II'. **Figure 1** shows the test card as received on channel E2 by Stephen Michie (Bristol) from the Melhus transmitter located in the Nordland area of the country.

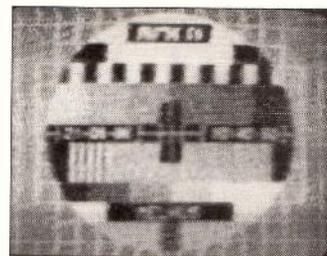
The Portuguese FuBK test card, with 'RTP-LISB 1' identification, is still broadcast, albeit before 0700 UTC, so you will need to get up early for this one. Peter Barber (Coventry) logged it at 0653UTC on the 13th prior to station opening and the *Muppet Show*. Peter reports that the detective series, *Murder She Wrote*, is being shown on both RAI UNO (Italy) and TVE-1 (Spain).

### Richard Gosnell

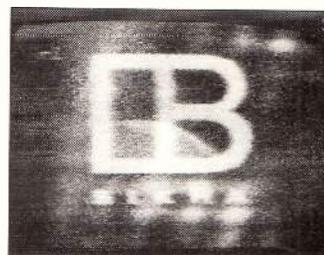
(Swindon) has identified many Central European countries this July, including Hungary (MTV-1) on channel R1, Lithuania (LTV) R2, Russia (PTJ) R2, Poland (TVP-1) R2, Ukraine (YT-1), Italy (RAI UNO) IA and Spain (TVE-1) E2 and E3.

**Tim Tebbs** (Kent) has also seen most European services this season. Perhaps the most exotic catch was the Tunisian 'RTT-1' FuBK test card on channel E4 during an opening to Italy and Slovenia.

July 7th provided some excellent DX catches for **Shaun Taylor** (Howden). From 1300UTC, Scandinavian signals were evident with Sweden, identified by the SVT-1 logo and clock, and later



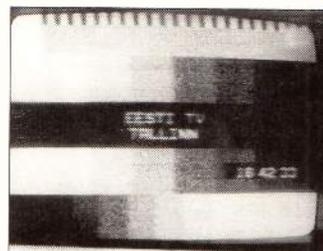
**Fig. 1: The Norwegian test card with stylised 'NRK 1' identification at the top. The date and time is shown across the centre with the transmitter location name below. Occasionally this is replaced by the identification 'NORGE'.**



**Fig. 2: 'BIKHA' news caption from the Ukraine second network, received on channel R2.**

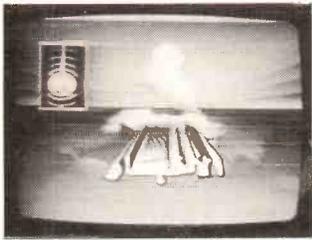


**Fig. 3: Newsreader for the Ukraine second network. The 'YT-2' logo is displayed in the top-left corner of the screen.**



**Fig. 4: Estonian TV test card. Apart from the clear station identification across the centre, there is another much smaller logo located in the top-right of the picture. This consists of a crescent-shaped design set inside a small square made up of fine horizontal lines.**

Finland showing the FuBK test card with 'YLE-TV1' identification on channel E3. By 1715UTC, channel R2 was



**Fig. 5: Part of the Iraqi TV news opening graphics used in 1990.**

active and an 'ET' or 'BT' logo was seen. This is most likely to be 'BT' from Belarus. Did anyone else spot it? Slovenian TV (SLO-1) was present at the time on channel E3 from the Kum transmitter.

**Mike Gaskin** (Cornwall) witnessed an unusual frequency-selective opening on July 9th with several Italian f.m. stations present



**Fig. 6: A blast from the past! The BBC Tuning Signal which was introduced on June 16th, 1956. It was accompanied by specially composed music called Television March.**

between 100 and 108MHz during the mid-morning period without a trace of any Band I activity. Meanwhile, **Andrew Jackson** (Birkenhead) claims there is another Italian private station operating on channel 1A. On July 10th at 0840UTC, he noticed a logo resembling neither 'RAI UNO' or 'TVA'.

### Tropospheric Reception

Conditions have been excellent at times with numerous openings to the

Benelux countries. During the early hours of July 17th, **Tim Tebbs** (Kent) logged Danish TV-2 signals on channels E26, E33 and E35 and also a caption on channel E35 relating to Norwegian telephone numbers, possibly aired by the private TV-2 service in Norway. At 0215UTC on channel E46 a picture with a translucent '4' logo in the top-right of the picture was resolved. The only plausible explanation is that it was the Swedish 4th network. It has been received in the UK in the past.

A set-top log-periodic antenna is used for u.h.f. DX-ing by R. Frost (Felixtowe). July reception included various Belgian BRTN-1 and BRTN-2 transmitters, identified by the test card.

**Bob Brooks** (South Wirral) has reported improved tropospheric conditions around the middle of the month with France (Canal Plus), Belgium (BRTN-1) and Eire (RTE-1 and Network-2) all in Band III. **Andrew Jackson** (Birkenhead) cannot wait for the Irish 3rd network to start up. The Dublin transmitter will share the same channel as the Winter Hill outlet (Granada ITV) in Lancashire, i.e. channel E55, and consequently some interesting co-channel interference is bound to result.

A profusion of German transmitters was received by **Andrew Burfield** (Braintree) on July 17th and 19th. These included Bremen (ARD-1 E22 and ZDF E32), Niebüll (ARD-1 E29, ZDF E34 and N-3 E60), Nordhelle (ZDF E37, WDR-3 E60), Hochsauerland (WDR-3 E40), Brocken (MDR-3 E34) and Biedenkopf (Hessen Drei E52). An unidentified SAT-1 relay was also resolved on channel E52.

### Keep On Writing!

We are always very pleased to hear from SWM readers. If you write, and you would like a personal reply, please don't forget to enclose a stamped-addressed envelope. Please send reception reports, off-screen photographs and information to arrive by the 3rd of the month to:- **Garry Smith, 17 Collingham Gardens, Derby DE22 4FS.**

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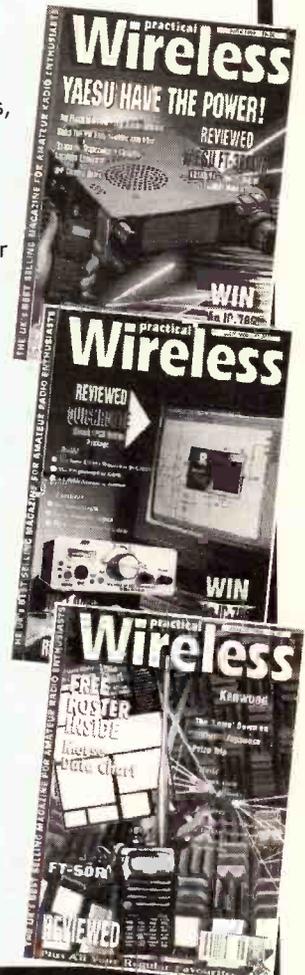
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# SSB Utility Listening

A few months back I gave you some advance notice of a Space Shuttle launch (see the August issue). This launch was due on July 31st, but was delayed due to technical problems. The next planned launch date for this mission is in the middle of September, so this issue will appear a little too late to give any advance warning. If the mission gets delayed any further, there is a good chance that it will take place in late September, so keep an ear on the NASA h.f. frequencies for launch traffic, and audio re-broadcasts by WA3NAN.

## Utility Addresses

Back in the July issue, I mentioned a letter from **Charles Weston**, who was looking for a book or other publication which lists utility station addresses. I have had a few responses to this request, including a few via the Internet.

**Peter Cain** writes to say that he recommends the *Utility Address Handbook*, which is available from Interproducts in Perth. I have not personally seen this book, so I cannot comment on its completeness or accuracy. Interproducts advertise almost every month in *SWM*, so take a look at one of their adverts for their full address and 'phone details.

**Hans-Peter Tillman** writes from Germany, also recommend a number of books with utility addresses. Herr Tillman writes a section in the German radio newsletter called *EAWRC Bulletin* (East and West Radio Club) - but more of that later. Hans-Peter recommends the *Klingenfuss Guide to Utility Stations*, but says that he finds it better for c.w. and RTTY/FAX stations. He suggests that those with more interest in s.s.b. stations should consider the book *Spezial-Frequenzliste* written by Rainer Branolte and Wolf Siebel. The 9th edition has just been published and covers 1996/1997; it costs DM34.80 (about £15), and is available directly from the publishers at Siebel-Verlag, Auf Dem Steinbuechel 6, D-53340 Meckenheim, Germany. Although this book is written in German, this is not much of a problem, as the addresses of stations are the same in any language.

Hans-Peter compiles the Utility Report section of the monthly *EAWRC Bulletin* magazine. This a German language newsletter for radio listeners, and covers all kinds of transmissions in the

shortwave bands. He kindly sent me a copy of the May issue, in which he lists over 250 stations which have QSLed during the previous two years. Hans-Peter says that a sample copy of the magazine can be obtained by sending two IRCs (International Reply Coupons, available at main Post Offices) from EAWRC, Bahnhofstr. 56, D-50374 Erfstadt, Germany.

## Nightwatch

Last year, over the course of several issues of *SWM*, I ran through a series of topics covering the USAF and some of their discrete frequencies, along with examples of callsigns and typical operations. Earlier this year, I was about to print a listing of their frequencies when I found that everything had changed.

Much to my surprise, on June 1 they changed all the codes used to identify each frequency. The might of the listening community swung into action, and within a few days, several of their new codes had been identified. Over the past few months nearly all of the new network has been discovered.

The network consists of a number of stations, using code-words as callsigns, and generally speaking, operating over and around North America. The stations are primarily military, and are usually US Air Force and/or US Navy - although other civilian organisations join-in during exercises or during times of national emergency.

## Common Callsign

The most common callsign is Nightwatch, and this is usually suffixed with a number between 01 and 04. All the other callsigns heard (and there have been hundreds) are either one or two words, with usually at least seven or eight letters in each callsign. One pattern that is obvious from the callsigns is that there is no pattern at all!

The callsigns used by these stations did not seem to make a radical change in June, however the way that they referred to their active and secondary frequencies did change. The Nightwatch stations started to refer to other frequencies by a new series of designators - the 'Zulu series'. Since this change, they have not referred to the old

designators at all.

Over the past few months, several listeners in Europe and the USA have been busily compiling a list of the new Zulu network frequencies. This has been quite painstaking work, as often these stations will be in monitor mode only for a few hours at a time, and then suddenly make a few brief transmissions to let everyone else know that they are OK.

## Assigned Frequencies

Two things are immediately obvious when you look at the table - the assigned frequencies for each Zulu channel run in ascending sequence; and that the Zulu numbers are all a multiple of five (except in two cases - see later). It is possible that the sequence continues beyond Z235; that is the highest code heard to date, but the recent propagation has probably prevented them from user higher frequencies.

The frequencies are all well-known USAF discrete frequencies, and almost all of them come from the system in use before the Zulu plan came into being at the start of June. Prior to June, there were four distinct series of channels (the Papa, Sierra, Whisky and X-ray series), now there is just one. In the new network, there are two channels which are not multiples of five (Z124 and Z211); these have been referred to by several stations, but their exact frequency is still unknown. Also, note that Z205 is out of sequence, in that it is the one frequency which is not in ascending order.

Much of the traffic on this network revolves around passing Emergency Action Messages (EAMs) to each other, making sure that each station in the network is aware of the latest EAM, and also numerous radio-checks to be certain that they can hear one another.

Every few months, there are exercises involving several civilian organisation such as FEMA (the US Federal Emergency Management Agency) and NCS (National Communications System). These exercises usually introduce a large number of new callsigns to the network, and are used to train radio operators. One ground station which they contact frequently uses the callsign WAR 46 and is the JCS Alternate Joint Communications /Command Center at Raven Rock in Pennsylvania.

## Nightwatch Frequencies:

(all MHz, u.s.b.)

Z100	unknown
Z105	unknown
Z110	3.134 (poss.)
Z115	3.143
Z120	3.295 (poss.)
Z125	4.495 (poss.)
Z130	4.472
Z135	4.745
Z140	5.026
Z145	5.705
Z150	5.800
Z155	unknown
Z160	6.715
Z165	6.757
Z170	7.831
Z175	9.016
Z180	9.057
Z185	9.809
Z190	10.204
Z195	unknown
Z200	11.181
Z205	11.494
Z210	11.229
Z215	13.242
Z220	13.245
Z225	13.907
Z230	15.046
Z235	unknown

## Not 05 sequence

Z124	unknown
Z211	12.070



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# Airband

**M**y personal aeronautical highlight this year was taking part in the air display at Quiberon, France, on August 11. My job was to add an English-language translation to the commentary given by two public relations representatives of the French Air Force (see photo).

At one time, the crew of the Patrouille de France were introduced to the crowd and I found myself on the rostrum, surrounded by pilots! They fly eight Alpha-jets in close formation (rather like the Red Arrows). A noticeable difference was that they changed formation in the climb, unlike the Reds who do it in the circuit away from the crowd's viewpoint. The crowd were able to listen to the air-to-air chat (143.1MHz) over the public address system.

## Follow-Ups and Foul-Ups

What are the rescue helicopter call signs? This was asked by **F.J. Hermann** (Bransholme) in August. According to page 120 of *Rescue* (Beaver & Berriff) those attached to particular stations are: 117-118 Sumburgh; 119-120 Stormoway; 122-124 Valley; 125-127 Coltishall; 128-130 Leconfield; 131-133 Boulmer; 134-136 Leuchars; 137-139 Lossiemouth; 140-142 N. Ireland; 143-146 N. Sea; 166-168 Manston (if it's still there!); 169-171 Chivenor; 174-176 Lee-on-Solent (helicopter still operates despite comments in 'Frequency News' below); 177-179 Prestwick; 190-192 Brawdy and 193-199 Culdrose.

Still with the August issue, **Peter Rycraft** (Wickham Market) is interested in the reliability of GPS operated inside the passenger cabin. He sent an article describing GPS installed inside a Hawk of the Red Arrows. Now, it doesn't say if an external antenna was fitted, but the wide cockpit glazing won't attenuate the signal as much as the aluminium tube fuselage of an airliner.

Peter and **Bill Oxford** (Cheshire) also tell me that a 'Beluga' (August again) is a white whale. Sorry there wasn't room for the abbreviations in August. To end your confusion, I've included them within this month's table. In September two misprints crept in on page 62. First column, fifth line up: *re\_u* is French for 'Roger.' Third column, eleventh line up, magnetic north is 3° of the compass away from true (not 3°C which would be a temperature!).

All photos by Christine Mlynek. Answering the wind direction question (September), **John Cordy ZL2DT** (New Zealand) confirms it's true for meteorological purposes except a.t.i.s. and aerodrome control, they use magnetic. John should know - he was Chief Controller at Wellington.

## Some History

In the 1950s, Gaydon (Warwickshire) was synonymous with the V-bomber nuclear deterrent force. **Stephen Hill** (Warwick) remembers Victors there. Well, Stephen, there were also Valiants for a while, but wing spar cracks appeared early in their operational life and it was deemed uneconomic to repair or modify them. Your memory is correct, the airfield's visual identity beacon was GD. Now Gaydon's a car test track and the runway has been erected on it.

## Operations Department

The controller doesn't need to be near a radar head - see my comments about the en-route centre, below. Anglia Radar covers the southern part of the North Sea on 125.275 or, when directed, 128.925MHz. **Chris Daw** (Flitwick) has discovered the controller is based at Stansted. But where is the radar head? I think Claxby, Lincolnshire, is most likely as it has the right coverage. Often controllers see a mosaic picture constructed from data obtained from more than one radar.

On what routes do aircraft overfly Harrow Weald (and David Wilkins in particular) in the cruise? At this altitude, above FL245, airways such as R1/G1 don't apply. Reference to the chart suggests UB29/UW501 but radar headings allow some deviation. The London Middle/Upper Sectors are likely to

be controlling these flights on 127.425, 132.45, 132.6, 134.75 or 135.425MHz.

## Your Experiences

**Nigel Haslop** (Cambridge) took my advice in the April 1995 *SWM* and passed the flight radio exam! Well done! Enrolling in an evening class, the training included putting on headphones in an adjacent classroom while the other students listened to simulated radio procedures. He hopes that no-one in real life ever gets the simulated emergencies he had to handle! Not content, Nigel then took the Aerodrome Flight Information Service Officer rating, self-taught from the CAA textbook CAP 410. Now you could get a job on an aerodrome, Nigel!

**Mrs. B.** (Isle of Man), popped over to Sanford (southern USA) on Britannia BY529A (routing to the south of the Atlantic via Bermuda). Mid-July, though, she was following the Schneider Trophy air race sponsored by Manx Airlines. The airline put up Winston Oliver and Chief Pilot Keith Manktelow. Other names I recognise are Paul Moorhead, now flies CAP 10B G-CZCZ, wonder if he remembers when I helped push his previous mount, Beagle G-AZCZ out of the mud at Elstree, Carolyn Evans, better known as Technical Secretary at the British Air Line Pilots Association, Spencer Flack, in his red Baron of course and Brian Manning, no relation.

In 1914, Howard Pixton won the trophy in Monaco; now his daughter, Stella, was able to present the prize to Alan Austin and Gerald Rowntree flying a Grumman AA5.

