short wave magazine

BRITAIN'S BEST RADIO MAGAZINE

FEBRUARY 1999 £2.75

all your Favourites inside

KWZ 30 HF DSP Receiver Reviewed

Antenna Modelling With Joe Carr

Faris Reviews FTrunk

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MilAir SPECIAL

PETER BOND FOCUSES ON DISCRETE FREQ'S

PLUS: PHOTO GALLERY – GULF WAR PICS

ALINCO DJ-X10E

wideband scanning receiver

packed for action!

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- **RECEIVES** 100kHz - 2000MHz
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Frequency.....100kHz - 2000MHz
Memories.....1200
Scan Speed.....25 ch/sec
Scan Steps.....Selectable (50Hz - 500kHz) in 20 fixed steps
Receiver.....Triple Superheterodyne
Dimensions...57(H) x 150(W) x 25.5(D)
Weight.....320g (with EBP-37N Battery pack)

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EBP-33N....Small size 650mAH NiCad...£39.95
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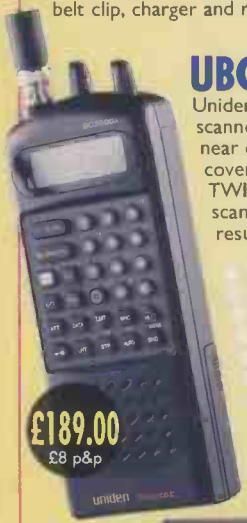

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- TURBO SCAN 100 Ch/Sec
- TURBO SEARCH 300 St/Second
- Alpha Numeric Display
- Automatic Store
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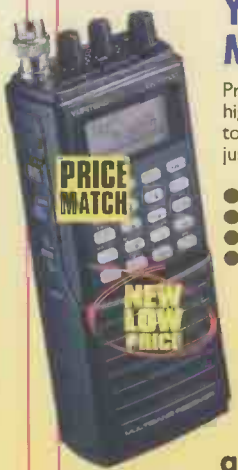

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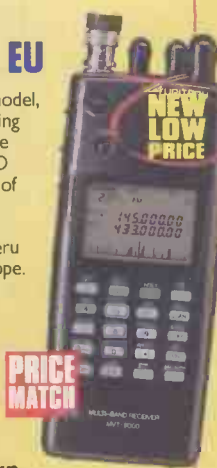

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February 1999 Issue

short wave

AIRBAND

BROADCAST

MilAir SPECIAL FEATURE

by Peter Bond

Peter Bond takes a more exploratory look at some of the more interesting areas of military airband - the discrete frequencies (i.e. frequencies not used for general Air Traffic movements, like Tower, Approach, Area Radar, etc.). Topics include Air Defence Radar, Air Refuelling, Base Frequencies, Low Level Areas, Air to Air, and much more. Peter also explains about a new system of discrete frequencies used by the United States Air Force, called HAVEQUICK. Interesting stuff! - A definite read.

COVER PICTURE

Courtesy Peter Blanchard

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To provide you with a ready reference here are the contact details of all our regualr authors.

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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, 12 Hazelhurst Road, Castle Bromwich, Birmingham B36 0BH, Tel: 0121-681 4168**. A small catalogue containing components, projects and p.c.b.s is available, free, to anyone sending **Roy** or **Sue Martin** an s.s.a.e.

Photocopies & 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 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 for *SWM* are £2.85 each and photocopies are £2 per article.
Binders are also available (each binder takes one volume) for £6.50 plus £1 P&P for one binder, £2 P&P for two or more, UK or overseas. Prices include VAT where appropriate.
A complete review listing for *SWM/PW* is also available from the Editorial Offices for £1 inc P&P.

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Orders for back numbers, binders and items from our Book Store should be sent to: **PW Publishing Ltd., FREEPOST, Post Sales Department, Arrowsmith Court, Station Approach, Broadstone Dorset BH18 8PW**, with details of your credit card or a cheque or postal order payable to PW Publishing Ltd. Cheques with overseas orders must be drawn on a London Clearing Bank and in Sterling. Credit card orders (Access, Mastercard, Eurocard, AMEX or Visa) are also welcome by telephone to Broadstone **(01202) 659930**. An answering machine will accept your order out of office hours and during busy periods in the office. You can also FAX an order, giving full details to Broadstone **(01202) 659950**. The E-mail address is **bookstore@pwpublishing.ltd.uk**

Technical Help
We regret that due to Editorial time scales, replies to technical queries cannot be given over the telephone. Any technical queries by E-mail are very unlikely to receive immediate attention either. So, if you require help with problems relating to topics covered by *SWM*, then please write to the Editorial Offices, we will do our best to help and reply by mail.

ed's comments

Yet More Scheveningen...

Okay hands up who had a lump in their throat listening to the final hours of PCH. I sure did. As I explained last month Scheveningen has a place close to my heart, as it was a very early radio experience for me, and one of my main motivations for my radio interests. They certainly went out with a bang. I listened throughout the 24 hour period of the special event and there was barely a quiet moment. Good-bye Scheveningen.

On a similar note I have heard unofficially that Portishead Radio has had a temporary 'stay of execution' and are due to remain operational for an additional six months.

WUN Christmas Competition

For those of you who don't know, the WUN - World Utility Network - is a global band of utility communications enthusiasts, of which I'm proud to be a member. The WUN members communicate mainly via the Internet and have over a thousand like-minded colleagues.

Over the recent Christmas holiday period, the WUN ran a monitoring competition. Based on loggings supplied by the entrants, the winners have recently been announced. It comes as no surprise to me that the first and second place positions go to two UK listeners who use examples of that great British receiver, the Racal RA1792. Having recently added one to my collection, owing partly to JW's findings as per last year's September *SWM*, I know what a great tool they are.

All this talk of competitions though, leads me to the point, are there any *SWM* readers who think a listening contest is a good idea. Come on, who's interested?

Mailing List

The *SWM* readers' E-mail list is now operational. You can subscribe and join in the action by sending an E-mail (no subject or body required) to **swm_readers-on@pwpublishing.ltd.uk** For those of you who have been patiently waiting for this announcement, thank you for your understanding. It has been a struggle in the available time to get things set up. I am personally disappointed with how long it's taken to get to this point. I'm sure, however, that the wait will have been worth it. I look forward to watching this interactive element of *SWM* grow and benefit our readers who can join in. For those who can't, I'll try to keep you appraised of major happenings via this page and the rest of the magazine.