I mentioned the Lee-on-Solent rescue helicopter above, **Sam Plowman** (Portsmouth) thinks it might relocate to Shoreham. On my way to the Isle of Wight earlier this year, I saw a Bristow 'privatised' air-sea rescue Sikorsky S-61. Sam will be interested to

## Godfrey commenting at an airshow.

Photograph: Christine Mlynek.



know that maritime aircraft don't have any special place in the airband spectrum, they work all the usual frequencies. Sam's home town accommodates the *Ark Royal*, *Illustrious* and *Invincible*, aircraft carriers of 19500 tonnes each. Contrast that with a roll-on-roll-off Isle of Wight ferry of 3000 tonnes! At the other end of the scale, Sam saw a visit by USS *John F Kennedy* of 80000 tonnes - too big to enter Portsmouth, left at anchor to the mercy of the rapidly-swinging Solent tidal stream.

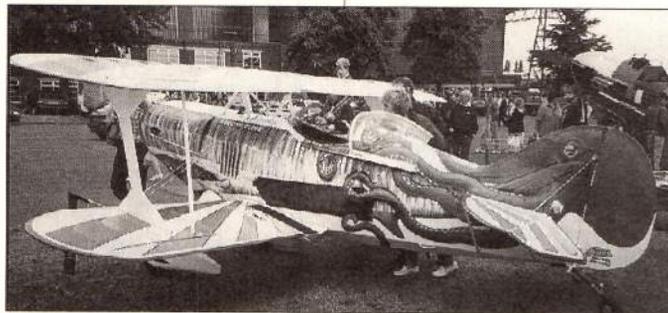
If you're looking for a job, the new en-route centre at Swanwick (near where Sam lives) is advertising fixed-term posts. Low-paid compared to a controller, the job involves being the pilot's voice on the radar simulator. Sign of the times, that, low pay and short-term. At least the advert informs us that Swanwick will cover the whole of the London Flight Information Region.

## Information Sources

If ordering updated charts from the RAF (1 AIDU, Northolt) then please note that the old 510 E/W has been superseded by UK(L)2 and likewise 523 is replaced by EU(H)12.

How do you go about ordering charts, frequency lists, etc? This column is too small for me to bring you anything other than significant frequency changes. There's no room for long lists! Instead, my job is to tell you where to get lists from and how to make the best use of them. Send a reply-paid self-addressed envelope (to hold one A4 sheet) to the Editorial Office at Broadstone (see address on the Contents page of this issue). Do **not** send to me! Ask for *Airband Factsheet* (currently on edition 4). This lists suppliers who deal with the public by mail order.

My 'phone number is given at the end of this column for genuinely urgent information. For example, vital news that you discover right on the day of my press deadline. Please, though, do NOT ring me just for a casual



Pitts S-1S Special. Photograph: Christine Mlynek.

enquiry about routine information that you could have looked up in one of the frequency lists. Remember, I write the column and run the Museum in my spare time! If the level of non-urgent calls remains high, the telephone facility will have to be withdrawn!

In February, **Mark Zee** (Waterford) wanted to know when North Atlantic vertical separation was to be reduced to 1000ft (currently 2000ft). In March 1997, FL330-FL370 will become subject to reduced separation according to AIC 80/1996 from the CAA. Eventually, FL290-FL410 will be affected.

## Frequency and Operational News

**Martin Sutton** (CAA) kindly sent in some AIP information. Belfast (Aldergrove) Approach/Radar changes to 120.9 (was 120.0MHz). Also from the CAA comes the ever-useful GASIL (edition 4 of 1996). Campbelltown reverts to the frequency originally allocated when it was called Machrihanish: 125.9 (was 133.05MHz) and now has an ATZ. Cranfield's Tower changes to 134.925 (was 123.2MHz). Fleetlands now has an ATZ, contact 135.7MHz; this takes over from Lee-on-Solent, which loses its ATZ and donates its

frequency to nearby Fleetlands. Flotta loses its ATZ. Honington gains one, contact Lakenheath Radar 128.9MHz.

Despite what I printed last month, Old Sarum is on 123.2 and not 125.95MHz. Perth loses its ATZ, all radio services (119.8 and 122.3MHz as well as the PTH n.d.b. 388kHz) and is now unlicensed. Southend's new radar on 128.95MHz participates in the Lower Airspace Radar Service. Turweston now has ICAO location indicator EGBT.

The AIP amendments show the ANKER reporting point to be renamed as OLKER (on your North Atlantic chart at N61° W006°30').

There are numerous new reporting points, too many to list, so if you find difficulty locating a particular one, write to me. As usual, there's no substitute for obtaining charts from official sources (see under 'Information Sources,' above). Bill Oxford found that the BOLIN reporting point, part of the Manchester Standard Terminal Arrival Route (STAR) has been replaced by MERSI.

Although my press deadline means you'll be reading this after the event, you might be able to piece together what happened at this year's Farnborough Show with information from AVC (Twickenham postmark). The following are expected (all MHz)

but I wonder if they're by special arrangement, not being listed in the official sources.

Fairoaks/Blackbushe approach 124.4 (callsign: 'Farnborough'); helicopters after 1600: 134.17; Heli Control 121.17; Pad 126.3; Ground 130.82.

The most likely frequencies, of those in routine use, are Odiham Director, transit traffic, helicopters outbound before 1600: 125.25 & 315.52 & 386.77; Tower & Display (Radar) 122.5 & 357.4; Display

(Approach) & helicopters inbound before 1600: 134.35 & 336.27; Precision Approach Radar 130.05 & 259.0; Ops 130.5MHz.

The next three deadlines (for topical information) are October 18, November 15 and December 13. Replies always appear in this column and it is regretted that no direct correspondence is possible. Genuinely urgent information/enquiries: 0181-958 5113 (before 21:30 local please).

## Abbreviations

A	Airbus
AIC	Aeronautical Information Circular
AIP	Aeronautical Information Publication
a.t.i.s.	automatic terminal information service
ATZ	Aerodrome Traffic Zone
CAA	Civil Aviation Authority
DC-FL	Douglas Commercial flight level
ft	feet
GASIL	General Aviation Safety Information Leaflet
GPS	Global Positioning System
ICAO	International Civil Aviation Organisation
i.l.s.	instrument landing system
kHz	kilohertz
km	kilometres
M	Mach
MHz	megahertz
N	north
n.d.b.	non-directional beacon
nm	nautical miles
NOTAM	NOTice to AirMen (includes AirWomen)
v.h.f	very high frequency

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# Scanning

**S**oap addicts who watch *Emmerdale* will have, by now, noticed that scanners have made their debut - albeit in a rather unorthodox fashion!

Whilst television is a media known for its sensationalism of particular subjects - because that's what pulls in the viewers - the actual harm done to it may present a completely biased, and therefore damaging, front to people who have no knowledge of the subject matter. In the case of *Emmerdale*, the characters playing a family constantly one step away from legality, have a mobile snack bar. This they intend to use by following accidents and other emergencies and so boost their business. The scanner angle is being used as a form of eavesdropping on local police frequencies in order to find out where accidents and so forth are and then to drive there and set-up shop. The result, they hope, is that they will have a 'guaranteed' business. As one of the central characters said, it meant that people stuck in queues behind any incident would be peckish - and they'd see the snack bar and buy.

Scriptwriters must have, by virtue of their profession, vivid imaginations. However, as a scanner owner and user, I object strongly to the hobby being presented in this way. For a start, technical accuracy was way out. There was no scanner used at all in the scenes shot, supposedly, to illustrate one being used. What was used, however, was a cheap short wave radio, complete with whistling heterodynes and s.s.b. chatter and dubbed transmissions that sounded like they'd been done low-budget by a technician on the toilet. Not at all convincing - in fact downright insulting!

Secondly, the programme has determined that all scanner users are nothing more than ghoulish anoraks who spend all their days listening in to the latest smash in the manner of someone listening in to Jimmy Young on the Beeb. Or, at worst, criminal or 'chancer' types who would use the information gleaned on the air to facilitate their business and thus profit by other people's misfortunes. What makes me angry - and should make you lot out there just as mad - is that a proper scanner was not used for the scenes, no attempt was made at realism at all and the producers of the show just couldn't be bothered to make any attempts to realism. Furthermore, they have shown the hobby to be populated by members of an 'odd sect'. That's you and me, folks!

This sort of supposed entertainment damages us as hobbyists. For one, it portrays scanner - and radio - enthusiasts in general as ghouls. For another, it purports to display real slices of life served up as entertainment. It didn't for me. What it showed, clearly, was that the damage done to the scanner corner of the market is obviously still front line and is heavily distorted. It depicts the hobby as the preserve of the most odd - and I object to that! We are not at all interested in eavesdropping on road crashes nor in making a profit out of other people's misfortunes and the producers of the series should address that. Many owners get immense pleasure from their hobby and respect should be given to that.

Scanners have had an increasingly poor press of late - but at least papers like *The Sun* get their facts straight.

**John Griffiths recommends the Maruhama RT618 as a suitable hand-held scanner for Zak Dingle and his family.**



*Emmerdale*'s producers and production company - Yorkshire TV - obviously have a research department and I'd just like to say to them that any research made in this particular case was money wasted. There are many sources - myself included - freely available to TV researchers who would be only too happy to put the case for scanners forward. I believe that the accurate depiction of a proper scanner and its abilities, allied to a passing reminder about the law, would have served a far better purpose. The budget rated shots may as well have shown the character bent over a domestic portable, because that's probably all it was! If and when the case comes to 'court', I'm sure many of you will be absolutely glued to the screen to see exactly how 'Exhibit A' is described. I know I will! Because, by any stretch of the imagination, a scanner it most certainly ain't!

If you notice scanners used in other TV series - LWT's *The Bill* carried an episode where accuracy was about as realistic as it could be - please write and let me know. Your comments will be most welcome!

## Project Aurora

On other matters now. Aviation enthusiasts in particular will have heard of 'Project Aurora', the *it-doesn't-exist-and-it's-not-based-at-RAF Macrahannish-even-if-it-does* programme. In layman's terms this is a super-secret high-altitude spyplane rumoured to be in existence but denied by the US as being even built.

It's come to my attention that the aircraft uses the callsign 'Gaspipie' and I'd be indebted to listeners who have monitored such a callsign who would get in touch with details. My thanks to anonymous of Newcastle-upon-Tyne for his report of hearing the callsign last year apparently reporting an altitude of 100 000ft!

## Letters

A letter from **Lincoln Imp** now, who reports good results with his MVT-7200. His question about the callsign 'RAF AIR 1E35 'On Guard' can be explained as follows. A 'Guard' frequency is one that is monitored 24 hours a day, 365 days a year. In the case you mention, by London Military. As

for RAF AIR: This is a generic callsign allocated to the aircraft operated by 38 Group of the RAF. Your callsign with the indicator digit '1' was possibly an aircraft of 32 (The Royal) Squadron. 38 Group are controlled from High Wycombe with 32 Squadron operating HS125s - so you probably heard either a member of the Royal Family being ferried or some high ranking military officer! They also operate Andovers and Gazelles so your callsign was one of three possibilities! The aforementioned Imp also lists frequencies heard from an unnamed US Air Base. These were heard on: 409.025, 411.725, 411.800, 411.950, 412.925, 413.375 & 410.250MHz. I can't be specific on exactly where these originate from, but Lakenheath seems favourite.

Another letter from a listener in Somerset tells me that RNAS Yeovilton operates sometimes on a two tower frequencies of 127.35 & 372.65MHz as a simulcast, that is, simultaneous broadcast on both frequencies. This serves a good purpose in that it can be monitored by both civil and military flights in the same area, at the same time. Other Yeovilton frequencies are reported as follows - though not in simulcast!: 311.325, 369.850, 262.925 & 122.1MHz. West Country monitors may be interested in logging those.

## Those TADS Again

Tads have reared their ugly head again with various letters from another 'Anonymous' warning us all of 'Big Brother' and attempts to corner 'innocent' scanner users. However, I take umbrage with 'Anonymous' telling me that printing TADS and police frequencies would be alright and that I should do it.



**A quick look through the adverts in *Short Wave Magazine* would have turned up a secondhand AR-2002 for just £179. More in the Dingle's league!**



**How about a pre-owned Realistic PRO02004 base station scanner for the Dingles?**

It has been pointed out to me that some of my recent comments regarding TADS, specifically those made in the August column regarding Photavia Press, were incorrect. I fully accept that Photavia Press at no time said that they would be publishing a list of TADS and, therefore, could not have 'backed down' as I suggested. With this humble apology for any inconvenience caused to them, the matter of TADS is now closed. That's right, **closed!**

**Military Aviation**

I have just been told by the Editor that Military Airband will be given its own slot in the magazine, starting with the November issue.

I will, therefore, be sending my snippets of Milair info to the new columnist, Peter Bond c/o the Editorial Offices at Broadstone. I hope that you will all do likewise.

As a direct result of this shakeup, I will be trying to steer 'Scanning' along a much more general course. Let me know if there are any specific scanning topics you would like me to try to cover on your behalf. This column, like all the others in *SWM*, needs your input to flourish.

**UFOs**

My thanks to those readers who continue to send in UFO reports and the like. Keep them coming! May I ask for assistance on an issue surrounding the next item? Apparently there was a great deal of military activity around the Hog's Back area on the A31 Farnham to Guilford Road on the 29th June and reports suggest that a triangular unidentified craft

was seen in this area closely followed by a posse of military vehicles. Time was after midnight. Anyone with info - apart from Mr. JH who wrote the report - please get in touch. As for other developments in this area, it now seems certain that most UFO sightings are not extra-terrestrial but rather terrestrial! No more for now, but keep watching the skies as they say!

A letter from **Mark Boswell** of Westoning asks which airband guide would be the best to have. This isn't a difficult question to answer. Of the many available on the market one sticks out in my mind and that is the excellent one produced by Javiation. Their *VHF/UHF Airband Frequency Guide* has long been a favourite of mine. It's wire bound, easy to read and accurate. I would recommend this above most of those available

on the market as it is concise and easy to use.

Those with E-mail facilities can take a peek at **info@javiation.demon.co.uk** and also **http://www.demon.co.uk/javiation** for WWW pages. CompuServe users can E-Mail at: **100117,535**. Postal address for the guide is: **Javiation, Carlton Works, Carlton Street, Bradford BD7 1DA, Tel: 01274 732146.**

In this hobby it's often confusing to decide which guide presents the most user-friendly face as well as being value for money and tough enough to stand chucking in a rucksack with a scanner. I have no hesitation in recommending the above guide to those with a serious interest in airband. Go for it!

**Postal Strike**

This month hasn't been good for mail, probably due to the postal strikes, so all I can say is "please write!" Whilst airband items have continued to dominate the listings I get, there must be many of you out there who listen to other areas? Remember, it's your column and I only collate what you send me. With that in mind, get your pens on to paper and write! I can only give you what you send in!

That's it for another month and I look forward to hearing from you if you've got something to say. Until next month then, be careful and catch you down the log sometime!

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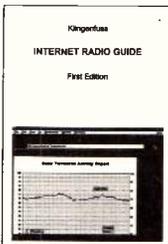
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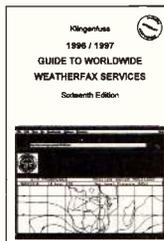
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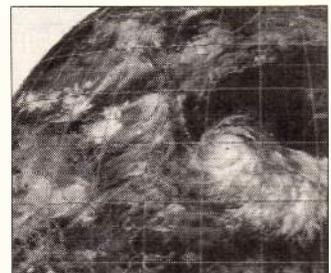
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## AH ELECTRONICS

# Info In Orbit

Fig. 1: GMS Sector A image from Frank Slater.



As anticipated last month, I have been able to collect more information on INSAT (the Indian National communications SATellite which carries earth-imaging sensors) and, as part of these inquiries, received two superb INSAT images for inclusion in this column - something of a scoop I think! An Internet update this month; featuring the web site of the Space Monitoring Information Support (SMIS) laboratory of the Space Research Institute (IKI), Commonwealth of Independent States.

## Current WXSATs

Many were taken by surprise when METEOR 3-5 came over the horizon on the morning of 3 August - not transmitting; I had logged passes the previous day. The satellite remained quiet for a few days then resumed routine transmissions on 7 August. Change-over to METEOR 2-1 was scheduled for 21 August as mentioned in the mid-month Kepler elements update (see last item).

## Letters and Pictures

Summer months see a succession of severe weather around the Americas and in the Far East. This month brought a picture from **Frank Slater** of Spalding showing the typhoon imaged by GMS-5, the Japanese geostationary WXSAT on 27 July and transmitted at 1346UTC by METEOSAT-5 as part of its sequence of retransmitted images. The typhoon was between Papua New Guinea and Japan, approaching the island of Okinawa. Frank comments on the clarity of the 'eye' of the storm and added that he built his own quad loop yagi for METEOSAT-5 reception (1691 and 1694.5MHz). His yagi feeds a Dartcom downconverter (1691MHz



Fig. 3: INSAT-2B visible-light image, whole disc.

down to 137.50MHz), which then feeds a WXSAT receiver and into a computer running Timestep's PROsat-II software.

**D. Thomas** of Porchester also uses PROsat-II for monitoring METEOSAT and the polar orbiters and wrote asking whether I knew of anyone in his area using the same system with whom he could get in contact. It is not feasible for me to maintain such a list but I will be happy to pass on any letters sent to him via my address. Hurricane 'Bertha' was imaged by GOES-E (GOES-8) for several days around 12 July and a number of these images were retransmitted by METEOSAT-5. **Robert Hall** of Capetown, SA, collected **Fig. 2**.

## INSAT - (Indian National Satellite)

Details of routine operations within the geostationary WXSAT constellation appear regularly in 'Info' and include METEOSAT-5,

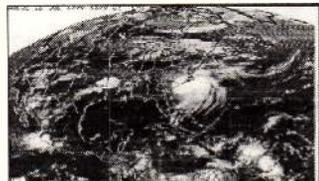


Fig. 2: Hurricane Bertha from GOES-8 via METEOSAT-5 on 27 July.

GOES-8 and 9, GMS-5 and GOMS (ELEKTRO). Each of these is also one of a group (more GOMS launches are planned). The Indian satellite INSAT has not normally been included in the WXSAT group, although EUMETSAT is increasingly listing it in published articles; its operations are not strictly those of a geostationary WXSAT.

In order to find out more about INSAT, I used the Internet to get in touch with **K. Narayanan**, who is the Programme Director of INSAT at the Department of Space, in Bangalore, India. He very kindly agreed to provide a considerable amount of information for this column - and some pictures!

The INSATs are geostationary, multipurpose satellites operated by the Department of Space, on behalf of the Government of India. The collection of data, its processing, use and distribution, is the responsibility of the India Meteorological Department. The satellite caters for the needs of broadcasting, television, telecommunications and meteorology.

Early satellites in the series (INSAT-1A to 1D) were built by the Ford Aerospace and Communication Corporation, USA, to an Indian specification. The first (INSAT-1A) was launched in April 1981, followed by INSAT-1B in August 1983. July 1988 saw the launch of INSAT-1C and INSAT-1D was launched in July 1990. These carried communications C-band and S-band transponders, and a very high resolution radiometer (VHRR). Resolution of the VHRR on the first INSAT satellite was 2.75 by 2.75km in the visible and 11 by 11km in infra-red.

The second generation INSAT system (INSAT-2 series) has to cater for growing demands by its users, and has been designed and built by the Indian Space Research Organisation itself. The first of the series 2 satellites (INSAT-2A) was launched on 10 July 1992, and the second (INSAT-2B) on 23 July 1993, by Ariane-IV launchers, and provide current communications and meteorological services to India.

Each carries a Very High Resolution Radiometer operating in the visible and infrared regions. Spatial resolution in the visible is 2x2km, and in the infra-red 8x8km. There are three INSAT satellites now operational with this kind of radiometer. It takes about 23 minutes to scan an image of the earth's full disc (mode 1). Sector scans are also possible using modes 2 and 3, this latter mode permitting images of a sector every 7.2 minutes, and therefore particularly suited to monitoring severe weather conditions such as cyclones. Normally images are taken once in three hours. However, as per WMO (World Meteorological Organisation) standards, half hour consecutive images are taken at specified timings. During the cyclone season or any special events (such as a developing weather system), images are taken every 30 minutes.

The complete INSAT-2A/B VHRR specifications were sent to me and show that the satellites work at a high efficiency. Full resolution image data is transmitted to the ground using one of the telecommunications antennas on board the satellite. Antenna coverage from the INSATs is essentially limited to India, its island territories and the surrounding regions. Data is transmitted in digital format and is not encrypted. Due to the high data rate and low power transmission, the receive system is fairly complex.

Processed images, along with other meteorological data, are broadcast via INSAT in the S-band in a hybrid digital/analogue mode in the clear. Simple and inexpensive

receivers could be made use of for this purpose. This transmission is something similar to WEFAX. The Meteorological Data Dissemination (MDD) channel could be received by anyone in the coverage area of INSAT satellites (India and neighbouring countries).

The next multi-purpose satellite in the series is INSAT-2E, scheduled for launch in late 1997. It will carry a three-channel very high resolution radiometer (the extra band being for water vapour) and an enhanced resolution 3-band CCD based payload.

My grateful thanks to K. Narayanan, Programme Director, INSAT, and Dr. S. V. Kibe of the Indian Space Research Organisation HQ, of the Department of Space, Government of India, for providing this information, these photographs, and an article by George Joseph of the Space Applications Centre in Ahmedabad, India.

## Internet Site Update

For those unfamiliar with Internet activities, the world-wide web forms the 'graphical' part of the Internet. Many computers are permanently linked (networked) for the immediate transfer of data, and some 'networks' are themselves linked. The Internet is probably the most hyped network, but it can provide the latest information, and is invaluable to researchers. Individual computers, such as those used for NASA's sites, provide multiple outputs (ports), just like home computers.

## SMIS

The SMIS (Space Monitoring Information Support Laboratory) web site of the Space Research Institute (IKI), within the Commonwealth of Independent States, recently updated its internet site significantly and now provides downloadable satellite tracking software - which I could not resist trying!

Their homepage <http://smis.iki.rssi.ru> (shown in **Fig. 5**.) provides links to SMIS and IKI, which themselves provide information on these organisations and their backgrounds and staff. Further links to actual satellite data, data usage policy, SMIS news and services are included.

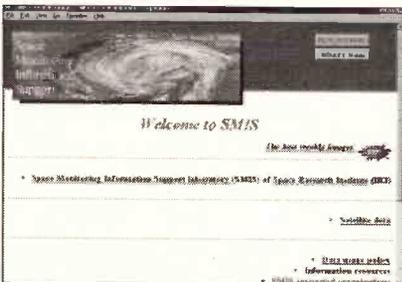
## 'Best Weekly Images'

When I checked for the second time in a few days into the main SMIS

site during the preparation of this section, the page had just been updated and now offered a selection of five 'best weekly images'. These showed a fire near Volgograd city imaged between 2 and 3 August, from which I have selected two - **Fig. 6** and **Fig. 7**. Impressive! They were imaged on 3 August and enhanced with artificial colour.

One gets a definite feeling of openness and fellowship reading these web pages; people referred to within them have readily responded to my queries about CIS satellite operations. As an example of this, I asked one well-known scientist within the organisation, a question about OKEAN and SICH; within a matter of days he sent (E-mailed) me several pages of information - helping to ensure that information printed within these columns remains accurate.

Pages providing GOMS (ELEKTRO) image examples are available, as are detailed descriptions of their SCANOR software - the high resolution data receiving and processing system for the earth's surface and atmosphere monitoring. It is used to control dishes monitoring the NOAA AVHRR transmissions.



**Fig.5: SMIS World Wide Web home page.**



**Fig. 6 and 7: Fire near Volgograd on 3 August from SMIS internet site.**

These sites, together with those of other space-related organisations, continue to provide information for use in this column - ensuring that readers are kept up-to-date with events. I have thanked the individual organisations for giving permission to publish their information. Updates on other WXSAT-related sites are planned for future columns.

### POES June Seminar

The 'Polar-Orbiting Operational Environmental Satellite' seminar was held in America in June, and information concerning presentations at the conference was made available in early August.

During the three-day, five session seminars, many international speakers were featured and papers subsequently published provide an insight into plans for future WXSAT operations well into the next century. Sessions on POES, DMSP (Defense Meteorological Satellite Program), Earth Observations program and the Chinese WXSAT programme were held. METEOSAT, Mission to Planet Earth, and presentations on the construction of low-cost a.p.t. stations were included. From a huge wealth of information about the future plans of various countries for meteorological satellite programmes, I have selected a few highlights.

### National Oceanic and Atmospheric Administration (NOAA)

Greg Mandt, Jim O'Neal and Pam Taylor provide an abstract explaining the background to NOAA's future plans. "Currently, we are operating NOAA 12 as the primary morning satellite and NOAA 14 as the primary afternoon satellite. Our next satellite, NOAA-K (which will become NOAA 15 after it is

launched) represents a new generation of polar satellites. There will be new microwave sounding instruments (AMSU-A and AMSU-B) and improved versions of the visible/infrared imager/radiometer (AVHRR/3) and infrared sounder (HIRS/3)".

"For more than 30 years the United States has

provided a satellite based, global meteorological and environmental monitoring system. The present system collects imagery and measures atmospheric temperature and humidity, surface temperature, cloud cover, water-ice boundaries, ozone concentrations, aerosol distributions, vegetation indices, and proton and electron fluxes near the Earth. Data are also retransmitted from balloons, buoys and remote automatic stations for *in-situ* collection. In addition, the satellites provide Search and Rescue location, and rescue services to downed aircraft and vessels in distress at sea. All of the aforementioned data are transmitted, in real time and at no cost, to all users with necessary receiving equipment, under an 'open-skies' policy". Currently, about 1000 wideband (HRPT) and several thousand small (APT) users worldwide receive and use data.

### Co-operative programme NOAA and EUMETSAT

Both organisations have agreed in principle, and are in the final stages of formal approval, of a co-operative joint polar programme beginning in the year 2001. The purpose of this co-operation is to continue and improve the operational meteorological and environmental forecasting and global climate



**Fig. 4: INSAT-1D visible-light image on Mercator projection - dated 23 July 1996 at 0500UTC.**

monitoring services of the agencies. These services contribute to the wider objectives of the World Meteorological Organization Global Observing System, the Global Climate Observing System, the United Nations Environmental Programme, the Intergovernmental Oceanographic Commission, and other related programmes. The NOAA/EUMETSAT joint programme will continue the long-term

continuity of observations from polar orbit furnished by the United States since 1960.

The basis of the agreement is that NOAA will provide spacecraft for flight in the afternoon orbit and EUMETSAT will provide spacecraft for flight in the morning orbit. NOAA will provide the full set of instrumentation currently flying on its morning satellite to EUMETSAT for inclusion on its morning satellite. EUMETSAT will provide a new Microwave Humidity Sounder to fly on both the NOAA and EUMETSAT satellites. Both agencies will make available to each other data collected from their respective satellites.

Summarising - "The NOAA POES programme has provided continuous service to the world for over 35 years. Our next launch representing the fifth generation of satellites combined with our planning efforts with the METOP and NPOESS reflect a great deal of change over the next ten years. We desire to maintain close ties with our user community through this time of change to ensure continuity and improved services and products.

### Frequencies

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-5 (geostationary) uses 1691 and 1694.5MHz for WEFAX  
 GOES-8 (western horizon) uses 1691MHz for WEFAX  
 MIR 145.55 and 143.625MHz.

### Next Month

I have moved a feature on 'Chinese WXSAT developments' (from the seminar) to next month's 'Info' because of space limitations. Other presentations will be featured in future months.

### Shuttle Launch Schedule

Shuttle flight STS-80 *Columbus* is scheduled for launch on 31 October into a 28° inclination orbit.

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.

### Kepler elements - MIR and 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.

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# Decode

## All the Data Modes

**S**imon Patterson has recently been impressed with the range of signals available from a v.h.f./u.h.f. scanner. As a result he's now considering buying one to use for combined utility and v.h.f. listening. This is a temptation facing many listeners and there isn't really a good answer. It is very difficult (and expensive) to design a competent receiver that will cover the frequency range from hundreds of kHz through to hundreds of MHz. In practice, most wide range receivers on the amateur market are primarily scanners with extended coverage into the h.f. bands. This usually results in poor strong signal handling characteristics, inadequate selectivity combined with poor frequency stability and frequency steps that are too coarse to allow accurate tuning of data signals. If your main interest is scanning with just an occasional foray into utilities, you may get away with an extended range scanner. If you are serious about utility listening you will be quickly disappointed by the limited performance of most extended scanners.

**Steve Clark** asks about the availability of hardware interfaces for use with JVFAX and Hamcomm. There are many suppliers that sell ready built interfaces, but the one that has a proven track record with Decode listeners is the receive only unit sold by Pervisell Ltd. This interface is extremely well built and uses high quality components throughout. It also sells at a very reasonable £16.99 fully inclusive and they offer a full money back guarantee. For more details contact: **Pervisell at 8 Temple End, High Wycombe, Bucks HP13 5DR. Tel: (01494) 443033** or see <http://www.pervisell.com> for their Web site.

### Hamcomm 3.1

Yes there's a new version of Hamcomm on the streets with many new and interesting changes. Although the program has always been primarily designed for the radio amateur it has a host of features that make it very attractive to utility listeners as well. Other than a number of minor bug fixes, the most significant change is the inclusion of a PACTOR listen mode for decoding PACTOR ARQ and FEC

modes.

The only snag here is that this extra mode is only available in the registered version of Hamcomm. I'm sure this will improve the registration rate! The shareware version however, has many new features that will appeal to utility listeners. One area that I have found particularly useful is the enhancement to the main text receive screen. The first most obvious change is the addition of a vertical tuning display on the left hand screen border. This is a very simple implementation, but it does provide a very useful on-screen display to speed-up tuning. If you need to move to the Spectrum or Tune display screen, this can now be done by clicking the mouse on the centre frequency or current frequency read-out respectively. You can also reverse the keying by clicking on the normal/reverse field - a real boon when decoding RTTY signals.

There have also been some changes made to the AMTOR ARQ mode which provide fine tuning for improved synchronisation and the repeat blocks detection software has been enhanced.

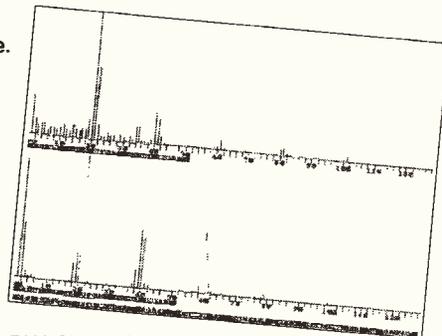
The ability to resolve Synoptic signals has always been very popular and this has been further enhanced with extra codes included in sections 1, 2 and 3. One area that greatly increases the flexibility is the extensions to Hamcomm's configuration file. I don't have space to cover all the changes here, but the sample configuration file is very well documented. A really powerful addition is the facility to be able to program commands to combinations of ALT, CTRL, Shift and the mouse buttons.

For example, you could select your favourite receive modes or maybe switch the printer or file logging on and off with just the click of the mouse. The assignments are completely customisable via the configuration file. Maybe I'll put together a specialist listeners configuration file and include it in my Reader's Offers.

### Signal Analysis

Those of you who follow this column will know that, once past the initial magic of decoding the

Fig. 1: Hamcomm Bit length Measure.



simpler modes such as FAX, RTTY and AMTOR, listeners start searching for more challenging modes to decode. It's also common for newcomers to decoding to get extremely confused by the wide range of whirs and warbles that sound for all the world like RTTY signals, but somehow can't be decoded. In order to move up to what's become known as the complex modes first demands some understanding of how to analyse a data signal and so decide whether or not you are likely to be able to decode it. In this feature I'll introduce you to some of the basics of signal analysis and give some guidance on how to recognise certain signal types. Although I'll be covering a number of measurement systems, in my experience, the most valuable tool of all is your ear! An experienced listener can recognise a wide range of data signals including the transmission mode and baud rate just by listening. You may think this is a bit far fetched, but I can assure you it's true. Once you have

number that's used to represent the letter. A binary number being one that's made-up of just 1s and 0s. **Table 1** is a simple chart to show how to convert from decimal to binary numbers.

As you can see the conversion is very simple. Each of the digits within the binary number is called a bit - this is an acronym for Binary digit. Now, when we actually send a data signal it is sent in what's known as serial format. This is where each bit is sent in turn, one after the other. In the example of our RTTY signal, each letter is made up of five bits, but there are an extra two and a half bits added. These are called the start and stop bits and effectively wrap-up each letter so that the decoder at the distant end can tell when one letter ends and the next begins.

So, back to our original question about the baud rate. You will often hear people talk about baud rate and bit rate as if they were the same thing, however, there is a subtle but important

difference. The baud rate is the speed at which each element of the signal is sent. In the case of our RTTY signal we would measure the total number of bits sent in a second including, the start and stop bits. The bit rate is different as we would only count the bits that are used to represent the information and ignore the start and stop bits. To give you a practical example, a 50 baud RTTY signal has a bit

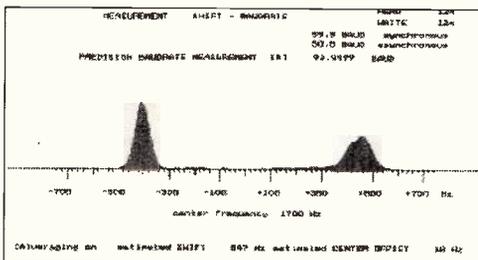


Fig. 2: Code 3 Speed & Shift Measurement.

rate of just 33.3 bits per second and each element of the signal would have a period of 50ms. This difference occurs for all types of asynchronous signals i.e. those that wrap-up each transmitted character with a start and stop bit.