Don't forget that by joining the list, you'll be able to access the joint knowledge and experience of your fellow readers. An important point though, is things won't be at full tilt from day one. It will take a while before people subscribe themselves, so don't be disappointed on day one.

CD

As I hinted in the January issue, 1999 will provide you with some cover mounted bonuses. The first of these will be a CD that will feature on the April *SWM*. I'm busy working on this project and I've just taken a break from that very task to type this Editorial page.

The CD will contain 'tons' of useful info and software for the listener. For a few more details see page 51 of this issue. An eye on the *SWM* web site would be useful, and so would the mailing list I've just mentioned above.

Oops, nearly forgot - Happy New Year to all.

73

Kevin Nice

Dear Sir

I find myself writing this letter in response to the comments made by Bob G8JNZ, with regards to the JRC NRD-525G. I take it that he had the '525G which is the version that was sold in this country.

I have had numerous receivers over the years, such as the Kenwood R-2000, R-5000, the Icom IC-R71, IC-R72 and JRC NRD-515, NRD-525 and NRD-535. Out of that list, the NRD-525 comes first in all departments.

Bob's comments about the audio surprised me, I have never found the audio to be "clinical" as he put it, after all you have got a tone button to play with which means you can have the tone set in the position that you prefer, I have it mid-way most of the time. If you put the audio through a hi-fi speaker, as he did, you will not get the proper sort of audio that is required for h.f. communications, and that is the most important consideration when listening to any receiver whether it is a cheap one or a top-of-the-range radio.

I have had my '525 also for several years and it is still, in my opinion, one of the best available today. I was very disappointed with the '535 and a lot of other people were too.

That is why I got my '525 back. It has got all the controls that you need to pull out all those very hard to hear signals, and both the pass band tuning and notch filter work very well. Plenty of memories, 200, to store all your favourite frequencies. The build quality is second to none, but the most important feature are the filters. I was fortunate to acquire these not so long ago, and the difference this made was quite astounding.

Need I say more? I may be biased towards the NRD-525, but having used all the so-called top-of-the-range receivers it is still one of the best. That is why it is still most sought after and will still fetch over £600 if you sell one, more if you have the v.h.f. and u.h.f. converters fitted. I think that speaks for itself.

In my judgement, the only receiver to beat it is the Drake R8, but only the later versions. I do agree with Bob on the point about the manual, having just paid a large amount of money you do expect something a little better. As the new NRD-545 has got d.s.p., etc., let's hope that it is better; after all it costs a fortune and not that many people will go out and buy one unless it is a lot better than its predecessors. But I will still wait and see for a while before I consider buying a new NRD-545.

J.B. Palmer
Waterlooville

Dear Sir

First of all, happy Christmas and a prosperous New Year to you and *SWM*. *(We've had this letter a while! Thanks, same to you - **Ed**).* I am a new subscriber to *SWM* and find it very informative, as I'm more of a s.w.l. than a transmitting amateur.

Your correspondent on page 5 (Jan '99 *SWM*), David Hall, mentions cordless telephones operating around 1.6MHz. This is the 'base-station' which transmits to the handset - the duplex frequency being around 47MHz.

However, because of the considerable 'aerial', they can be heard at considerable distances, too! People, who know nothing of s.w.l.s would probably never use cordless 'phones, if they knew how public their conversations were. Manufacturers **and** the relevant **authority** for **licensing** them are failing in a duty to tell their customers that their 'phones are not as private as they would wish them to be! 'Baby alarms' on 49MHz - ditto!

However, I write about mysterious signals which are 59 and 40dB here at Cardiff. They occupy a considerable spectrum - from 31.020 - 31.060MHz and another batch at 34.140 - 34.195. I discovered these whilst listening for American p.m.r. to discover how far the m.u.f. had risen. My receiver is the Icom 756, and on its spectrum analyser it can be seen that these signals consist of close-spaced unmodulated carriers. Your readers' comments could be sought via your columns, hopefully!

Brian D. Williams
South Wales

Dear Sir

(In reply to Gordon Griffiths' letter in the December issue).

An add-on 'band-scope' would need to measure the strength of signals on adjacent channels. Control of scanning plus signal level (a.g.c.?) sensing is required, doubtless best done at i.f. Hence, every scanner is different and most would require extensive modification. Nice idea, but a practical non-starter I fear.

G. Manning
Middlesex

Dear Sir

I read with interest the letter from Frank of Shipton-on-Stour in your January edition about listener QSLs and felt that I had to reply.

I have had my class A call since 1985 and since then I have received a number of s.w.l. cards. Almost without exception these cards have given me no useful information. It is no use sending a card that only says that one station worked another. The stations in question already know that. After all, this information is already in their logbooks.

To be of any use, the listener should include information on band conditions, RST reports at the s.w.l.s location and, if possible, further reports on the Ham station over a short period. In fact, the report should include as much information as space allows. This should enhance the chances of a return card.

With regard to Frank not getting returned cards when sending an s.a.e., he should bear in mind the following. A lot of operators do not QSL at all. In fact, they do not even have cards printed. If he is sending UK stamps to foreign stations then they can't be used. He would do better sending IRCs, in fact the RSGB QSL Buro might be a better if slower bet.

In all, I am sorry that Frank has such a poor QSL return rate. He might be interested to learn that the return rate for Amateur stations is only about 40%.

Hang in there Frank, we need you.

Peter Finbow G0DEH
Middlesex

TOP QSL

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 at QSL, *Short Wave Magazine*, Arrowsmith Court, Station Approach, Broadstone, Dorset BH18 8PW.

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

Your News

Don't forget to keep sending me information on your new products, (*photographs a definite must!*), as soon as details are released, together with any information on Open Days, Special Offers, New Catalogues and general items of news. Remember, mentions are **free**, so don't delay, send off your news to Zoë Crabb today!

LAGAN VALLEY ARS

The **Lagan Valley Amateur Radio Society** meet every 2nd Wednesday of the month at Harmony Hill Art Centre, Lisburn, Co. Antrim. There is no meeting during July and August. More information from **Reid MI0BOT** on **(01232) 258403**, E-mail: **gi4gty@qsl.net** or check out the web site at **www.qsl.net/gi4gty**

CONFERENCE REPORT

Live amateur radio, novice lessons, construction work together with lectures on international aid work, Christian services and DXing, were all part of a hugely successful programme and enjoyed by over 70 delegates at the 1998 WACRAL 40th Celebration & Annual Conference, held back in October 1998.

WACRAL's 1998 Conference at Torbay.

The Conference heard of the outstanding work of **Anita Edgar**, daughter of the well known antenna expert **G2DYM**, who has funded and opened an orphanage for the street children of Goa and now devotes her life to their needs. A lecture by **David Wiltshire** of Hover Aid introduced their unique hovercraft mission to bring aid to the impoverished areas of Lake Chad and the Zambezi.

Born entirely out of amateur radio, the provision of satellite communications for the hard pressed relief agencies was the topic presented by **David Palmer G4PFX**, who showed how he has adapted a Yaesu dual-bander to provide E-mail facilities for links between HQ and remote communities, using 'Store and Forward' Low Earth Orbiting Satellites.

G4UJW controls the WACRAL net.

As mentioned in December's 'Communiqué' pages, **John Corbett G3TWS** was invested as the third President of WACRAL and **Elaine Birch G0WTO** as General Secretary. The Construction Challenge Cup was won by **Ron Huntsman G3KBR** for his field strength meter.

Conference stations GX3NJB and M1CRA operated throughout the weekend, with a record 66 calls participating in their usual Sunday morning net (0800-0900 on 3.747MHz).

Readers can find out more about WACRAL activities and details of their 1999 Conference, which is to be held at Lydney in Gloucestershire, by contacting **G3XNX** at **51 Alma Road, Brixham, South Devon TQ5 8QR, Tel: (01803) 854504.**

Mitsubishi Electric's MGF4950A low noise amplifier solution for next generation 30GHz satellite system applications.

LOW COST DEVICES

Mitsubishi Electric have announced the introduction of the MGF4950A low noise HEMT, designed specifically for use in C to K-band amplifiers. The super low noise InGaAs devices are hermetically sealed in metal ceramic packages and are ideal for low noise satellite amplifier receiver applications in multimedia and satellite interactive terminals.

Whereas conventional satellite receivers are used in the X-band, MGF4950A is designed for next generation satellite systems operating up to 30GHz. The leadless devices are low cost and suitable for surface mount production, capable of withstanding the rigours of reflow soldering.

The low noise MGF4950A is rated typically at a noise figure of 0.45dB, with a typical gain of 13.5dB, both at 12GHz. Recommended bias conditions are 2V drain to source and 10mA drain current, providing typically 75dB transconductance.

Maximum gate to drain and gate to source voltages are typically -4V, with a maximum drain current of 60mA, dissipating 50mW maximum total power. Operating channel temperature is 125°C and the devices can be stored between -65° and 125°C.

Other electrical characteristics include a gate to drain breakdown voltage of -3V minimum and a gate to source leakage current of 50µA maximum. Saturated drain current is typically 35mA and gate to source cut-off is -1.5V maximum.

More information from **Mitsubishi Electric Europe BV, Seminconductors, Travellers Lane, Hatfield, Herts AL10 8XB, Tel: (01707) 276100, FAX: (01707) 278997** or visit the web site at **http://www.mitsubishichips.com**

WINDING & DIVIDING UP

The original Malvern Hills Repeater Group, established in 1972, and with the first transmission of GB3MH taking place on 9 December 1974, is winding up the original accounts and dividing up the remaining funds equally between the new Malvern Hills Repeater Group, based in Worcester, callsign **GB3NW**, the Hereford Amateur Radio Society, operating under the callsign **GB3ZA** and the Gloucester Repeater Group's 2m repeater, callsign **GB3GC**. In addition, all the equipment for both the 2m and 70cm repeaters has been divided amongst the three above named committees.

Both the original repeaters GB3MH and GB3MS closed back on 1 January 1996 due to a combination of continued interference and compounded by the indifference of the RA to do anything about it. Also, the repeater was still being run by the surviving four of the original group that pioneered repeaters in the early days, namely **G3PWJ, G3VDX, G3NUE, G3WGY**, who literally ran out of time and patience to cope with the situation.

Throughout its 24 year life, these repeaters were entirely funded by voluntary contributors, freely and willingly, and it was extremely rare, apart from the annual Upton Strawberry Rallies, to solicit funds. Those of us who are left are most grateful for this unstinted support received from members of the Amateur Radio fraternity, interested in pioneering this long and on-going experiment.

SOUNDS OF SLATE

No matter what style of music you listen to, the Sculpture series of loudspeakers provide a sound quality beyond that ever experienced before. Based upon extensive research and development, and using for the first time Welsh slate as the construction material, the Sculpture loudspeakers combine high build quality, selected high quality components, individual assembly and the computer matching of speaker pairs. The result is a sound quality which is clear, clean, smooth and balanced.

The use of Welsh slate as the speaker cabinet material is not a gimmick, it is a material which has all the right characteristics and qualities, but it is difficult to obtain and shape. However, using a special source of slate from the world-renowned quarries at Corris in Mid Wales, and over 100 years of experience in working slate at Inigo Jones near Caernarfon in North Wales, they are able to offer the truly discerning listener a unique speaker design and construction.

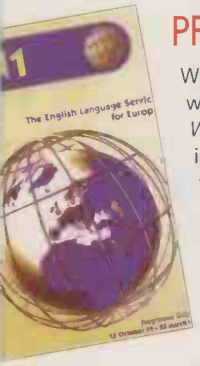
Being individually hand crafted, these speaker pairs are

VERULAM'S AGM

The **Verulam Amateur Radio Club** are holding their AGM on the 23rd February 1999 at 2000 at the **RAF Association HQ, New Kent Road, St Albans**. Also, if you are interested in airborne interception radar, a talk is being held on this subject on 23rd March 1999 at 1930 for an 2000 start at the above address.

Further information from **Walter Craine G3PMF** on **(01923) 262180.**

PROGRAMME GUIDES



World Radio Network's programme guides for winter/spring 1998/1999 are now out! *WRN1* and *WRN3* bring together programmes of international public radio services and transmit them via satellite, cable, local re-broadcasters and Internet to Europe and other parts of the world. *WRN1* is in English and *WRN3* is in German.

World Radio Network provides a uniquely objective view of news, current affairs and opinions from across the world. The programmes are original broadcasts which are fed daily to World Radio Network's headquarters in London and then transmitted either live or time shifted via *WRN1* and *WRN3*. Lots of programmes can also be heard 'on demand' via the Internet.

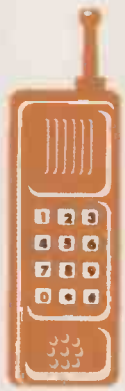
Public radio services from Western and Eastern Europe, such as RFI Radio France Internationale or Voice of Russia, and services from other continents, such as Voice of America or Channel Africa, give you a wide range of different perspectives, with daily news and current affairs directly produced in the country of origin.