When dealing with synchronous signals the bit rate and baud rate become the same. Now that you have an understanding of the term baud rate lets see how it can be used to identify different signal types. If you take a look through the specification of any complex decoding system you will notice a wide range of unusual baud rates being quoted. You may also notice that the only transmission system that uses 45.5, 50 and 75 baud is RTTY. So, if you come across a new signal and your decoder tells

developed this 'ear' for data signals, you can save a lot of time when tuning around for new signals. However, you still need to know how to use analysis tools effectively to be able to deal with any completely new signals that might appear on the bands. Although signal analysis implies the use of very specialised decoders, the initial stages of signal analysis can be done with the simplest of decoding systems. The very first parameter to check is the baud rate. This is basically the speed of transmission and it may be appropriate at this point to remind you of how a data signal is generated. Let's start with a basic RTTY signal. In this case pressing a letter on the keyboard causes the computer to generate a binary

Table 1

Decimal	Bit Weighting				
	16 (2 <sup>4</sup> )	8 (2 <sup>3</sup> )	4 (2 <sup>2</sup> )	2 (2 <sup>1</sup> )	1 (2 <sup>0</sup> )
12	0	1	1	0	0
11	0	1	0	1	1
9	0	1	0	0	1
28	1	1	1	0	0

you the baud rate is 45.5, 50 or 75, you are most probably the signal you are listening to is RTTY - you've just completed your first exercise in signal analysis! If you look at the automatic analysis mode in any of the complex decoders, you will find the first measurement taken is the baud rate. In some cases just knowing the baud rate identifies the signal. In other cases it just narrows down the choice, so making the next stage that much easier. The other attraction with baud rate measurement is that it's extremely easy to do.

All the software has to do is measure the period of the incoming signal to calculate the baud rate. If you have one of the more sophisticated decoding systems you will often find that the baud rate is measured to a hundredth of a baud. Although this is far greater accuracy that is required to decode the signal, it is done to help with signal identification. The advanced listener will use this information to build an electronic 'fingerprint' of a station which can help when trying to identify other transmitters that are part of a common network. Although the transmitters may be located in different countries and operate on different frequencies, the data signal may originate from the same source, so a signal that is exactly 0.2 of a baud slow from several transmitters could indicate that the transmitters form part of a larger network. If, like many, you're using the Hamcomm decoder you will know that it doesn't have a straightforward baud rate measurement facility.

However, you can use the bit length measurement system that's available from the Mode menu. Once activated the top trace shows the duration of high tone signals whilst the bottom is used for low tones with the scale marked in ms. You first need to tune-in to the signal you want to check - make this a good clean signal with known characteristics to start with (i.e. Bracknell Met on 4.489MHz - 75baud 400Hz shift). It's vital that you tune the signal accurately and have adjusted the shift to match the signal. The best way to do this is to use the Spectrum display that's also available from the Hamcomm Mode menu. Once tuned-in and set to Bit Length measurement, you should see a number of peaks gradually build-up along each scale as shown in Fig. 1. To measure the baud rate, you just place the marker over the left-most peak and read the baud rate from the scale at the top. The only snag with the Hamcomm system is that it only really works well with a clean, interference free, signal. The next most powerful tool for signal identification is measurement of the frequency shift used by the signal. As a reminder, when a data signal is passed to a transmitter the 0 and 1 of the digital signal are translated

to two closely spaced radio frequencies. In a typical commercial RTTY station these two frequencies would be spaced just 400Hz apart. It is this spacing that's called the shift and the shift remains constant even after the signal has been processed by the receiver and is presented as audio tones to the decoding system. As with the baud rates, there is a link between the transmission mode and the shift. A good example here is the 50 baud 400Hz shift combination that's used by most of the press agencies. If you come across a signal with these characteristics it's almost certain to be a press station. Another popular combination is 170Hz shift and 100 baud synchronous. If the signal is pulsing or chirping it's most likely SITOR-A and if it's steady it's probably SITOR-B. Over the years there have been a number of

chart was published in 1992 by Tiare Publications and was

supplied as a laminated A4 sheet. I don't think it's available any longer and it would need to be updated to cover some of the newer modes such as PACTOR and the many ARQ variants. Measuring the shift with Hamcomm is very simple thanks to the excellent Spectrum display that's selected via the Mode menu. In Fig. 2, I've shown the combined shift and speed measurement available in the Hoka Code 3 package. When moving-on to the more complicated ARQ modes, accurate signal identification requires some more advanced tools. You still need to start with the basics of baud rate and shift, but next you need to look at the

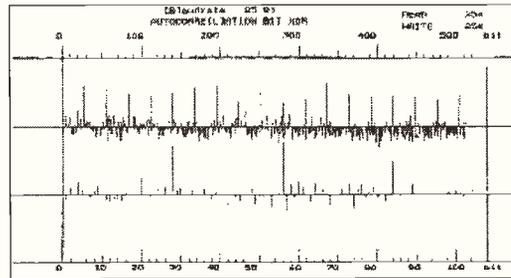


Fig. 3: Code 3 Autocorrelation - ARQ-E.

attempts to produce some form of table showing the relationship between baud rate, shift and mode.

Probably the most successful and well known was the one produced by Chuck Yarborough and known as the *Yarborough Matrix*. This comprised a matrix with baud rate indicated down the vertical side and shift along the top. In this case the shift was grouped into three bands, narrow, medium and wide. The original

data signal for any repetitive patterns. Many of the duplex ARQ links regularly invert data bits every 28 or 56 bits. If you can detect this you are well on the way to identifying the precise transmission type. The best tool for this task is the auto-

correlation bit mode. This is available on the most sophisticated decoders and provides a graphical display that clearly shows any repeating characteristics of the signal.

In Fig. 3 I've shown a typical display from the Code 3 decoder showing the 28 bit repetition pattern of an ARQ-E signal. As you can see the top trace shows the results over 500 bits whilst the lower trace gives a more detailed 100 bit view. Once you have

completed this part of the analysis you can then move on to the character analysis mode. This uses all the previously defined settings, but lets you change the alphabet used by the decoder. This is basically a trial and error exercise to find the best fit. As most of these systems are left idling for long periods you usually end-up selecting the alphabet that produces the least output. That about concludes this very brief introduction to signal analysis and I will continue with more detail in a later column if there's enough interest. If you have any views or tips on using analysis tools please drop me a line.

## Internet News

One of the most important recent changes has been the release of Netscape Navigator 3.0. This is the latest in a line of top flight Web browsers that's available as a free download from

<http://home.netscape.com/> Netscape's web site. Despite all the claims from other suppliers, this browser is the best so far. If you have Internet access you really ought to take a look at the Worldwide Utility Club's site, <http://cellini.leonardo.net/berri/wun/> is the URL for this. This contains all manner of useful information and excellent links to other radio related sites. For the data enthusiast one of the most useful features is the *Digital Signals FAQ v4* (Frequently Asked Questions) compiled by Stan Scalsky and Mike Chase. This provides a host of information on both transmission systems and decoders. There are even some audio clips of digital signals to help you recognise the sounds.

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# Amateur Bands Round-up

Listening to the Amateurs Let's have all your news and comments, sent as usual for the start of the month.

By the time you get to read this piece, it'll be getting into autumn, and by now you should - you really should - have done whatever is needed to be sure your antenna system doesn't decide to give up the ghost. The loss of an antenna, as such, is nothing, but what you need to consider is what might happen if it chooses to come down in the middle of a gale. I had one do that to me once, and to be quite honest, it scared the daylight out of me! Just remember where the prevailing wind lies - south-west in open country, but it may be different in built-up areas. Then consider what might happen in the case of a gale from any direction, and ask yourself whether debris could possibly fall where it could hurt or kill someone. In my own case the layout of the houses funnels winds into either a south-westerly or north-easterly direction, but increases the intensity, so I have a system that is, some would say, grossly over-guyed....but at least after the annual 'MOT' I can sleep at night!

## Propagation

Of course, we're in the summer doldrums as far as the h.f. bands go, but things have been happening on, for example, that neglected six metre band, as so often happens in the summer. So - if the h.f. bands are flat, don't be afraid to look elsewhere. If you live in flat country, a quick skim round the two-metre repeater frequencies for unusual ones will alert you to band openings, and you can then switch to s.s.b. for a look around. And, of course, take note of the terrain - for example, I was in Betws-y-coed a few days ago, and the only channel the car radio offered was a weak signal on 198kHz - none of the other pre-set m.w. or l.w. channels had any audible sounds whatever! That being so there wasn't much point in looking at the amateur bands.

## Sunspot Cycle 23

Here are five predictions for you. Space Environmental Centre (NOAA) offer May 1996 based on sunspot observations; but on solar flux they predict December 1996. Australia's suggestion is for June 1996. Belgium, the world's official keeper of sunspot records, suggests Cycle 22 will end in November 1996, while the National Geophysical Data Centre at Boulder also plump for November 1996. These, notice are the top experts, so we can make some assumptions, of which the

prime one will be that almost certainly Cycle 23 - the upswing in conditions - will start sometime in 1996. Unfortunately, though, as I've said before, while the individual sunspots occur at random when looked at on a daily basis, we have to average them daily figures out over months to get a visible trend. That means that if Cycle 23 began in June, we won't be sure until 1997. Don't quote me, but I've a hunch we may already be on the upswing.

## Letters

Not so many this time. Let's start with **Andy Bright** from Watford who comments that back in the early 1980s many transmitters didn't have the 10, 18 and 24MHz bands fitted, so activity was low, while nowadays there is usually something of interest on his favourite 18MHz band. I'm not sure I agree entirely; most of the activity on these bands was - and indeed still is - on the key since that was the recommendation made for use of these narrow segments. Changing tack a little, Andy notes how 28MHz tends to come alive on contest weekends even at sunspot minima. This has always been the case since I was first licensed and indeed before that. However, the openings are brief and under normal conditions when everyone is listening and no-one transmitting they get missed! We teach our amateurs not to waste time on a CQ call, but overlook that a CQ on a 'dead' band just might pick out the right fleeting moment. Hence the reason for the Six and Ten Reporting Club. For £7 a year you receive the *Six and Ten Report* regularly and of course you can input your own data as well.

Turning to Andy's list, we were a mite amused at his description of 'X5ABL' from Serbia, wondering who allocated that call. There are 14 different DXCC countries with an X as the first letter of the prefix, and I don't think any of them did! Putting it bluntly, that was our old friend Slim again, using a self-allocated call. On 3.5MHz Andy found lots of South Americans, LU/CX/PY, YV, plus VKs, 4S7BRG, ZP6VT, ZS6AUL and SU1SK. Cranking down to 7MHz there were again S. Americans to be found, as PY/CE/YV, not to mention YB2MQ, V21FC, HK4RSW, ZL3NW with a huge signal at 0640 clock-time, and 9Q5OWB. At 14MHz a couple of new ones were 5W1PC and EK6GC, plus Jas, ET3BT, assorted Ws, 4K6GF, 9G1BL, XT2DP, 9N1HA, CE4TEV, D2AO, FR5DX, VR2KM, BV7GA, TU2ZR, ZD7WRG,

VP8CWE, VU2TSJ, CE7UP, UK8LWE, HZ1TA, VP5/I0LL, 8R1Z, PR5L, YB1XUR, HP3FGA, XE11AX, J43AO (a special for the Olympic Games), 4S7BRG, Y11FC, PZ1DR, 4M5LS and island of YV, YB4JKO, ZS8IR, AH8A and AH6AZ. At 18MHz we find 4S7BRG, ZP1BO, H5ANX, AP2JZB, PJ8AD, 5N2CFA, KP4ERJ, FY5GF, 9J2SZ, 4X6RE and 7X2VZK. 21MHz next, where Andy booked in UA2FB, 4S7EA, VE1KC, W7OM, K0TT, various East Coast Ws, 5N0T, C40M (a contest call from Cyprus), and V51VB. Finally 28MHz where the band was 'opened' by the contest over the weekend July 13/14 to produce N4MM and various W1-2-3 signals around 2100Z plus VE1GBD and VE3RM, the last around lunch-time.

Another one with some odd calls to report is **Dennis Miller** in Dawlish. One he noted spelt it out as 'Tango Zero Zero Sierra Washington'! This one claimed to be the Principality of Seborga. As far as I'm concerned that one is about as valid as a nine-pound note; but the 9H0A claiming to be in Rabat would seem OK - my atlas shows Rabat on the western side of Malta. Dennis mentions Top Band signals from DK5YO, EA3JE, IK1GPG, and YPOA the latter in Romania. On 3.5MHz the log entries included HK1FGE, K4HJJ, AA1BU/KP2, OY/SM6RXS, TI4CF, XT2DP, and 5N2MVE. At 7MHz we note C2DYM, CM2RY, CP6RI, HC6TI, H18PJ, HP3FGA, J6/F5CCO, PY5BY, TI4CF, TR8IG, UA0UDN, ZP6VT, 4Z5FB, and 7X5JF, while 14MHz produced A61AN, CE3CM, CX5FK, something calling itself 'DX1A', FM5GU, HK6GN, HS1GNR, JA2ID, JW8GV, OI0MHT, PV8HOA, TF5DZ, UA9FBH, YV5KYS, 4M5LS who was IOTA SA-35, Los Roques Is, 5N0MVE, 7N1LEW, and 9V1WWW. Up on 21MHz Dennis found L75AA - either Slim again or a slip of the typewriter fingers - PY5HXT, W6XR, ZD8Z, 5N0T, and 9H0A. Finally, 28MHz where ZD8Z was logged.

A new contributor - welcome aboard! - is **John Whittle** in Aberystwyth who has an FRG-8800 with around 15 metres of wire slung from the roof to the garden shed, plus a log kept by computer. Looking first at 14MHz we see the usual East Coast Yanks, plus W61THTI4CF, XJ1CWI on Seal Island, VO1NS, VY2SS/E2 running Europeans, RA9DX, VQ9WM, FR5DX, RF1B (a special call), A9SU, and a host of smaller fry. Down to 3.5MHz, and John's log shows various G stations, notably GX0RFC at RAF St Mawgan and GB50/UN on the Isle of Man celebrating 50 years

of the United Nations. On 7MHz we noted RU6LS, UT1T, and assorted nearer Europeans, too.

Over now to **Colin Dean** from Barnsley, who seems to have stuck to 14MHz where he logged A71BY, A71DX, A71FF, A92GF, AP2JZB, AP2N, BV5GQ, BV6EK, BV7GA, BV8AS, DU3BBY, DU8FI, ET3BT, EX5T, EX0V, EY8CO, FR5DX, HL3ADI, HS1RU, HS8FZ, HS0/G4UAV, JW7QIA, JY5SW, OD5RQ, OH0/DL1RNW, OI0MHT, OI0NJV, SU1SK, TA4/UT5MD, T14CF, TR8IG, UN2D, VU2GRS, XX9KC, YB28AR, Y11AS, Y11DX, VE3MJQ/YK, ZD7CTO, ZZ4JW, 3V8BB, 4F3CV(=DU), 4J3M, 4K3DF, 4L7AA, 4S7BRG, 4S7EA, 5H3MZ, 5N0T, 5R8EN, 5Z4FZ, 7Q7RM, 9G1NS, 9G1YR, 9K2RA, 9L11S, 9M2SH, 9V1AB and 9V1WWW.

## Here and There

The upcoming operation from Midway signing own call/KH4 first, and later AH0W/KH4; was to mark the turning-over of Midway to the US Fish and Wildlife Service, with the official name now being Midway Atoll Wildlife Refuge. It is said that it is over 100 years since there were any public visitors there.

Sable Island activity can be looked for from WA4DAN/CYO between October 22 and 29. If, on the other hand, it's Tonga you want, then seek A35RK with the cards directed to W7TSQ.

We have mentioned the *DX Magazine* and the *DX Bulletin* on many occasions; we understand they have now been taken over by Paul and Nancy Smith, AE4AP and KB4RGW, publishers of the *GOLIST*, *QSL Manager List* and the *DX Reporter*. Thanks to RSGB's weekly *DX News Sheet*, and monthly *DX News Magazine*, both edited by Chris Page G4BUE, for information. Incidentally, RSGB non-members can subscribe to *DXNS*. Enquiries to RSGB, Lambda House, Cranborne Road, Potters Bar, Herts EN6 3JE.

## Finito

That's the lot for this time, alas. Remember I can only report to readers what readers tell me, and if you want a longer column it's up to you to send some letters!

Input to reach me by the first of the month, addressed as always to me at PO Box 4, Newtown, Powys SY16 1RA.

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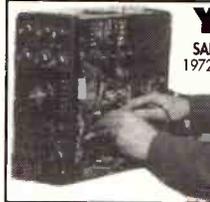
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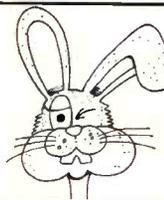
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# Off the Record

The *Offshore Echo's* and France Radio Club's 'Euro-Radio 96' held at Calais on July 6th was an outstanding success. As mentioned last quarter, I was there as a guest and of course as the OTR correspondent, too.

The session commenced with a video presentation depicting life on the Radio Caroline ship *Ross Revenge* whilst at sea. An interview featuring myself followed during which **Chris Edwards** and I discussed the offshore stations of the 60s. After the refreshment break, the latest Caroline video, *Turning The Tide*, was screened. This shows the *Ross Revenge* leaving Docklands in London and being unceremoniously shoved into the dry dock basin, not an easy manoeuvre when a vessel of that size has no motive power.

Following this, former Radio Caroline Chief DJ **Tom Lodge** took the microphone and treated the packed venue to a magical mystery tour of his experiences on both the *MV Mi Amigo* and the *MV Caroline* during the 60s. Of great interest was the journey from Frinton to the Isle-of-Man during which the *Frederica* (MV Caroline) broadcast as it sailed around the coast.

Tom also explained how he managed to influence the programmes on both of the Caroline ships, which had been losing listeners to Radio London's popular Drake format, which had been developed in the USA. Of the future he said that Radio Caroline belonged at sea using high power (lots of applause) and that the solution could be to obtain a flag and broadcast licence via a foreign administration. He ended with a brief commercial for the CD *Don't Touch That Dial - 2*, which is a recreated Caroline North Show featuring **Bob Stewart**, **Tom Lodge** and a 20 minute unaired interview with the Beatles.

## Third World Option

This is one of several legal alternatives to keep Radio Caroline on the air that have been mooted around free radio circles since the 1990 Broadcasting Act became law. The thought of a ship flying the flag of a distant nation with a licence to broadcast from international waters seems like a dream. In reality any supporting state would want something in return, possibly air-time, which would place the station on the stage of international politics. A role which would undermine its

reputation and credibility as an independent free radio station. The host nation would have to cope with DTI complaints and possibly sanctions if they receive any form of international foreign aid.

On the other hand, the station would appear technically legal and therefore the 1967 Marine Offences (Broadcasting) Act and the amendments in the 1990 Broadcasting Act would not apply. It could also be legal to listen to, advertise and work on and in theory be supplied from UK ports. I suppose it's just unfortunate that the Caroline Islands in the Pacific are a dependency of the USA.



Radio Ozone has been with us since 1976 when it was known as Westside Radio.

## Pirate Video & Sound

If you are into pirate radio memorabilia including video and sound archive material, **East Anglia Productions** have just released their 96/97 catalogue. They also stock disco and radio jingles and sell or rent broadcasting equipment to

licensed users. You could of course dream of rocking your neighbours with a reconditioned Marconi 50kW medium wave transmitter for just £45 000.

Meanwhile back to reality, their latest book *Who's Who in British Radio* by Dawn Rusling is somewhat cheaper at £18.95 and makes fascinating reading. East Anglia Productions is at **21-23 Walton Road, Frinton-on-Sea, Essex CO13 0AA, Tel: (01255) 676252**. They also just happen to be the producers of the *Don't Touch That Dial* series of CDs.

## Pirate's Profile

Radio Blackbeard started in August 1994

using a self-constructed transistorised transmitter with an output of 30W in the 48 metre band. A newly built 60W valve transmitter is used for broadcasts on m.w. or the 76 metre band. Both transmitters are connected via 50Ω feeder to inverted vee antennas mounted on one support, one radiating north/south and the other east/west. Almost all shows are live and unrehearsed so you hear the station, warts and all. Reception reports are verified with an A4 size QSL and information sheets from **Dave Norris**.

Radio Ozone seems to have been with us for ages, in fact since 1976 when it was known as Westside Radio. It became Ozone in 1989 and has tried several different frequencies. The transmitter's p.a. section is made up from two 5B-254M valves, known as mini 807s, however, their replacements are three times the cost of the regular 807. These two small valves in parallel produce 80W of r.f. power.

The standby transmitter is a converted Heathkit Ham rig with a built-in variable frequency oscillator with an output of 80W. Their antenna is a dipole cut for 48m and offers good reception in the UK from their base in Dublin, Ireland. Reception reports are verified with an attractive QSL card.

## Strange But True

War Department listening ears... well they do look like giant concrete satellite dishes and they

were once used by the RAF, but really they are nothing to do with radio. The slight similarity to a radar dish is because these huge reflectors were made for the reception of sound waves from the sky. They were built for the RAF during the 1930s and presumably had sensitive microphones suspended at the centre of each dish to give an audio early warning of approaching aircraft. (See article in *SWM December '94*. Ed).

These concrete sound mirrors were eventually superseded by radar but their remains still exist around the south Kent coast. Pictured is a relatively small listening ear, about 5 metres tall, at Abbott's Cliff near Dover. Others exist along the Kent coast at Hythe and on the Romney Marsh. The Hythe Civic Society have published a 40 page book called *Mirrors By The Sea* giving details of the experiments and surrounding secrecy of these pre-war early warning devices. Copies are £4 inclusive of postage and packing from **Chris Lock, The Bookshop, 86 High Street, Hythe, Kent CT21 5AJ**.

## Pirate Post

**Graham Austwick** writes from Newark in Nottinghamshire saying he would like to see pictures and articles on the old offshore stations and remembers staying up late to listen to Radio North Sea International on his old Marconi 5 valve radio. He has a copy of Frank Turner's video on the sea forts, mentioned in the April article, and would recommend it to anyone interested in offshore radio history.

Another reader seeking information about RNI and Caroline North is **Colin Wilkins** of Garforth, Leeds. He is also seeking tape recordings of these stations. **Stephen Black** asks about lists of current pirates. I no longer do these myself but persons sending me a stamped addressed envelope will receive a list and details of where they can get a regularly up-dated chart on a monthly basis. I am pleased to say we have another free radio monitoring group sending in pirate reception logs. Perhaps you too would like to share your hobby with other pirate radio listeners and become one of our voluntary monitors? Quite apart from supporting free radio it can be a lot of fun, details from my home address at the head of this page.

## Short Wave Pirates

Station	Monitors
Albatross	B
Blackbeard	A,B,D
Brigitte	A,B
Britain	A,B,C,D
Caroline (France)	A,B,C
Crazy Wave	A
Crystal	A
Delta	A
Free London	A,B
Gloria	A
Horizon	A,B
Jolly Roger	A,B,D
Laser Hot Hits	A,B,D
Ozone	A,B,C
Packman	A
Pandora	A,B
Panther	A
Reflections	A,B,C,D
Subterranean Sounds	B,D
Titanic	B
Torenvalk	A
Transatlantic	A
UK Radio	A,C,D
Weekend Music	B,C

- A. Free Radio Monitoring, East Midlands.
- B. Bob Marsh, Bexleyheath, Kent.
- C. David Williams, Southampton, Hampshire.
- D. Jack Diamond, Folkestone, Kent.

# LM&S

## Long, Medium and Short Waves

There are two important things to note before studying the data herein. Firstly, British Summer Time (BST) ends at midnight on Saturday October 26. Clocks in the UK must then be put back one hour so that Greenwich Mean Time (GMT), which for practical purposes is the same as Universal Co-ordinated Time (UTC), will be displayed. If you have a clock beside your receiver set to UTC do not alter it when the time system changes to GMT.

Secondly, some of the s.w. broadcasters may alter their transmission schedules on October 26 to allow for seasonal changes in propagation. After that date some of the information herein may be inapplicable.

### 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 July.

In the early hours of July 29 **Alan Roberts** (Quebec, Canada) picked up BBC World Service *Newsday* on 198kHz, while it was being carried by Droitwich (500kW), Burghhead (50kW) and Westerglen (50kW). The combined transmission rated SIO 233 at 0220UTC. Although it was weak he was able to hear every word! He confirmed his findings by tuning to the BBC Antigua relay on 5.975MHz but there was a satellite delay on that transmission. He also heard Atlantic 252 in Clarkstown, S.Ireland, which rated SIO 222.

Despite frequent checks during the evenings **Fred Pallant** (Storrington) was unable to detect the 10kW transmission from the Radiotelevisione Italiana (RAI) outlet at Caltanissetta, Italy on 189kHz until July 28, when it peaked to SINPO 12442 at 2051.

### Medium Wave Reports

During at least five nights in July the conditions were suitable for the reception of m.w. broadcasts from some stations in E.Canada and E.USA. On the 11th **John Slater** (Scalloway, Shetland) logged CJYQ in St.John's NF on 930kHz as SIO333 at 0210UTC. Soon after 0300 on July 14 **Tony Stickells** (Thornton Heath) identified six stations, noting WNRB in Boston, MA on 1510kHz as 34333 at 0310; CJYQ St.John's, NF on 930 as 22222 at 0312; CBM Montreal, PQ 940 as 33232 at 0315; WINS New

York, NY 1010 as 34343 at 0320; WTOP Washington, DC 1500 as 34433 at 0325; also WBRR New York, NY 1130 as 45233 at 0333. John Slater heard CJYQ very clearly during the early hours of the 28th, 29th and 30th. He also received WNRB on 1510 at 0245 on the 30th, which rated SIO232 at 0245.

The sky waves from stations in E.Asia, the Middle East and N.Africa were also received in the UK after dark - see chart. At 2357 on July 15 **Tony Stickells** heard very clearly the 1000kW outlet at Nagpur, India on 1566 - this carries the 'National Channel' from 1325 until 0040 in Hindi and English.

In Leicester, **Andrew Stokes** was surprised to hear two of the low power outlets in Italy, namely Trieste on 981 (10kW), rated SIO121 at 0021 and Torino (20kW) on 999, SIO111 at 0019. Also noted in his extensive log, which was compiled mainly after dark, was Rabat, Morocco (25kW) on 819, which was peaking SIO444 at 2345.

The ground waves from some remarkably distant local radio stations were picked up during daylight by several listeners - see chart. While in Talgarth, **Gerry Haynes** (Bushey Heath) used a Kiwa loop ahead of a Kenwood R-5000 receiver and logged 116 stations in two days! The Kiwa loop was reviewed by Dick Ganderton in the August '95 *SWM* - that issue (or a photocopy of the article) is available from the **SWM Bookstore** - telephone **Michael** on (01202) 659930.

### Short Wave Reports

Owing to the sunspot minimum period the **25MHz (11m)** band is unlikely to be used for broadcasting in 1996.

The propagation conditions in the **21MHz (13m)** band vary from day to day. When favourable, R.Australia's broadcast to Asia via Darwin on 21.725 (Eng 0630-1100) has reached the UK. It was rated SIO252 at 0944 by **David Sayles** in Doncaster.

Also noted in this band were DW via Wertachtal? 21.680 (Eng to Asia, Pacific 0900-0950), rated 24222 at 0945 in Scalloway; RFI via Issoudun 21.620 (Fr to E.Africa 0800-1300) 55555 at 1200 by **Eddie McKeown** in Newry; RCI via Sines, Portugal 21.455 (Eng to Eur, M.East, Africa 1330-1400) 44444 at 1330 by **Thomas Williams** in Truro; R.Portugal via Sines 21.515 (Port, Eng to India, M.East 1400-

### Long Wave Chart

Freq (kHz)	Station	Country	Power (kW)	Listener
153	Bechar	Algeria	1000	G*
153	Donebach DLF	Germany	500	A,B,C,D,E,G,J,K,L*
162	Allouis	France	2000	A,B,C,D,E*,F,G,I,J,K
171	Nador Medi-1	Morocco	2000	C*,G*,J*
171	B'Shakovo etc	Russia	1200	B,C,F,J
177	Oranienburg	Germany	750	A,B,C,F,G,J
180	Pulati	Turkey	1200	J*
183	Saarflous	Germany	2000	A,B,C,D*,F*,F,G,I,J,K
189	Caltanissetta	Italy	10	G*
198	Droitwich BBC	UK	500	A,C,D,E*,F,H*,I,J,K
207	Munich DLF	Germany	500	A,C*,D*,F*,J,K
207	Azilal	Morocco	800	G*,J*,K*
216	Roumoules RMC	S.France	1400	A,B,C,E*,F,G,J,K
225	Raszyn Resv	Poland	?	A,B,C*,D*,F*,G*,J*,K*
234	Beidweiler	Luxembourg	2000	A,B,C,E*,F,G,I,J,K
243	Kalundborg	Denmark	300	A,B,C,D,E,G,J,K
252	Tipaza	Algeria	1500	A*,D*,E*,F*,J*,K*
252	Atlantic 252	S.Ireland	500	A,B,C,D*,E*,F,G,H*,I,J,K,L*
261	Burg(R.Ropa)	Germany	200	A,B,C,E*,F,G,J,K*
261	Taldom Moscow	Russia	2500	D*
270	Topolna	Czech Rep	1500	A,B,D,F,G*,J*
279	Minsk	Belarus	500	A*,D*,F*,G*

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

Listeners:-

- |                             |                                    |                                     |
|-----------------------------|------------------------------------|-------------------------------------|
| (A) Martin Dale, Stockport. | (E) Stephen Jones, Oswestry.       | (J) Tony Stickells, Thornton Heath. |
| (B) John Eaton, Woking.     | (F) George Millmore, Wootton, IoW. | (K) Andrew Stokes, Leicester.       |
| (C) Ted Harris, Manchester. | (G) Fred Pallant, Storrington.     | (L) Thomas Williams, Truro.         |
| (D) Sheila Hughes, Morden.  | (H) Alan Roberts, Quebec, Canada.  |                                     |
|                             | (I) Tom Smyth, Co.Fermanagh.       |                                     |

1500 Mon-Fri) 34333 at 1405 by **Stan Evans** in Herstmonceux; REE via Noblejas 21.570 (Sp to S.America 1200-1800) 44444 at 1500 by **Robert Connolly** in Kilkeel; BBC via Ascension Is 21.660 (Eng to W/E/S.Africa 1100-1700) 15321 at 1545 in Thornton Heath; BBC via Limassol, Cyprus 21.470 (Eng to E.Africa 1300-1700) 35553 at 1615 by **David Edwardson** in Wallsend; R.Portugal Int via Sines 21.655 (Port to Brazil 0700?-2000 Sat/Sun) 33443 at 1630 by **Darren Beasley** in Bridgwater; UAER, Dubai 21.605 (Eng to Eur 1600-1640) 22322 at 1640 by **Norman Thompson** in Oadby; R.Japan via Moyabi, Gabon 21.700 (Jap to Eur, M.East, Africa 1600-1700) SIO242 at 1654 by **John Eaton** in Woking; REE via Noblejas 21.570 (Fr to ? 1800?-1900?) 33333 at 1820 by **Peter Pollard** in Rugby.

Daily variations in propagation also occur in the **17MHz (16m)** band. When favourable, two of R.Australia's broadcasts have reached the UK: 17.715 from Carnarvon (Eng to Asia, Pacific 0200-0900), rated 34543 at 0700 in Wallsend; 17.880 from Darwin (Eng to Asia, Pacific 0200-0730) 43433 at 0720 in Herstmonceux.

Also noted before noon were R.Pakistan via Karachi 17.900 (Eng to Eur 0800-0845), rated 33223 at 0818 in Truro; R.Slovakia Int 17.550 (Eng to Australia 0830-0857) 34433 at 0835 in Bridgwater; R.Prague, Czech Rep 17.485 (Eng to Asia 0900-0927) 44444 at 0910 by **Chris Shorten** in Norwich; SRI via Schwarzenburg? 17.515 (It, Eng, Fr, Ger, Port to Australia, S.Pacific 0830-1100) 33333 at 0910 by **Tom Winzor** in Plymouth; R.Vlaanderen Int, Belgium 17.595 (Eng to Africa 0900-0930) SIO444 at 0925 by **Philip Rambaut** in Macclesfield; R.Austria Int, Moosbrunn 17.870 (Ger, Eng to Australia 0800-1100) 44444 at 0940 in Rugby; AIR via Bangalore 17.387 (Eng to Pacific

areas 1000-1100) 34333 at 1000 in Scalloway; SRI via Schwarzenburg? 17.515 (Eng, Fr, Ger, It to Far East, S.E.Asia 1100-1300) SIO323 at 1100 by **Tom Smyth** in Co.Fermanagh; R.Pakistan via Karachi 17.900 (Eng to Eur 1100-1120) 54455 at 1100 in Oadby; DW via ? 17.860 (Eng to W.Africa 1100-1150) 34433 at 1130 by **Gerald Guest** in Dudley.

After mid-day Africa No.1, Gabon 17.630 (Fr to W.Africa 0700-1600) was 34434 at 1209 in Woking; BBC via Antigua, W.Indies 17.840 (Eng to N/C.America 1400-1700) 25122 at 1508 in Thornton Heath; R.Jordan via Al Karanah 17.800 (Ar [Home Sce relay] 1300-1600) 24322 at 1553 in Newry; BBC via Ascension Is 17.830 (Eng to W/C.Africa 0730-2100) 43333 at 1605 by **Sheila Hughes** in Morden; Monitor R.Int via WSHB 17.510 (Eng to Africa 1600-2000?) 45434 at 1920 by **Tony Hall** in Freshwater Bay, IoW; R.Nederlands via Bonaire 17.605 (Eng to S/E/W.Africa 1830-2025) 33333 at 1945 by **Bernard Curtis** in Stalbridge; DW via Antigua, W.Indies 17.810 (Ger to S.America 2000-2120) 35433 at 2039 in Storrington; RCI via Sackville 17.870 (Eng to Eur, Africa 2000-2100) 42443 at 2046 by **Rhoderick Illman** in Oxted; VOFC Taiwan via WYFR 17.750 (Sp, Ger, Eng to Eur, [Eng 2200-2300]) 44444 at 2220 by **Martin Cowin** in Kirkby Stephen; DW via Antigua, W.Indies 17.810 (Ger to S.America 2200-2255) 44444 at 2250 in Kilkeel.