A BRIT'S BEST FRIEND?

According to the 1998 Motorola British and Technology report released at the end of last year, 82% of the British public believe that mobile 'phones enable them to sort out their personal problems. The report highlighted that one third of respondents use their mobile 'phone for keeping in touch with family while away on business and 93% of users valued the convenience their 'phone offers.

1000 adults and 350 children were interviewed by MORI for the report, commissioned by Motorola, now in its fourth year. The research looks at people's attitudes towards technology and it demonstrates that Britain is becoming a nation wanting mobility. The survey also looked at both adults and children's views on the Internet, PCs, digital TV and smart cards and on the electronic society, work, socialising and working practices.

This year, for the first time, Motorola includes children in the research and found a significant trend in the younger generation and their use of mobile 'phones. One child in twenty surveyed currently owns a mobile 'phone and over half of those questioned expect to own one in the next few years. Over half of the children who own a mobile 'phone use it every day, predominantly to arrange their social lives and to chat with friends.



81% of mobile users agreed that mobile improved their personal safety, and also gave them peace of mind about the safety of their loved ones, while two out of three users also agreed that mobiles make contact easier no matter where they are. Despite the trend in social users, mobile use in the business market is still clearly important, with 41% of users stating their mobile makes them more productive in their job, while one third believe their mobile 'phone is crucial to helping them stay ahead in business.

Nearly half of all mobile users have changed their mobile 'phone since they got their first, with 26% changing their 'phones twice or more. Reasons cited for changing mobile 'phones included one in five who wanted more up-to-date features and 19% who wanted a better deal of tariffs.

MONTHLY MEETING

The monthly meeting of the **Bangor & DARS** will be held in the Clandeboye Lodge Hotel, Estate Road, Bangor on Wednesday 3rd February at 8pm, when a talk on 'Computers in Amateur Radio' will be given. Members and all visitors are warmly welcomed. Contact **Roy** on **(01247) 460716** for more details.

produced in limited numbers, thus they are available only to those who require the ultimate in sound quality. They stand totally apart from mass produced products, and equally apart from those products using wood based cabinets.

The cabinet shape and size have been carefully determined following extensive research and development using state-of-the-art audio instrumentation, supported by a high level of sound technology expertise. The working of the slate and individual assembly of each cabinet is measured in days and uses skills developed over the past hundred years. The result is a speaker enclosure with enormous visual appeal, a timeless design and one able to fit any decor.

The speaker components, electronics and wiring are all carefully matched and sourced from top quality suppliers. The assembly is carried out in a carefully controlled environment. A final computer based matching of each speaker pair and extensive testing prior to despatch ensures a speaker system of the highest quality and performance.

The Sculpture Two Speakers are available at £2350 per pair, including stands. The prefabricators **Inigo Jones & Co** make numerous different types of bespoke product out of natural Welsh Slate. For more information contact **John Lloyd** on **(01286) 830242**.

Send your news to Zoë Crabb at the Editorial Offices

rallies

Attention Please!

Would you like to have your Rally publicised? If so, all you have to do is put together as much information as possible about the Rally, i.e. date, location, times, who to contact, etc. and send it to the Editorial Offices.

February 7: The Harwell Amateur Radio Society are holding their Radio & Computing Rally at the Harwell Science and Engineering Centre, one mile west of the A34, between Oxford and Newbury. Talk-in on S22. Doors open from 1000. There will be trade stands, Bring & Buy, bar, light refreshments, and craft exhibitors. Admission is just £1, children free. **G8NVI** on **(01235) 816379** or **http://www.hamradio.harwell.com**

February 7: The 14th South Essex Amateur Radio Society Radio Rally is to be held at the Paddocks, Long Road, Canvey Island, Essex. The Paddocks is situated at the end of the A130. Doors open at 1030. Features include Amateur Radio, computer and electronic component exhibitors, Bring & Buy, RSGB Morse testing on demand (two passport photos required), home-made refreshments, free car parking with space outside main doors for disabled visitors. **David G4UVJ** on **(01268) 697978**.

February 14: The 14th Northern Cross Rally is to be held at Thornes Park Athletics Stadium, Wakefield. There is one large hall, just out of town on the Horbury Road. Easy access from M1 juncts 39 & 40 - well signposted and with a talk-in on 2m and 70cm. Doors open 1100 (1030 for disabled visitors and Bring & Buy). **Roy G0TBY** on **(01924) 893321** or packet **G0TBY@GB7WRG**, E-mail **rally@waveg.demon.co.uk** or visit the web page at **http://www.waveg.demon.co.uk/rally/**

February 21: The Barry Amateur Radio Society Radio & Computer Fair has changed its venue. **The new and improved venue** is the Holmview Leisure Centre, Skomer Road, Barry. Facilities include lounge bar, catering and parking. Admission is £1.50 and doors open at 1000 for disabled visitors and 1030 for general public. **Brian GW0PUP** on **(01222) 832253** combined telephone and FAX number.

March 7: The Wythall Radio Club are holding their 14th Annual Radio & Computer Rally at Wythall Park, Silver Street, Wythall, near Birmingham on the A435, just two miles from junction 3 of the M42. Doors open from 1000 to 1600 and admission is £1.50. There will be the usual traders in three halls and a large marquee, Bring & Buy, bar and refreshment facilities are also on site. Talk-in on S22. There will also be a unique park and ride for easy and comfortable parking. Contact **Chris G0EYO** on **0121-246 7267** evenings and weekends for more details, FAX on **0121-246 7268** or E-mail **g0eyo@compuserve.com**

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. Editor

Lowe Electronics Ltd

JRC NRD545

The latest model in the JRC range, the new NRD 545, which is their first receiver using DSP (Digital Signal Processing) from the IF stages onwards. The DSP enables a wide choice of digitally implemented filters to be provided, together with IF shift and continuously variable passband width. The combination of these facilities gives the NRD 545 a level of performance than has previously been unheard of in a receiver costing less than £10,000.
Every equipment reviewer that has had the opportunity to try the NRD 545 to date has been amazed at the performance that JRC engineers have managed to cram into this small box.