Noted in the **15MHz (19m)** band during the morning were R.Australia via Carnarvon 15.530 (Eng to Asia, Pacific 0600-0900) rated 45344 at 0602 in Kilkeel; R.Pakistan, Islamabad 15.470 (Eng to Eur 0800-0848) 33232 at 0804 in Bridgwater; Monitor R.Int via KHBI Agingan Pt, N.Mariana Is 15.665 (Eng to E.Eur? 0800-0855) 24343 at 0815 in Freshwater Bay; BSKSA Riyadh 15.060 (Ar to N.Africa 0900-

# Medium Wave Chart

Freq (kHz)	Station	Country	Power (kW)	Listener	Freq (kHz)	Station	Country	Power (kW)	Listener	Freq (kHz)	Station	Country	Power (kW)	Listener
520	Hof/Kirzburg (BR)	Germany	0.2	B*,J*	891	Huisberg	Netherlands	20	G*	1404	Brest	France	20	A*,J*,G*,J*,K*
531	Ain Beida	Algeria	600	A*,G*,J*	900	Bno(CRoZ)	Czech Rep	25	F*	1413	RNE5 via ?	Spain	?	G*,K*
531	Leipzig	Germany	100	A*,B*,F*	900	Milan	Italy	600	A*,C*,F*,G*,J*,J*,K*,L*	1422	Heusweiler(DF)	Germany	1200/600	B*,F*,G*,J*,K*,N
531	RNE5 via ?	Spain	?	F*,G*,H*,J*,K*	900	Qurayyat	Saudi Arabia	1000	G*,J*	1440	Marnach(RTL)	Luxembourg	1200	A*,F*,G*,J*,K*,N
531	Beromunster	Switzerland	500	D,G,J	909	B'mans P(BBCS)	UK	140	B,G,J,J,K,L*,M*	1440	Damman	Saudi Arabia	1600	F*,G*
540	Wavre	Belgium	150/50	A*,F*,G*,J*,K*,L*,M*	918	Plesivec(Sloven/nR)	Slovenia	600/100	A*,J*,K*,M*	1449	Redmoss(BBC)	UK	?	E,F*,J*
540	Soit	Hungary	2000	F*,J	918	Madrid(RInt)	Spain	20	A*,F*,G*,J*,K*	1467	Monte Carlo(TWR)	Monaco	1000/400	A*,F*,G*,J*,K*
540	Sidi Bennour	Morocco	600	A,D*,G*,J*	927	Wolvertem	Belgium	300	A*,F*,G*,J*,K*,M*	1485	AFN via ?	Germany	1	J*,K*
540	Vitoria(El)	Spain	10	J,K*	938	Bremen	Germany	100	A*,B*,F*,G*,H*,J*,K*,M*	1485	Carlisle(BBC)	UK	1	f
549	Les Trembles	Algeria	600	A*,C*,G*,J*,K*	938	Venezia	Italy	20	G*	1494	Clermont-Ferrand	France	20	J
549	Thurnau (DLF)	Germany	200	A,B*,F*,G*,J*,K*	936	RNE5 via ?	Spain	?	J*,K*	1494	St.Petersburg	Russia	1000	C*,F*,G*
558	Espoo	Finland	100	A*,K*,L*,M*	945	Toulouse	France	300	A*,F*,G*,J*,J*,L*,M*	1512	Wolvertem	Belgium	600	A,C*,F*,G*,J*,K
558	RNE5 via ?	Spain	?	A*,F*,K	954	Brno (CRoZ)	Czech Rep.	200	G*,J	1521	Kosice(Citazice)	Slovakia	600	A*,K*
567	Tullamore(RTE1)	Ireland (S)	500	A,B,E,G,J,J,K,L*,M*	954	Madrid(O)	Spain	20	A*,G*,J*	1521	Duba	Saudi Arabia	2000	G*,J*
576	Muhlacker(SDR)	Germany	500	A*,B*,F*,G*,J*,K*	963	Pori	Finland	600	A*,F*,G*,L*,M*	1530	Vatican R	Italy	150/450	A*,C*,F*,G*,J*,K*
576	Barcelona(RNE5)	Spain	50	A*,B*,G*,J*,K*	972	Hamburg(NDR)	Germany	300	A*,B*,F*,G*,J*,K*,L*,M*	1530	Penha(VOA)	Sao Tome	100	I*
595	Paris(FIP)	France	8	G,J,L*	972	RNE1 via ?	Spain	?	F*,G*,J*	1539	SEB via ?	Spain	?	G*,J*,K*
595	Madrid(RNE1)	Spain	200	A*,B*,F*,G*,J*,K*	981	Alger	Algeria	600/300	A*,C*,F*,G*,J	1557	Nice	France	300	J
595	Dumfries(BBC/Scott)	UK	2	A,B,I,J	981	Trieste	Italy	10	K*	1566	Nagpur	India	1000	J*
594	Frankfurt(HR)	Germany	1000/400	B*,G*,J*,K*,L*,M*	981	Berlin	Germany	300	B*,F*,J*,K*,L*	1566	Stax	Tunisia	1200	J*,K*
594	Oujda-1	Morocco	100	G*,J*,K*	990	Potenza	Italy	10	A*	1575	Genova	Italy	50	G*,J
594	Muge	Portugal	100	A*,J	990	R.Bilbao(SER)	Spain	10	A*,G*,K*	1575	SEB via ?	Spain	5	G*,J*,K*
603	Lyon	France	300	J*,M*	990	Redmoss(BBC)	UK	1	F*	1584	SEB via ?	Spain	2	G*,J*,K*
603	Berlin (Lux)	Germany	10	D*,L*	990	Tywyn(BBC)	UK	1	E	1593	Holzkirchen(VOA)	Germany	150	F*,G*,J*
603	Sevillat(RNE5)	Spain	50	A*,F*,G*	999	Schwerin (RIAS)	Germany	20	D*	1602	SEB via ?	Spain	?	J*
603	Newcastle(BBC)	UK	2	B*	999	Torino	Italy	20	K*	1602	Vitoria(El)	Spain	10	G*,J*,K*
612	Athlone(RTE2)	Ireland (S)	100	A,B,E,G,J,J,K*	999	Madrid(COPE)	Spain	50	A*,H*,J*,J*	1611	Vatican R	Italy	15	J
612	RNE1 via ?	Spain	10	D*,G*,J*,K*	1008	SEB via ?	Canaries/Spain	?	J*					
621	Wavre	Belgium	80	A*,F*,G*,J*,K*,L*,M*	1008	Flevo(Hilv-5)	Holland	400	A,B,F*,G*,J,K,L*					
621	RNE1 via ?	Spain	10	F*,J*,K*	1017	Rheinsender(SWF)	Germany	600	A*,B*,D*,F*,G*,J*,K*,L*,M*					
621	Barcelona(OCR)	Spain	50	G*,L*	1017	RNE5 via ?	Spain	?	G*,J*,K*					
630	Vigra	Norway	100	A*,F*,G*,J*,K*	1026	SER via ?	Spain	?	G*,J*,K*					
630	Tunis-Djedeida	Tunisia	600	A*,G*,J*	1044	Dresden(MDR)	Germany	250	B*,F*,G*,J*,K*,M*					
639	Praha(Liblice)	Czech	1500	A*,F*,G*,J*,K*,L*,M*	1044	Sebaa-Aouin	Morocco	300	G*					
639	RNE1 via ?	Spain	?	B*,F*,G*,J*,K*	1044	SER via ?	Spain	?	J*,K*					
639	La Coruna(RNE1)	Spain	100	A*	1044	S.Sebastian(SER)	Spain	10	A*,G*					
648	RNE1 via ?	Spain	10	J*	1053	Zaragoza(COPE)	Spain	10	F*,J*,K*					
648	Orfordness(BBC)	UK	500	B*,C*,G*,J*,K*,M*	1053	Talk R.UK via ?	UK	?	A,B,D*,G,J,J,K					
657	Neubrandenburg(NDR)	Germany	250	B*,J*,K*	1062	Kalundborg	Denmark	250	A*,F*,J*					
657	Napoli	Italy	120	G*,J*	1062	R.Uno via ?	Italy	?	J*					
657	Madrid(RNE5)	Spain	20	F*,G*,J*,K*	1071	R.France via ?	France	?	F*,G*,J*,K					
657	Wrexham(BBC/Wales)	UK	2	A,B,D*,F*,J,K	1071	Riga	Latvia	50	G*					
666	Messkirch(Rohrdt(SWF))	Germany	300/180	B*,J*,K*	1071	Bilbao(El)	Spain	5	A*,G*,J*					
666	Sitkuni(R.Vilnius)	Lithuania	500	F*,J*	1071	Talk Radio UK via ?	UK	?	B.,K*					
666	Lisboa	Portugal	135	F*,G*,L*	1080	Katowice	Poland	1500	A*,F*,G*,J*,L*,M*					
666	Barcelona(COPE)	Spain	10	A*	1080	SER via ?	Spain	?	G*,J*,K*					
675	Marseille	France	600	G*,J*,K*,M*	1089	Talk Radio UK via ?	UK	?	A,B,G,J,J,K					
675	Lopit(R10 Gold)	Holland	120	A,B,F*,G*,J,K,L*	1098	Nitr(Jarok)	Slovakia	1500	A,B*,F*,G*,J*,K*,L*					
684	Sevillat(RNE1)	Spain	500	A*,B*,F*,G*,J*,K*,M*	1107	AFN via ?	Spain	10	B*,F*,J*					
684	Avajal(Beograd-1)	Yugoslavia	2000	F*,G*,J*	1107	RNE5 via ?	Spain	?	K*					
693	Tortosa(RNE1)	Spain	2	F*,J*	1107	Talk R.UK via ?	UK	?	A,B,G*,J*,K,M*					
693	Droitwich(BBCS)	UK	150	A,B,D*,G*,J,J,K,M*	1116	Bari	Italy	150	J					
702	Flensburg(NDR)	Germany	5	A*,B*,F*,J*	1116	Pontevedra(SER)	Spain	5	F*,G*					
702	Monte Carlo	Monaco	40	G*	1125	La Louviere	Belgium	20	F*,G*					
702	TWR via Monte Carlo	Monaco	300	J*,K*	1125	Deanevec	Croatia	100	J*,J					
702	Slovensko 1 via ?	Slovak Rep.	?	B*,J	1125	RNE5 via ?	Spain	?	F*,G*,J*,K*					
702	Zamorat(RNE1)	Spain	10	J*,K*	1125	Llandrindod Wells	UK	1	E					
711	Pennes 1	France	300	A*,G*,J*	1134	COPE via ?	Spain	2	F*,G*,J*,K*					
711	Heidelberg	Germany	5	B*,J*,K*	1134	Zadar(Croatian R)	Yugoslavia	600/1200	A,B*,F*,G*,J*,K*,L*					
711	Laayoune	Morocco	600	G*	1143	Stuttgart(AMN)	Germany	10	A*,B*,F*,G*,J*,K*					
711	Murcia(COPE)	Spain	5	J*	1143	COPE via ?	Spain	2	K*					
720	Lisnagarvey(BBC4)	Ireland (N)	10	G*	1152	RNE5 via ?	Spain	10	K*					
720	Norte	Portugal	100	A*	1161	Strasbourg(Fint)	France	200	A*,F*,G*,J,L*					
720	Stax	Tunisia	200	G*	1179	SER via ?	Spain	?	F*,G*,K*					
720	Lots Rd,Ldn(BBC4)	UK	0.5	A,B,D*,G,J,J,K*	1179	Sevillat	Sweden	600	A,B*,F*,G*,J,J*,K					
729	Putbus(Bergen(NDR))	Germany	10	J*	1188	Kuene	Belgium	5	F*,G*,J*,K*					
729	Cork(RTE1)	Ireland (S)	10	B*,E*,F*,G*,J*,K*,L*	1188	Richtensbach(MDR)	Germany	5	B*,K*					
729	RNE1 via ?	Spain	?	G*,F*,G*,J*	1188	Szolnok	Hungary	135	J*,J					
738	Paris	France	4	B*	1197	Munich(VOA)	Germany	300	F*,J*					
738	Poznan	Poland	300	F*,G*,J*	1197	Verde via ?	UK	?	A,B,G,J,J,K					
738	Barcelona(RNE1)	Spain	500	A,B*,F*,G*,J*,K*,L*,M*	1206	Bordeaux	France	100	J*					
747	Flevo(Hilv2)	Holland	400	A,B*,F*,G*,J,K,L*	1206	Wroclaw	Poland	200	J*					
747	Cadiz(RNE5)	Spain	10	F*,J*	1215	Virgo via ?	UK	?	A,B,G,J,J,K					
756	Braunschweig(DLF)	Germany	800/200	A*,B*,D*,F*,G*,J*,K*,L*,M*	1224	Leystadt	Holland	25	B*,F*,H,J,J,K					
756	Bilbao(El)	Spain	5	G*,J*,K*	1224	Manningtree(V)	UK	0.5	G*					
756	Redruth(BBC)	UK	2	E*,F*,G,J	1233	Liege	Belgium	5	F*,J,J,K*					
765	Sottens	Switzerland	500	A,B*,F*,G*,J*,K*,L*	1233	Virgo via ?	UK	?	A,B*,J,K					
774	Sofia	Bulgaria	50	G*	1242	Marseille	France	150	F*,J*,K*					
774	Enniskillen(BBC)	Ireland (N)	1	B,I	1242	Virgo via ?	UK	?	A,B*,J*,K					
774	RNE1 via ?	Spain	?	A*,F*,G*,J*,K*	1251	Marcali	Hungary	500	F*,J*					
783	Burg	Germany	1000	A*,B*,F*,G*,J*,K*,L*	1251	Huisberg	Netherlands	10	C*,F*,J*,K*					
792	Limges	France	300	A*,G*,L*,M*	1260	SER via ?	Spain	?	G*,J*					
792	Lingen(NDR)	Germany	5	B*,F*,J*,K*	1260	Guldorf(V)	UK	0.5	G,J					
792	Sevillat(SER)	Spain	20	F*,G*,J*	1269	Neumunster(DLF)	Germany	600	A,B*,F*,G*,J*,K*					
801	Munchen-Ismaning	Germany	300	B*,F*,J*,K*,M*	1269	COPE via ?	Spain	?	G*,J*					
801	RNE1 via ?	Spain	?	A*,F*,G*,J*	1278	Strasbourg	France	300	J*					
810	Madrid(SER)	Spain	20	A*,C*,F*,J*,K*	1278	Dublin(Cork(RTE2))	Ireland (S)	10	A,B,C*,E*,G*,J*,K*					
810	Westerglen(BBC/Scott)	UK	100	A,B,C*,D*,E*,G*,J*,K*	1287	RFE via ?	Czech Rep.	400	A*,F*,G*,J,K					
819	Batra	Egypt	450	F*,J*,L*	1287	Lerida(SER)	Spain	10	G*,J*,K*					
819	Toulouse	France	50	F*	1296	Kardzali	Bulgaria	150	G*					
819	Trieste	Italy	25	J*	1296	Valencia(COPE)	Spain	10	J*,K*					
819	Rabat	Morocco	25	J*,K*	1296	Orfordness(BBC)	UK	500	E,I,J*,K*					
819	Warsaw	Poland	300	A*,G*,L*	1305	Rzeszow	Poland	100	F*					
828	Hannover(NDR)	Germany	100/5	A*,F*,J*	1305	RNE5 via ?	Spain	?	F*,K*					
828	Rotterdam	Holland	5	B*,F*,J*,K	1314	Kvitsoy	Norway	1200</						