PLUS FREE NVA 319 SPEAKER WORTH £199.00

Lowe Price **£1595.00** Carriage £10.00

JRC NRD345G

JRC need no introduction to most SWL's but their mini receiver does! An all-mode receiver, the NRD345 includes synchronous detection as standard, offering low signal distortion and clear sound. Direct Digital Synthesis is employed in a phase locked loop circuit to enhance the carrier to sideband noise ratio. The RF amplifier and the first mixer in the front end stage incorporate 4 low-noise junction-type FETs with excellent cross modulation characteristics respectively to ensure high sensitivity with wide dynamic range. Other features include a variable level noise blanker, clock and timer functions and a built-in RS232 interface for computer control.

NEW PRICE!

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ALSO AVAILABLE: CHE199 WIDE BAND CONVERTER £299.00

Lowe HF-150 Europa

Still amongst the world's best selling Short Wave Receivers, the Lowe HF-150E is a receiver worth having. Rugged construction together with impressive performance still makes it the best value in receivers available anywhere

Key features

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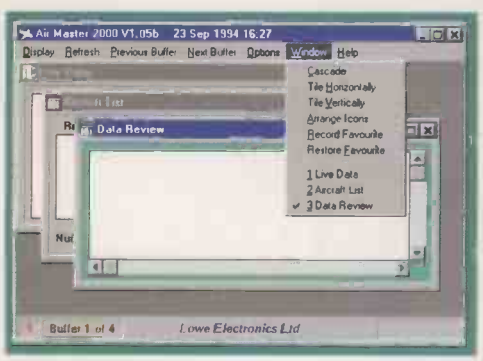
5kHz to 30MHz in 100kHz steps

2.6kHz and 6.5kHz selectable IF bandwidth

LCD Display

Lowe Price **£499.00**



AIRMASTER 2000

Software decoder for ACARS

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

Lowe Price **£89.95**

Upgrade from earlier DOS version **£29.95**

Lowe Electronics Ltd

Lowe HF-225 Europa

Frequency Coverage: 30 KHz to 30 MHz

Reception Modes: AM, USB, CW, Narrow band FM, AM synchronous.

Display: 5 digit back lit negative LCD (green) readout to 1 KHz.

Analogue S-meter calibrated S1-S9 + 10dB +30dB and + 50dB.

Tuning: keypad or variable rate tuning knob.

Tuning Rates: CW, SSB, AMS 8 Hz steps at 1.6 KHz per revolution, AM mode 50 Hz steps at 9 KHz revolution. Memories: 30 frequency memories selectable with spin dial, memories 1-10 can be selected with keypad, two tunable frequency stores (VFO A/B).

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RF SYSTEMS

Magnetic Long Wire and Balun Antenna

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Magnetic Long Wire Balun

The original model that started it all - not to be confused with cheap copies. Uses special military grade ferrite to ensure optimum magnetic transfer of signals over a wide frequency range.

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DX One Professional Active Antenna

A Beverage on your balcony?

The ultimate in SW active antennas. We have supplied dozens of these for critical high performance applications such as military and Government monitoring and hotel radio distribution systems. Covers 10kHz to 85Mhz with exceptional active amplifier specifications.

Price now only £295.00

AA150 active antenna

Originally designed to match our own HF150 receiver, this high performance small active antenna is only the size of a mobile whip, yet gives excellent results for those without long back gardens in which to put up a wire. Comes complete with a mains power unit and DC splitter box to enable it to be used with any make of receiver.

Price now £148.00

DX10 Active Antenna

An economy active antenna for HF using a specially designed amplifier whose gain increases with frequency, thus giving excellent results with older receivers. Only 90 cm long and complete with mains power unit.

Price now £125.00

DATONG AD370

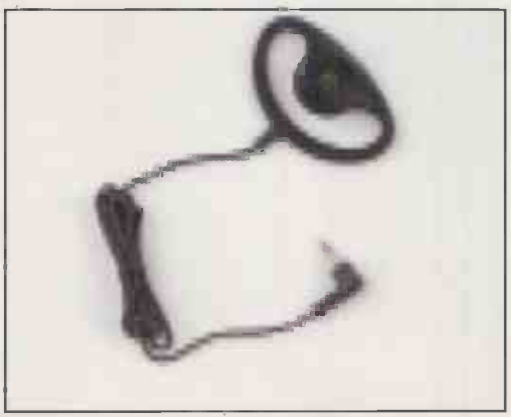
AD370 Outdoor Active Antenna

100kHz-34MHz, dual 59 whips, include lead in cable

Lowe Price £93.94

LEP300

A lightweight miniature speaker which fits comfortably over the ear. It is especially useful in noisy environments, such as crowds, public places etc. This type is very popular with the emergency services.



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■ Gerry L Dexter c/o *SWM* EDITORIAL OFFICES, ARROWSMITH COURT, STATION APPROACH, BROADSTONE, DORSET BH18 8PW.
■ E-MAIL: gdexter@pwpublishing.ltd.uk

Bandscan America

BROADCAST

In Chile, Voz Cristiana now has all its frequencies active, most of which are being quite well heard in North America, often with up-tempo Latin-flavoured Christian music. Several frequencies are in action at various times. Check 21.550, 17.680, 15.375, 11.890, 11.755 11.690, 9.635 and 6.090 throughout the day and night-time hours.

Recent loggings of Brazilian stations include:

MHz	Station
3.205	Radio Ribeirao Preto, Ribeirao Preto
3.375	Radio Educadora, Guajara Mirim
4.755	Radio Educacao Rural, Campo Grande
4.765	Radio Integracao, Cruzeiro do Sul
4.775	Radio Liberal, Belem
4.805	Radiodifusora do Amazonas, Manaus
4.815	Radiodifusora, Londrina,
4.845	Radio Cultura Ondas Tropicais, Manaus
4.865	Radio Missoes da Amazonia, Obidos
4.875	Radiodifusora Roraima, Boa Vista
4.885	Radiodifusora Acreana, Rio Branco
4.895	Radio IPM-AM,, Campo Grande
4.905	Radio Relogio, Rio de Janeiro
4.915	Radio CBN Anhanguera, Goiania
4.945	Emisura Rural, Petrolina
4.955	Radio Cultura, Campos
6.040	Radio Clube Paranaense, Curitiba
6.050	Radio Guarani, Belo Horizonte
6.080	Radio Novas de Pas, Curitiba
6.150	Radio Record, Sao Paulo
6.160	Sistema LBV Mundial, Sao Paulo
6.170	Radio Cultura, Sao Paulo
9.615	Radio Novas de Paz, Curitiba
9.530	Radio Nova Visao (carrying Radio Transmundial) Santa Maria
9.565	Radio Universo, Curitiba
9.675	Radio Cancao Nova, Cachoeira Paulista
11.725	Radio Novas de Paz. Curitiba
11.765	Radio Universo. Curitiba
11.780	Radio Nacional da Amazonia, Brasilia
11.805	Radio Globo, Rio de Janeiro
11.815	Radio Brazil Central, Goiania
11.830	Radio CBN Anhanguera, Goiania
11.895	Sistema LBV Mundial, Sao Paulo
11.925	Radio Bandeirantes, Sao Paulo
15.325	Radio Gazeta, Sao Paulo
17.715	Radio Cultura, Sao Paulo

DXers continue to find single sideband relays of various Argentine medium wave outlets. Most frequently noted is Radio Rivadavia, using 6.240, 8.098 and 15.820MHz, which has also carried Radio Mitre at times. Radio Provincia de B.A (Buenos Aires) shows up on 8.098 now and then.

Another recent appearance is Feeling FM, also on 15.820.

It seems that, one way or another, HCJB plans to stay in Ecuador, no matter what happens with the new airport, planned for near the current HCJB transmitter site at Pifo. The station may build two new sites within Ecuador - one would concentrate on Europe, another for the Americas.

If that weren't enough to worry about, the station also has to keep an eye on the *Pichincha* volcano which has been showing signs of restlessness. The ash emitted by any eruption could cause problems for the studios and offices in Quito.

Recent Mexican activity includes a better signal from the still rather new XERTA on 4.800, doing well one evening around 0300, despite the several other stations which find that a popular spot. This one airs some station IDs in English and French. Others include Radio Mil, 6.010 (Mexico City), which pops through in the very early morning hours - as early as 0800; XEQM, Merida, carrying a local outlet called Candela FM; Radio Educacion 6.185 (Mexico City), with some nice programming all through the evening and early morning hours, including the occasional station identification in English, and the government station, Radio Mexico Internacional, which continues to be a regular on 9.705 and airing English programs at various times.

Radio Miskut in Nicaragua has higher power and extended hours. It often runs to 0400 and later, where it formerly closed by 0100. The Voice of Guyana (Guyana Broadcasting Corporation) is active again; it's being heard as early as 0700 on 3.290, often with a quite good signal. The programming includes feeds from the Voice of America and some BBC newscasts.

In Honduras, HERT, 4.960, has been reactivated from Puerto Lempira and has been heard around 0000. Radio International, 4.930, often puts in very good signals during North American evening hours. Of course, old reliable La Voz Evangelica never misses a beat, although their transmitter has been a kiloHertz or so off its assigned frequency for what seems like years now (4.819 instead of 4.820).

Another reactivation is Radio Cima in the Dominican Republic on 4.960 (as is HERT, above). Another Dominican, Cristal International, is being quite widely reported on 5.011. Radio Amanacer, 6.025, is also being heard, as is Onda Musical, on 4.780. A few years ago the Dominican Republic was nearly silent on short wave. All these operate from Santo Domingo.

Speaking of Radio Amanacer, apparently Adventist World Radio, which owns that station, plans to close its sister station at Cahuita, Costa Rica and move the transmitters to the Dominican Republic.

In Colombia, Radio Macarena has been reactivated from Vilavicencio on 5.975, airing a variety of Latin American musical types.

The newest US short wave broadcaster should certainly be on the air by the time these words see print (tests were run as early as last September). The initial schedule for WWBS in Macon, Georgia, has them on 11.910 from 2300 to 0000 and then 0000 to 0400 on 11.905. It's 'even money' that the schedule will expand, depending on how much time they can sell to various preachers and religious organizations, a la most of the other American short wave stations.

At the moment, the newest station is WBCQ - 'The Planet', operating from near Kennebunk, Maine. It's operating on 7.415, scheduled from 2000 to 1000 but probably still not filling up all those hours. The programs are a eclectic mix of locally produced material, commercial religion and other out-of-house sources.

KNLS, Anchor Point, Alaska is currently operating on 7.365 from 0800 to 1100 and 1200 to 1400, on 6.150 from 1100-1200, and 7.355 from 1400 to 1800. One hour English segments air at 0800 and 1300. Other broadcasts are in Russian and Mandarin Chinese.

Radio Vlaanderen International (Belgium) is now being relayed to North America via Bonaire. Currently scheduled in Dutch at 0430-0456 on 11.750, and 2300 to 2326 on 13.670. English via Bonaire is from 2230 to 2256.

A half hour of English from Radio Prague, Czech Republic, is being carried on WRMI, Miami, Florida on 9.955 from 0400 to 0430. You may run into some Cuban jamming if you try to hear this. WRMI runs several anti-Castro programmes and the jammers have WRMI in their sights most of the time.

A note about frequencies: Many, if not most of the frequencies mentioned in this column are variable, usually within a few hertz either side of the quoted frequency. A station may be logged on 4.79473 and be listed for 4.795. We quote the listed frequency (4.795 in this case) because these variances are sometimes based on the interpretation of the source and, even if accurate, are often temporary in nature. We assume knowledgeable listeners and DXers know that any station, particularly the smaller ones, may be a fraction off their assigned frequency now and then (or always!) and allow for that possibility as a matter of course.

That's all for now. Until next time, good listening!

Recent loggings of other Ecuadorian stations include:

MHz	Station
3.280	La Voz del Napo, Tena
3.289	Radio Centro, Ambato
4.770	Radio Centinela del Sur, Loja
4.795	La Voz de las Caras, Bahia de Caraquez
4.780	Radio Oriental, Tena
4.815	Radio El Buen Pastor
4.840	Radio Interoceanica, Santa Rosa de Quijos - (long listed but only recently being heard with any consistency.)
4.870	La Voz del Upano, Macas
4.900	La Voz de Saquisili, (aka Radio Liberatador), Saquisili
5.980	Radio Federacion, Sucua.

Part of the 'antenna farm' at Radio Canada's transmitter site in Sackville, NB.