# Local Radio Chart

Freq (kHz)	Station	ILR BBC	a.m.r.p (kW)	Listener	Freq (kHz)	Station	ILR BBC	a.m.r.p (kW)	Listener
558	Spectrum, London	I	0.80	B,C,F,H,K,M,N,O	1161	Tay AM, Dundee	I	1.40	A,C,G
585	R.Solway	B	2.00	A,C,F	1170	Amber SGR, Ipswich	I	0.28	C,G*N
603	Cheltenham R	I	0.10	A,B,C,F,H,K,L,M,N,O	1170	GNR, Stockton	I	0.32	C,G,I
603	InvictaSG Litt'brne	I	0.10	D,F,H,I*,K,O	1170	SCR, Portsmouth	I	0.12	C,F,H,O
630	R.Bedfordshire(3CR)	B	0.20	A,B,C,F,H,K,L,M,N,O	1170	Signal G, Stoke-on-T	I	0.20	B,C,G*,I,L,M*
630	R.Cornwall	B	2.00	A,C,F,H,O	1170	Swansea Snd, Swansea	I	0.58	AC
657	R.Cornwall	B	2.00	A,C,F,H,K,M,N,O	1170	1170AM, High Wycombe	I	0.25	F,K,O
657	R.Cornwall	B	0.50	A,C,F,H	1242	InvictaSG, Maidstone	I	0.32	F,K,N,O
666	Gemini AM, Exeter	I	0.34	C,D,E*,F,H,K,O	1242	IoW Radio, Wootton	I	0.50	C,F,H,O
666	R.York	B	0.80	A,B,C,F,G,L,O	1251	Amber SGR, Bury StEd	I	0.76	A,C,F,G*,I,K,O
729	BBC Essex	B	0.20	A,C,D,F,K,L,M,N,O	1260	Brunel CG, Bristol	I	1.60	CF
738	Hereford/Worcester	B	0.037	A,B,C,F,H,K,L,M,N,O	1260	Marcher G, Wrexham	I	0.64	B,C,G,I
756	R.Cumbria	B	1.00	A,C,G	1260	SabrasSnd, Leicester	I	0.29	FM*N,O
756	R.Maldwyn, Powys	I	0.63	A,B,C,E*,F,H,K,N,O	1260	R.York	B	0.50	AG
765	BBC Essex	B	0.50	A,C,D,F,H,K,L,M,N,O	1278	Gt.Yks G, Bradford	I	0.43	C
774	R.Kent	B	0.70	A,D,F,K,M,O	1296	Radio XL, Birmingham	I	5.00	A,C,F,G,H,K,N,O
774	R.Leeds	B	0.50	A,B,C,F,G	1305	Gt.Yks G, Barnsley	I	0.15	A,B,C,G,M*
774	3 Counties SG, Glos	I	0.14	B,C,H,M	1305	Premier via ?	I	0.50	C,F,G*,H,K,O
792	Chiltern SG, Bedford	I	0.27	C,F,H,K,L,M,N,O	1305	Touch AM, Newport	I	0.20	C,G*,H
792	R.Foyle	B	1.00	C,J	1323	S. Coast R, Brighton	I	0.50	C,F,H,K,O
801	R.Devon & Dorset	B	2.00	A,C,F,H,K,O	1323	Somersersnd, Bristol	B	0.63	A,C,F,O
828	Chiltern SG, Luton	I	0.20	C,F,K,L,M,N,O	1332	Premier, Battersea	I	1.00	C,F,G*,H,K,O
828	Magic 828, Leeds	I	0.12	B,C	1332	WGMMS CG, Peterboro'	I	0.60	C,G*,I,M*,N
828	R.WM	B	0.20	CL	1332	Wiltshire Sound	B	0.30	C,F,H,O
828	2CR CG, Bournemouth	I	0.27	C,H	1359	BreezeAM, Chelmsford	I	0.28	F,K,O
837	R.Cumbria/Furness	B	1.50	A,C,G	1359	Merica CG, Coventry	I	0.27	C,D*,N
837	R.Leicester	B	0.45	B,C,F,H,K,L,M,N,O	1359	R.Solent	B	0.85	C,D*,F,H,O
855	R.Devon & Dorset	B	1.00	A,C,D,H	1359	Touch AM, Cardiff	I	0.20	C,D*
855	R.Lancashire	B	1.50	A,B,C,G	1368	R.Lincolnshire	B	2.00	C,F,K,N,O
855	R.Norfolk	B	1.50	F,K,N,O	1368	Southern Counties R	B	0.50	C,F,H,K,O
855	Sunshine 855, Ludlow	I	0.15	C,F,K,L	1368	Wiltshire Sound	B	0.10	C,H
873	R.Norfolk	B	0.30	A,B,C,F,H,K,L,M,N,O	1377	Asian Sd, Manchester	I	?	B,G,K*
936	Brunel CG, W.Wilts	I	0.18	A,C,F,H,K,M,O	1413	Premier via ?	I	0.50	C,F,G*,H,J,K,O
945	Derby (Gem AM)	I	0.20	A,B,C,D,F,H,K,L,M,N,O	1431	Breeze AM, Southend	I	0.35	B,C,F,G*,H,K,O
954	Gemini AM, Torquay	I	0.32	C,F,H,K,O	1431	210 CG, Reading	I	0.14	B,C,F,G,H,K,O
954	Wyvern, Hereford	I	0.16	B,C,F,K,M,O	1449	R.Peterboro', Cambis	B	0.15	A,C,F,H,K,N,O
963	Asian Sd, Manchester	I	?	A,B,C,G	1458	R.Cumbria I	B	0.50	A,C,G
963	Viva, Southall	I	1.00	C,F,H,J*,K,L,M,O	1458	R.Devon & Dorset	B	2.00	A,C,H
990	R.Devon & Dorset	B	1.00	A,C,F,H,O	1458	Fortune, Manchester	I	5.00	B,C,G,I
990	Gt.Yks G, Doncaster	I	0.25	B,C,F,O	1458	R.Newcastle	B	2.00	G
990	WABC, Wolverhampton	I	0.09	B,C,F,L,M,N,O	1458	Sunrise, London	I	50.00	B,C,F,G*,H,K,N,O
990	Gem AM, Nottingham	I	0.25	B,C,F,K*,L,M,N,O	1458	Radio WM	B	5.00	C,F,L,M*
999	Red Rose G, Preston	I	0.80	A,B,C,G*	1476	CountySnd, Guildford	I	0.50	C,D*,F,G*,H,K,O
999	R.Solent	B	1.00	C,D,F,H,K,O	1485	R.HumberSide (Hull)	B	1.00	C,F,G
1017	WABC, Shrewsbury	I	0.70	A,B,C,F*,I,L,M*,O	1485	R.Merseyside	B	1.20	A,B,C,G,I
1026	R.Cambridgeshire	B	0.50	B,C,D,F,K,L,M*,N,O	1485	Southern Counties R	B	1.00	C,F,H,K,O
1026	Downtown, Belfast	I	1.70	A,C,D,J*	1503	R.Stoke-on-Trent	B	1.00	A,B,C,D,F,G,H,K,O
1026	R.Jersey	B	1.00	C,F,H,O	1521	R.1521 Craigavon, NI	I	0.50	A,C,G,I
1035	Country 1035, London	I	1.00	B,C,F,G*,H,J,K,M*,O	1521	MercuryXtra, Reigate	I	0.64	B,C,D*,F,G*,H,K,O
1035	R.Sheffield	B	1.00	B,C	1530	R.Essex	I	0.15	F,H,K,M*,O
1035	N.Sound, Aberdeen	I	0.78	A,G	1530	Gt.Yks G, Hudders'd	I	0.74	A,B,C,G
1035	W.Sound, Ayr	I	0.32	C	1530	Wyvern, Worcester	I	0.52	C,F,H,K,O
1107	Moray Fth, Inverness	I	1.50	G	1548	R.Bristol	B	5.00	CF
1116	R.Derby	B	1.20	A,B,C,D,F,G,K,L,M*,N,O	1548	Capital G, London	I	97.50	C,F,H,K,O
1116	R.Guernsey	B	0.50	C,D,F,H,K,O	1548	City G, Liverpool	I	4.40	A,B,C
1152	Amber, Norwich	I	0.83	B,C,F,G*,D	1548	Max AM, Edinburgh	I	2.20	G
1152	Clyde 2, Glasgow	I	3.06	G	1557	R.Lancashire	B	0.25	A,B,C,G
1152	GNR, Newcastle	I	1.80	G	1557	Mellow, Clacton	I	0.125	B,C,F,G*,K,O
1152	Lon.Newstalk, London	I	23.50	C,H,K,N,O	1557	Northants SG	I	0.76	B,C,F,G*,K*,M*,N
1152	Pic'ly G, Manchester	I	1.50	A,B,C,I	1557	Sth Coast R, Soton	I	0.50	C,F,G*,H,K,O
1152	PlymSnd AM, Plymouth	I	0.32	C	1584	KCBC, Kettering	I	0.04	B*,C*,F,M*,N
1152	Xtra-AM, Birmingham	I	3.00	C,F,L,M*	1584	London Turkish R	I	?	C,F,H,K,O
1161	R.Bedfordshire(3CR)	B	0.10	F,K,L,M*,N,O	1584	R.Nottingham	B	1.00	B,C,D*,F,G,L,M*,O
1161	Brunel CG, Swindon	I	0.16	A,C,F,H,K,O	1584	R.Shropshire	B	0.50	A,C,F
1161	Gt.Yks, Hull	I	0.35	B,C,G*,L	1584	Tay, Perth	I	0.21	C,G,J*
1161	Southern Counties R	B	1.00	C,F,H,K,O	1602	R.Kent	B	0.25	C,D,F,G,H,K,O

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

- Listeners:-  
 (A) Robert Connolly, Killeel.  
 (B) Martin Dale, Stockport.  
 (C) Gerry Haynes, while in Talgarth, Powys.  
 (D) Sheila Hughes, Morden.  
 (E) Stephen Jones, Oswestry.  
 (F) Brian Keyte, Bookham.  
 (G) Ross Lockley, Galashiels.  
 (H) George Millmore, Wootton, IoW.  
 (I) David Saylor, Doncaster.  
 (J) Tom Smyth, Co.Fermanagh.  
 (K) Tony Stickells, Thornton Heath.  
 (L) Andrew Stokes, Leicester.  
 (M) Norman Thompson, Oadby.  
 (N) Norman Thompson, while in Leicester.  
 (O) John Wells, East Grinstead.

Woodhall Spa; R.Pyongyang, Korea 13.785 (Eng to Eur, M.East, Africa 1500-1550) 44324 at 1531 in Thornton Heath; UAER, Dubai 13.675 (Eng to Eur 1600-1640) 44444 at 1604 in Rugby; AWR via Slovakia 13.590 (Eng to Africa 1600-1700) 34543 at 1645 in Wallsend.

Later, R.Norway Int 13.805 (Norw [Eng Sun only] to Africa 1800-1830) was 53343 at 1810 in Norwich; Croatian R, Zargreb 13.830 (Cr, Eng to Eur 24hrs) 55555 at 1824 in Stockport; DW via Sines, Portugal 13.790 (Eng to Africa, S.Asia 1900-1950) SIO444 at 1900 in Co.Fermanagh; R.Denmark via RNI 13.805 (Da [Eng 1st Sun only] to Africa 1930-1955) 44444 at 1935 in Appleby; WEWN Birmingham, USA 13.695 (Eng to Eur 2000-2157) 45444 at 2030 in Bridgwater; RCI via Sackville 13.650 (Eng to Eur 2000-2158) 33333 at 2046 in Oxted; Monitor R.Int via WSHB 13.770 (Eng to Eur 2000-2157) 32232 at 2056 in Oadby; WHRI South Bend, USA 13.760 (Eng to E.U.S.A, Eur 1500-2157) 35333 at 2135 by **Harry Richards** in Barton-on-Humber; R.Havana, Cuba 13.715 (Eng to Eur 2100-2200) 43433 at 2155 in Herstoncoex; Monitor R.Int via WSHB 13.770 (Eng to S.America 2200-0000) SIO444 at 2249 by **Francis Hearne** in N.Bristol; WWCR Nashville, USA 13.845 (Eng to E.U.S.A 1400-0100) 32332 at 2310 in Killeel; AWR Costa Rica 13.750 (Eng to C/N.America 2300-0000) 44333 at 2330 in Scalloway.

There is much of interest in the **11MHz (25m)** band. Noted before noon were HCJB Quito 11.615 (Eng to Eur 0700-0830), rated 35433 at 0700 by **Roy Patrick** in Derby; R.Japan via Kranji, Singapore 11.740 (Jap, Eng to

Far East 0500-1000) SIO333 at 0746 in N.Bristol; Voice of Greece, Athens 11.645 (Gr, Eng to Eur 0600-0800) 55555 at 0750 in Norwich; R.Korea Int via Sackville, Canada 11.715 (Eng to S.America 1030-1100) 34222 at 1055 in Bridgwater; R.Sweden via Horby? 11.650 (Eng to N.America 1130-1200) 44444 at 1147 in Bradford.

After mid-day R.Romania Int, Bucharest 11.940 (Eng to Eur 1300-1400) was 44444 at 1328 in Plymouth; WWCR Nashville, USA 12.150 (Eng to ? 1400-1500) 45434 at 1441 in Woodhall Spa; SRI via ? 12.075 (Eng, Fr, Ger, It to S/C.Asia 1500-1700) SIO323 at 1500 in Co.Fermanagh; R.Australia via Carnarvon 11.660 (Eng to S.Asia 1430-2057?) 33332 at 1510 in Oxted; R.Pakistan, Islamabad 11.570 (Eng to Eur 1700-1755) 45344 at 1720 in Newry.

During the evening R.Kuwait via Kabd 11.990 (Eng to Eur, N.America 1800-2057) was noted as 54351 at 1900 by **Robert Frost** in Felixstowe; R.Romania Int, Bucharest 11.940 (Eng to Eur 1900-1955) 44433 at 1900 in Galashiels; R.Bulgaria, Sofia 11.720 (Eng to W.Eur 1900-2000) 32232 at 1906 in Stockport; Israel R, Jerusalem 11.605 (Eng to W.Eur, E.U.S.A 1900-1930) 45444 at 1925 in Rugby; R.Netherlands via Flevo 11.655 (Eng to Africa 1730-2125) 43333 at 1935 in Truro; SRI via ? 11.640 (Eng, Fr, It, Ger to Africa 2000-2200) 42333 at 2000 in Appleby; Qatar BS via Al Khaish 11.785 (Ar to Eur 1705-2130) 54444 at 2000 by **Paul Bowery** in Burnham-on-Crouch; RCI via Sackville 11.690 (Eng to Eur, Africa 2000-2130) 54454 at 2106 in Kirkby Stephen; R.Bulgaria, Sofia 11.720 (Eng to Eur 2100-2200) 44444 at 2107 in Freshwater Bay.

Later, the BBC via Ascension Is 11.750 (Eng to S.America 2000-0200) was 45434 at 2140 in Barton-on-Humber; R.Damascus via Adra 12.085 (Eng to N.America 2105-2205) 34333 at 2145 in Scalloway; BBC via Ascension Is 11.835 (Eng to W.Africa 1930-2315) 34444 at 2208 in Woking; AIR via Bangalore 11.620 (Hi, Eng to Eur 1745-2230) 45545 at 2230 in Oadby; BBC via Kranji, Singapore 11.955 (Eng to F.East 2000-0000) 33322 at 2330 in Killeel.

Some of the broadcasts in the **9MHz (31m)** band during the morning come from SRI via Schwarzenburg? 9.885 (Eng, Fr, It, Ger to Africa 0600-0800) 55555 at 0615 in Herstoncoex; R.Australia via Shepparton 9.710 (Eng to Pacific areas 0730-0900) 43333 at 0732 in Bushey Heath; R.Netherlands via Bonaire, Ned.Antilles 9.720 (Eng to Pacific 0730-1025) 32333 at 0757 in Burnham-on-Crouch; R.Netherlands via Nauen 9.650 (Eng to Eur 1030-1225) 45444 at 1150 in Barton-on-Humber.

Noted after mid-day were R.Norway Int, Oslo 9.590 (Norw to Eur 1200-1230), rated 44434 at 1209 in Bradford; Polish R, Warsaw 9.525 (Eng to Eur 1200-1255) 44444 at 1230 in Morden; Voice of Vietnam, Hanoi 9.840 (Eng to Eur 1600-1630) 54444 at 1615 in Norwich; R.Bangladesh 9.548 (Eng to Eur? 17457-1900) 33433 at 1800 in Galashiels; Voice of Turkey 9.535 (Eng to Eur 1830-1920) 43333 at 1830 in Appleby; Voice of Mediterranean via Russia 9.765 (Eng 1900-2000, Ar 2000-?) 45444 at 1900 in Derby; R.Netherlands via Flevo 9.860 (Eng to S/E/W.Africa 1830-2125) 32232 at 2009 in Kirkby Stephen; VOA via Gloria, Portugal 9.760 (Eng to M.East 1700?-2200) 33333 at 2035 in Stalbridge; China R.Int, Beijing 9.920 (Eng to Eur 2000-2157) 43333 at 2115 in Freshwater Bay; R.Bulgaria, Sofia 9.700 (Eng to Eur 2100-2200) 43444 at 2138 in Woodhall Spa; R.Nac del Paraguay 9.735 (Sp 0800-0400) 55555 at 2300 by **Bill Griffith** in W.London; RCI via Sackville 9.755 (Eng [CBC progs] to U.S.A, Caribbean 0200-0300 Tues-Sat) SIO444 at 0252 in N.Bristol.