The expanded US medium wave band (to 1700kHz) continues to welcome a growing number of stations. Those currently in operation include:

WPHG	Atmore, Alabama - 1620 (religious format)
KRIZ	Reston, Washington - 1620
WJVA	South Bend, Indiana - 1620 (oldies format)
KSMH	Auburn, California - 1620 (religious format)
KCJJ	Cedar Rapids, Iowa - 1630 (pop)
KKWY	Cheyenne, Wyoming (standards)
KDIA	Vallejo, California - 1640 -(soul)
KKJY	Lake Oswego, Oregon - 1640
WKSH	Sussex, Wisconsin - 1640 (religious)
KKTR	Costa Mesa, California - 1650 (traffic)
KCNZ	Cedar Falls, Iowa - 1650 (talk)
WBAH	Elizabeth, New Jersey - 1660 (Spanish)
KXOL	Brigham City, Utah - 1660 (oldies)
WQSN	Kalamazoo, Michigan - 1660 (sports)
WTDY	Madison, Wisconsin - 1670 (talk)
WNML	Warner Robins/Macon, Georgia - 1670 (sports)
WJNZ	Ada/Grand Rapids, Michigan - 1680 (rap)
WMHG	Muskegan/Grand Rapids, MI
KYAK	Arvada, Colorado - 1690 (Radio Disney)
WMDM	Lexington Park, Maryland - 1690 (talk)
WCMQ	Miami Springs, Florida - 1700 (Spanish)
KBGG	Des Moines, Iowa - 1700 (business)

Satellite dishes at the Voice of America's Delano, California transmitter installation.

MULTICOMM 2000

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FINANCING AVAILABLE

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★ ★ ★ RECEIVERS ★ ★ ★

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VHF/UHF converter £249.00

DSP ALL MODE DETECTION DSP DIGITAL IF FILTER DSP PASS BAND SHIFT DSP AGC
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DSP SQUELCH DSP TONE CONTROL DSP S METER DSP BFO DSP RF GAIN

★ **WIDE BAND CONVERTER UNIT £249.00** ★ **NVA-319 SPEAKER £139.00** ★

JRC NRD-345

This smart little set is JRCs entry point into the receiver market. It features syncronous detection as well as all mode. Good value for money!!

OUR PRICE £559.00

or 36 mths @ £20.21

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APR 19.5%

YAESU FRG-100

GREAT beginner's receiver. Easy to operate. GREAT VALUE for money. 50 memories. 50kHz-30MHz.

5 UNITS ONLY!

OUR PRICE £385.00

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AOR AR7030

The receiver you LIKE or DISLIKE. We don't consider this to be a beginner's receiver. Plenty 2nd hand units available.

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ROBERTS R-861

All mode, short wave plus VHF portable receiver. RDS. AM narrow filter, stereo.

OUR PRICE £165.00

BOOKS

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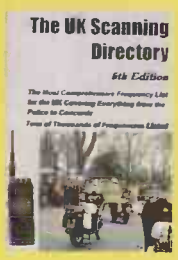


6th UK Scanning Directory

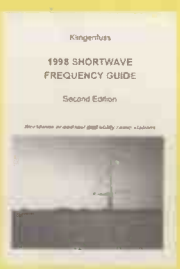
£18.50

Ferrells Confidential Frequency List 10th edition

£19.95

Short Wave International Frequency Guide

£12.95



1998 Short Wave Frequency Guide

£23.00

MULTICOMM 2000

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100kHz-2GHz continuous. All mode. No gaps. 1000 memories. 4 IF band widths. Alpha numeric display. Probably the best all round set in its class. Direct PC interface. Keypad entry.

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£1269.00
or 36 mths @ £45.87

AOR AR5000

10kHz-2GHz. All mode. 1000 memories DTMF decoder. Direct PC connection. 45 channel per sec scan speed. This receiver has it all in one.

OUR SPECIALPRICE
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LM&S

The information herein is based upon actual reception by listeners in this country and abroad. New contributors are always welcome - just send the details of the broadcast(s) you have been hearing to me with your name and address. I will write to you. There were many entries in the reports this time, so let's take a look at some of them!

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 November.

A broadcast from the Ukraine via Lvov on **171kHz** (Ukranian 2300-0100UTC) was heard for the first time by **Sheila Hughes** in Morden at 2310UTC on the 16th. Her attention was drawn to it by a DX programme broadcast in English by R.Ukraine International on a Saturday evening.

Up in Shetland, **John Slater** (Scalloway) picked up, on **189kHz**, the broadcasts from Rikisutvarpid (National Broadcasting Service, Iceland) after dawn on the 21st & 28th. No doubt the sea path helped the transmission from their 300kW outlet at Gufuskalar, W.Iceland to reach him at a remarkable SIO 444 at 0750UTC.

Medium Wave Reports

Very few of the broadcasts from m.w. stations in E.Canada and E.USA reached the UK at night during November. The band was often searched for early arrivals by **David Edwardson** (Wallsend) but nothing was heard.

On the 4th, **Harry Richards** (Barton-upon-Humber) received a clear identification from WNRB in Boston, MA on **1510kHz** at 0045UTC - their transmission rated SINPO 34333. However, he found the conditions unfavourable during the rest of the month.

Just before dawn on the 4th John Slater (Scalloway) heard WBBR in New York, NY on **1130** - their transmission was peaking SIO 333 at 0530. He listened again next morning and logged it as SIO 322. During subsequent checks nothing was heard until the 23rd, when WBBR rated SIO 232 at 0740. On the 24th it was SIO 222 at 0740 but quickly faded out.

The sky waves from some of the many m.w. stations in the Middle East, Africa, Europe and Scandinavia reached the UK at night. Amongst the entries in the chart is Tanaf, Iraq on **1377**, heard under a lot of interference by **Robert Shacklock** in Westwood, Notts. The African service of the Voice of America (VOA) via Sao Tome on **1530**, was picked up at 0300 on October 28 by **Paul Hawkins** in Cinderford. He used a 1.5m by 1.5m spiral loop with his Trio R-1000 receiver.

The ground waves from some local radio stations were received in quite distant places - see chart. The closure of ILR Mellow at 0800 on November 18 was reported by **Paul Graham** (Frinton-on-Sea). Mellow had studios in Colchester and the output from them was coupled to a 0.125kW transmitter on **1557kHz** located just outside Clacton-on-Sea. Paul says "New owners acquired this station in the late summer. A new station called 'Dream 100' has replaced Mellow as our local ILR station on **100.2MHz**, using 2.0kW e.r.p".

Short Wave Reports

There was no mention in the reports of any broadcasts having been received in the **25MHz** (11m) band. However, an information sheet was sent to me by **Richard Reynolds** (Guildford) which indicates that R.Budapest's broadcast schedule for the period 25 October '98 to 29 March '99 includes a transmission to Australia in this band. The details are as follows:-

25.700MHz (Hungarian to Australia 1000-1100 Mon-Fri + Sun; 1200-1300 Sat). Times UTC=GMT.