Reception in the **7MHz (41m)** band has been quite good from some areas. During the early morning RFPI Costa Rica 7.385 (Eng 24hrs) was 35343 at 0430 in Newry; WJCR Upton, USA 7.490 (Eng to E.U.S.A 24hrs) 24232 at 0600 in Scalloway; WYFR via Okeechobee 7.355 (Eng to Eur, Africa 0600-0800) 43433 at 0645 in Herstoncoex; R.Japan via Skelton, UK 7.230 (Eng to E.Eur 0700-0800) 43444 at 0700 in Appleby; TWR Monte Carlo, Monaco 7.115 (Eng to Eur 0640-0820) 34444 at 0710 in Plymouth; Voice of Greece 7.450 (Gr, Eng to Eur, Australia 0600-0800) 43343 at 0755 in Norwich; Monitor

# Tropical Bands Chart

Freq (MHz)	Station	Country	UTC	DXer	Freq (MHz)	Station	Country	UTC	DXer
2.310	ABC Alice Springs	Australia	2102	E,J	4.800	LNBS Lesotho	Maseru	2117	E,I,J,O
2.325	ABC Tennant Creek	Australia	2046	E,J	4.805	R.Nac. Amazonas	Brazil	2310	B,I,N,O
2.485	ABC Katharine	Australia	2034	E,J	4.815	R.dif. TV Burkina	Ouagadougou	2117	A,B,E,J,N,O,P
2.700	TWR Manzini	Swaziland	1951	E	4.820	La Voz Evangelica*	Honduras	0200	N
3.210	Em Nacional, Maputo	Mozambique	0145	N	4.820	AIR Calcutta	India	1708	E
3.215	RRI Manado	Indonesia	0145	N	4.828	ZBC R-4	Zimbabwe	2116	C,E,J,O
3.220	R.H.C.J.B Quito	Ecuador	0240	J	4.830	R.Botswana, Gaborone	Botswana	2142	I
3.220	Channel Africa	S.Africa	2200	I,O	4.830	R.Tachira	Venezuela	2330	B,D,I,N,O
3.220	R.Kara, Lome	Togo	2017	E	4.832	R.Rajoi	Costa Rica	0255	O
3.230	R.Sol de Los Andes	Peru	0221	J	4.835	R.Tezulutlan, Coban	Guatemala	0229	I
3.230	SABC Meyerton	S.Africa	1934	B,E,I,J,N,O,P	4.835	RTM Bamako	Mali	2116	A,B,C,E,G,I,J,N,O,P
3.240	TWR Shona	Swaziland	1901	E,O	4.840	AIR Bombay	India	1653	E,O
3.245	AIR Lucknow	India	1729	E	4.840	R.Andahuaylas	Peru	2241	C
3.255	BBC via Maseru	Lesotho	1932	E,I,J,O,P	4.845	ORTM Nouakchott	Mauritania	2220	B,E,G,I,N,O
3.270	SWABC 1, Namibia	S.W.Africa	1932	B,E,I,J,N,O,P	4.860	AIR Kingsway(Feeder)	India	1742	E
3.290	Namibian BC,Windhoek	S.W.Africa	2010	B,E,N,O	4.865	PBS Lanzhou	China	2220	C,G
3.300	R.Cultural	Guatemala	0222	I,O	4.870	R.Cotonou	Benin	2114	C,E,I,J,O
3.306	ZBC Prog 2	Zimbabwe	1925	A,C,D,E,I,J,O,P	4.885	R.Clube do Para	Brazil	2230	B,K,N,O
3.315	AIR Bhopal	India	1735	E	4.885	KBC East Sea Nairobi	Kenya	1835	J
3.316	SLBS Goderich	Sierra Leone	2106	B,E,J,K,O	4.890	RPI Paris	via Gabon	0404	I
3.320	SABC Meyerton	S.Africa	2305	B,E,N	4.890	R.Port Moresby	New Guinea	2044	J
3.325	RRI Tanjung Pinang	Indonesia	2232	C	4.890	ORTS Dakar	Senegal	0430	O
3.325	FRCN Lagos	Nigeria	2032	B,C,I,O	4.895	Voz del Rio Arauca	Colombia	2345	B,N
3.330	Christian Voice	Zambia	2053	E,I,J,O	4.895	AIR Kurseong	India	1732	E
3.335	CBS Taipei	Taiwan	2106	E,J	4.895	Pakistan BC	Pakistan	1944	J
3.338	R.Maputo	Mozambique	2233	C	4.905	R.Nat.M'djamena	Chad	2114	A,C,E,I,J,N,O,P
3.340	R.Uganda, Kampala	Uganda	2053	E,J,P	4.910	Tennant Creek	Australia	2043	J
3.345	AIR Jaipur	India	0043	O	4.910	R.Zambia, Lusaka	Zambia	2114	A,E,J,K,N,O
3.345	AIR Jammu	India	1723	E	4.915	R.Anhanguera	Brazil	0230	I,O
3.345	Channel Africa	S.Africa	2050	E,J,P	4.915	GBC-1, Accra	Ghana	2114	B,C,F,I,J,K,N,O,P
3.355	R.Nac Luanda	Angola	2215	B	4.915	KBC Cent. Sea Nairobi	Kenya	2035	I,J
3.356	R.Botswana	Gaborone	2053	E,I,J,O,P	4.920	R.Quito, Quito	Ecuador	0049	B,D,O
3.365	GBC R-2	Ghana	2043	B,C,D,F,I,J,N,O,P	4.920	AIR Madras	India	2300	E,N,O
3.365	AIR Delhi	India	1831	E	4.927	RRI Jambi	Indonesia	1752	A
3.375	R.Nacional S Gabriel	Brazil	2225	O	4.931	R.Internacional	Honduras	0220	FI
3.377	R.Nacional, Mulenvos	Angola	2105	B,E,I,J,N	4.935	KBC Gen. Sec Nairobi	Kenya	2023	D,E,I,J,O
3.380	NBC Blantyre	Malawi	2040	D,E,J,O,P	4.940	AIR Guwahati	India	1718	E
3.390	BBC via Meyerton	S.Africa	2028	E	4.950	R.Nacional, Mulenvos	Angola	2045	E,O
3.395	ZBC Gweru	Zimbabwe	0315	O	4.950	AIR Jammu	India	1725	E
3.395	BBC via Kranji	Singapore	2100	B,E,G,I,R	4.950	R.Madre de Dios	Peru	2300	B,N
3.395	BBC via Skelton	England	0500	I	4.955	R.Nac. de Colombia	Colombia	2300	B,N,O
3.395	R.Korea via Skelton	England	1830	A,H,I,M	4.980	Ecos del Torbes	Venezuela	2325	B,D,G,I,K,N,O
3.395	RPI Paris	France	2009	A,B,C,H,I,J,N,P	4.985	R.Brazil Central	Brazil	2340	B
3.395	R.Budapest	Hungary	2100	A,G,H,I,J,M,P	4.990	AIR Ext.Service	India	0035	I,O
3.395	China R via SRI	Switzerland	2129	M,R	4.990	FRCN Lagos	Nigeria	2110	C,I,O,P
3.395	SRI Beromunster	Switzerland	1942	P	5.005	R.Nacional, Bata	Eq Guinea	2113	E,I,J,O,P
3.395	DW via Jolich	Germany	2200	A,B,G,I,N,O	5.005	R.Nepal, Kathmandu	Nepal	1658	E
4.005	Vatican R	Italy	1935	M,P	5.010	AIR Thiru puram	India	0040	I,N,O
4.500	Xinjiang BS, Urumqi	China	1636	B,E	5.020	PBS-Jiangxi Nanchang	China	2325	B,E,O
4.735	Xinjiang, Urumqi	China	2115	B,C,E,N,O	5.020	Voz del Upano, Macas	Ecuador	2320	B,I
4.750	Xizang BS, Lhasa	Tibet	2330	B	5.020	La V du Sahel, Niamey	Niger	2111	C,I,O
4.755	R.Educ CP Grande	Brazil	2223	C,I	5.025	ABC Katharine	Australia	2135	J
4.760	Yunnan PBS,Kunming	China	2245	B,C,O	5.025	R.Parakou	Benin	2056	E,J,O
4.760	ELWA Monrovia	Liberia	0308	I	5.025	R.Rebelde, Habana	Cuba	2235	B,C
4.760	TWR Manzini	Swaziland	0300	O	5.025	R.Uganda, Kampala	Uganda	2056	E,J,N
4.770	Centinela del Sur	Ecuador	2345	B	5.030	AWR Latin America	Costa Rica	2355	B,O
4.770	FRCN Kaduna	Nigeria	2040	C,D,I,J,O,P	5.035	R.Bangui	C.Africa	0256	E,I,J,N,O,P
4.775	AIR Imphal	India	1851	E	5.040	L.V. de Yopal	Colombia	2034	I,N
4.775	TWR Manzini	Swaziland	1953	P	5.045	R.Cultura do Para	Brazil	2325	B
4.777	R.Gabon, Libreville	Gabon	2041	C,E,J,O	5.047	R.Togo, Lome	Togo	2112	B,C,E,I,J,N,O,P
4.783	RTM Bamako	Mali	2117	B,C,E,G,J,O	5.050	R.Tanzania	Tanzania	1840	E,I,J,N
4.790	Azad Kashmir R.	Pakistan	1713	E	5.055	RFO Cayenne(Matoury)	French Guiana	2345	B
4.790	R.Atlantida	Peru	2335	B,F	5.060	PBS Xinjiang, Urumqi	China	2325	B,E,O
4.800	R.Popular Cuenca	Ecuador	0228	I	5.065	R.Candip, Bumia	Zaire	1806	E
4.800	AIR Hyderabad	India	1735	E,O	5.075	Caraco Bogota	Colombia	2300	B,G,I,K,N,O

- DXers:-  
 (A) Vera Brindley, Woodhall Spa.  
 (B) Robert Connolly, Kilkeel.  
 (C) John Eaton, Woking.  
 (D) David Edwardson, Wallsend.  
 (E) PGordon Smith, Kingston, Moray.  
 (F) Bill Griffith, S.W.London.  
 (G) Sheila Hughes, Morden.  
 (H) Rhoderick Illman, Oxted.  
 (I) Eddie McKeown, Newry.  
 (J) Fred Pallant, Storrington.  
 (K) Roy Patrick, Derby.  
 (L) Clare Pinder, while in Appleby.  
 (M) Peter Pollard, Rugby.

- (N) Harry Richards, Barton-on-Humber.  
 (O) John Slater, Scalloway.  
 (P) Tony Stickells, Thornton Heath.  
 (Q) Norman Thompson, Oadby.  
 (R) Thomas Williams, Turo.

R.Int via WSHB 7.535 (Eng [Various Sat/Sun] to Eur, Africa 0500-0955) 43333 at 0805 in Stalbridge.

Later, Sudwestfunk via Rohrdorf 7.265 (Ger to Eur 24hrs) was 43444 at 1532 in Oxted; R.Australia via ? 7.330 (Eng to S.Asia 1800?-2100) 32432 at 1815 in Bridgwater; VOA via Selebi-Phikwe, Botswana 7.415 (Eng to Africa 1900-2230) 54344 at 1840 in Kirkby Stephen; R.Minsk, Belarus 7.210 (Eng 1645-1900 Tues) 31421 at 1845 in Galashiels; R.Australia via Carnarvon 7.260 (Eng to Asia, Pacific 1800-2100) 43211 at 1900 in Felixstowe; Israel R, Jerusalem 7.465 (Eng to Eur, N.America 1900-1930) 34333 at 1915 in Truro; R.Thailand via Udon Thani 7.210 (Eng to Europe? 1900-2000) SIO433 at 1931 in Doncaster; R.Nederlands via Talata Volon, Madagascar 7.120 (Eng to S/E/W.Africa 1730-2025) 41432 at 2000 in Barton-on-Humber; DW via Sines 7.170 (Eng to Eur 2000-2050) 44344 at 2000 in Bradford; VOIRI Tehran 7.260 (Eng to Eur, M.East 1930-2028) SIO323 at 2000 in Co.Fermanagh; AIR via Allgarh? 7.412 (Hi, Eng to Eur 1745-2230) 54455 at 2045 in Oadby; R.Romania Int, Bucharest 7.195 (Eng to Eur 2100-2156) 43333 at 2140 in Morden; R.Moldova 7.520 (Eng to Eur 200-2225) 23222 at 2215 in

Rugby; BBC via Kranji, Singapore 7.110 (Eng to Far East 2200-0045) 34454 at 2240 in Woking; CPBS China 7.504 (Chin [CNR-1] 2000-1735) 35333 at 2300 in Guildford; WRNO New Orleans, USA 7.355 (Eng to E.USA 2300-0300) 33333 at 2350 in Kilkeel; KTBN via Salt Lake City 7.510 (Eng to N.America 0000-1600) 44433 at 0131 in Bushey Heath.

In the **6MHz (49m)** band there are many broadcasts from listeners in Europe. Some originate from WEWN Birmingham, USA 5.825 (Eng 2100-1000), rated 34333 at 0740 in Truro; R.Austria Int, via Moosbrunn 6.155 (Ger, Eng, Fr, Sp 0400-2300) SIO333 at 0747 in N.Bristol; R.Vlaanderen Int, Belgium 6.035 (Eng, Fr, Du, Ger, Sp 0900-?) SIO333 at 0933 in Macclesfield; R.Bremen, Germany 6.190 (Ger) 55555 at 1100 in Oadby; Deutschland R. Berlin 6.005 (Ger 24hrs) 44454 at 1535 in Manchester; R.Prague via Litomysl 5.835 (Eng 1700-1727) 55555 at 1700 in Norwich; BBC via Limassol, Cyprus 6.180 (Eng 1700-2200) 42232 at 1800 in Kirkby Stephen; R.Slovakia Int 5.915 (Eng 1830-1900) 43333 at 1850 in Oxted; RCI via Skelton, UK (Eng 2100-2130, also to M.East, N.Africa) 55555 at 2030 in Plymouth; R.Budapest, Hungary 5.935 (Eng 2100-2125) 44444 at 2110 in Morden; China

R.Int, Beijing 6.950 (Eng 2000-2157) 44333 at 2120 in Woodhall Spa; REE via Noblejas? 6.125 (Eng 2100-2200) 53444 at 2122 in Freshwater Bay; R.Ukraine Int 6.010 (Eng 2100-2200) 33433 at 2157 in Rugby.

Some of the broadcasts to other areas also reach our shores. Among those noted were R.Australia via Shepparton 6.090 (Eng to Asia 1430-1900?) 43423 at 1857 in Bradford; R.Nac Eq.Guinea via Malabo 6.250 (Sp to Africa 0500-2200) 34433 at 2200 in Bridgwater; BBC via Antigua, W.Indies 5.975 (Eng to C/S.America 2100-0800) 45554 at 2224 in Woking; Singapore BC 6.155 (Eng [R.One] 2200-1600) 33333 at 2300 in Scalloway; R.Nederlands via Bonaire, Ned.Antilles 6.165 (Eng to N.America 2330-0125) 43343 at 2345 in Newry; BBC via Sackville, Canada 6.175 (Eng to N.America 2200-0430) 43443 at 0010 in Kilkeel; CHNX Halifax, Canada 6.130 (Eng [relays CHNS] 24hrs) 52332 at 0152 in Bushey Heath; R.Romania Int, Bucharest 6.155 (Eng to N.America 0200-0256) SIO444 at 0200 in Co.Fermanagh; WHRI Noblesville, USA 5.745 (Eng to E.USA 2200-0400) 43333 at 0330 in Stalbridge.

## QUARTERLY LIST OF EQUIPMENT USED

- LM&S for \$August, #September, \*October/96
- \$, # Tim Allison, Middlesborough: Lowe HF-225 + r.w.
  - \$, # Darren Beasley, Bridgwater: Yaesu FRG-100 + a.t.u. + 15m wire.
  - \$, # Brian Bosson, Caine: Yaesu FRG-8800 + Howes ATU9 + 40m wire.
  - \$, # Paul Bowley, Burnham-on-Crouch: Sangean AT5 803A + 40m wire.
  - \$, # Vera Brintley, Woodhall Spa: Sony CRF 320 or Sangean ATS 803A + r.w.
  - \$, # Tez Burke, Bradford: Grundig Satellit-2000 + whip or 8m wire.
  - \$, # Noel Carrington, Sutton-in-Ashfield: Lowe HF-225 + a.t.u. + 20m wire.
  - \$, # Robert Connolly, Kilkeel: JRC NRD-525 + Datong AD370.
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  - \$, # Bernard Curtis, Stalbridge: Grundig Satellit-2100 or Tatung TMR7602 + r.w.
  - \$, # Martin Dale, Stockport: Sangean AT5 803A + Howes a.t.u. + 23m wire.
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  - \$, # Stan Evans, Herstoncoxe: Kenwood R-2000 + Balun + 11m wire in loft.
  - # Paul Glover, Worthing: Not stated.
  - \* Robert Frost, Felixstowe: Not stated.
  - \$, # Peter Gordon-Smith, Kingston, Moray: Icom R72 + a.t.u. + inverted V dipole.
  - \$, # Michael Griffin, Ross-on-Wye: Lowe HF-225 + a.t.u. + 45m wire.
  - \$, # Bill Griffith, W.London: JRC NRD-525 + 20m wire.
  - \$, # Gerald Guest, Dudley: Not stated.
  - \$, # Tony Hall, Freshwater Bay, IoW: Yaesu FRG-7 + r.w. or RF-B45.
  - \$, # Ted Harris, Manchester: Roberts RCB18.
  - \* Gerry Haynes, while in Talgarth: Kenwood R-5000 + Kiwa loop or Mag Balun + 20m wire.
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  - \$, # Fred Pallant, Storrington: Trio R-2000 + Howes CTUB a.t.u. + r.w.
  - \$, # John Parry, Larnaca, Cyprus: Realistic DX-400 + r.w.
  - \$, # Roy Patrick, Derby: Lowe HF-125 + 22m wire.
  - \$, # Clair Pinder, while in Appleby: JRC NRD-525 + a.t.u. + r.w.
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  - \$, # Alan Roberts, Quebec, Canada: Lowe HF-225 + 11m vertical dipole.
  - \$, # David Sayles, Doncaster: Not stated.
  - \$, # Eric Shaw, Chester: Lowe HF-225 + 7m wire.
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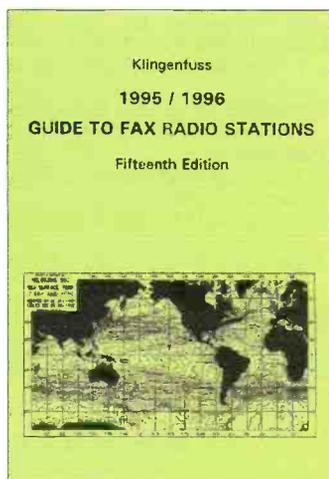
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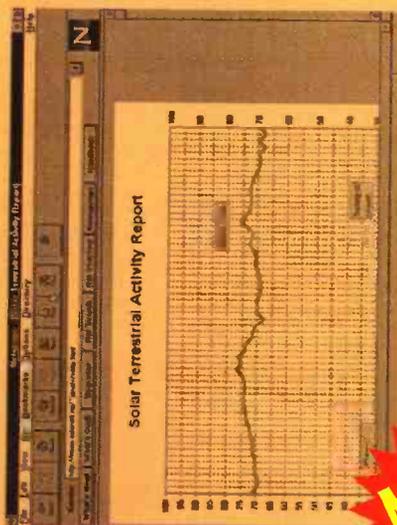
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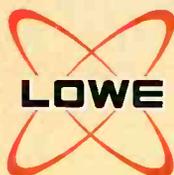
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