On December 18 I checked **25.700MHz** and received the broadcast, which commenced at 1100UTC and was preceeded by a 1kHz line-up tone, so the times may have been changed. The signal was quite weak here.

It seems likely that some broadcasters will include this band in their schedules commencing March 29. Test transmissions may take place beforehand, so frequent checks may be advisable!

Quite a few broadcasters are taking advantage of the propagation conditions now prevailing in the **21MHz** (13m) band. Those noted during the morning include the Voice of Russia 21.790 (Eng [WS]), rated 33233 at 0700 by **Clare Pinder** in Appleby; R.Romania Int **21.480** (Eng to ? 0700-0756) 44444 at 0715 by **Ross Lockley** in Galashiels; R.Australia via Shepparton **21.725** (Eng to Pacific areas 0600?-0858) 25542 at 0755 in Wallsend; BBC via Kranji, Singapore **21.660** (Eng to Asia 0530-1030) 44444 at 0825 by **Stan Evans** in Herstmonceux; R.Austria Int, Moosbrunn **21.765** (Eng, Ger to Eur, Australasia 0830-1100) 45444 at 0935 by **Thomas Williams** in Truro; BSKSA Saudi Arabia **21.495** (Ar [Holy Quran] to SE.Asia 0900-1200) 34423 at 1007 by **Vic Prier** in Colyton; UAER, Dubai **21.605** (Eng to Eur 1030-1100) 54554 at 1047 by **Darren Beasley** in Bridgwater; RAI Rome **21.520** (It to Africa 0600-1300) 44444 at 1114 by **Rhoderick Illman** in Oxted;

After mid-day they include R.Ukraine Int **21.510** (Eng to Australia 1200-1300), rated 54444 at 1200 in Morden; Channel Africa via Meyerton, S.Africa **21.530** (Eng to Africa 1300?-1400?) 44243 at 1300 by **Eddie McKeown** in Newry; Vatican R, Italy **21.850** (It to S.America? 1300-1330) 45555 at 1302 by **Fred Wilmshurst** in Northampton; BBC via Ascension Is **21.660** (Eng to Africa 1100-1700) 23332 at 1320 by **Simon Hockenhull** in E.Bristol; R.Prague, Litomysl **21.745** (Eng to E.Africa 1400-1430) 25342 at 1425 by **Mike Casey** in Manchester; R.Sweden, Stockholm **21.810** (Eng to N/C.America 1430-1500) 33233 at 1445 by **Robert Hughes** in Liverpool; HCJB Quito, Ecuador **21.455** (Eng [u.s.b. + p.c.] to N/S.America 1100-1600) SIO 323 at 1458 by **John Eaton** in Woking; REE via Noblejas **21.570** (Sp to S.America? 1000?-1700?) 44444 at 1500 by **Peter Pollard** in Rugby; BBC via Cyprus **21.470** (Eng to E.Africa 1400-1700) 55555 at 1534 by **Tom Winzor** in Plymouth; WYFR via Okeechobee, USA **21.525** (Eng, Fr, Port to Eur, Africa 1600-2000) 34433 at 1620 by **Robert Connolly** in Kilkeel; HCJB Quito, Ecuador **21.455** (Sp [u.s.b. + p.c.] to N/S.America 1700?-?) 33333 at 1715 by **Bernard Curtis** in Stalbridge; Voz Christiana, Chile **21.500** (Sp to N.America) 34333 at 1735 in Scalloway.

In the **18MHz** (15m) band R.Norway Int **18.950** (Norw to N.America? 1100-1130) was rated 44444 at 1100 in Oxted; Christian Science Broadcasting via WSHB Cypress Creek, USA **18.910** (Fr, Eng to C.Africa 1700?-1958) was 43333 at 1710 in Stalbridge.

Good reception from some areas has been noted in the **17MHz** (16m) band. During the morning Africa No.1, Gabon **17.630** (Fr to W.Africa 0700-1100, 1200-1600) was rated 45544 at 0730 by **Martin Goodey** in St.Mary's, Isles of Scilly; R.Austria Int via Moosbrunn **17.615** (Eng to Asia 0930-1000) was 44444 at 0940 in Truro; R.Prague, Czech Rep **17.485** (Eng to W.Africa 1000-1030) 44333 at 1000 in Morden; RAI Rome **17.780** (It [Home Prog-1 rly]) 44444 at 1009 in Oxted; BBC via Nakhon Sawan, Thailand **17.790** (Eng to Asia 0900-1100) 34333 at 1015 by **Ernest Wiles** while in Malta; BBC via Skelton & Woofferton, UK **17.640** (Eng to E.Eur, M.East, E.Africa 0700-1500) 34433 at 1030 by **Gerald Guest** in Dudley; R.Pakistan, Islamabad **17.835** (Eng to Eur 1100-1120) 44344 at 1100 in Newry.

After mid-day R.Bulgaria, Sofia **17.500** (Eng to Eur? 1200-1300) was 54454 at 1200 in Liverpool; RFI via Fr.Guiana? **17.575** (Eng to Eur, Africa, Asia, Pacific 1200-1300) SIO 444 at 1211

LONG WAVE CHART

Freq (kHz)	Station	Country	Power (kW)	Listener
153	Bechar	Algeria	1000	G*,K*
153	Donebach DLF	Germany	500	A,B*,C,D*,E*,F,G*,H,J,K*,L*,M
162	Allouis	France	2000	A,B*,D,E*,F,G*,H*,J,K*,L*,M
171	Nador Medi-1	Morocco	2000	G*,H*
171	B'shakovo etc	Russia	1200	A,B,E*,G*,H*,K*
171	Lvov	Ukraine	500	D*,K*
177	Oranienburg	Germany	500	A,E*,F,G*,H*,K*,L*,M
183	Saarlouis	Germany	2000	A,B*,D,E*,F,G*,H*,J,K*,L*,M
189	Gufuskalar	W.Iceland	150	I
198	Droitwich BBC	UK	500	A,B*,D,E*,F,H*,J,K*,L*,M
207	Munich DLF	Germany	500	A,B*,C,D,E*,F,G*,H*,K*,L*,M*
207	Azilal	Morocco	800	G*,H*,K*
216	Roumoules RMC	S.France	1400	A,C,D*,E*,F,G*,H*,K,L*,M
225	Raszyn Resv	Poland	?	A,B*,C,D,E*,F,G*,H*,K,L*,M*
234	Beidweiler	Luxembourg	2000	A,E*,F,G*,H*,K*,L*,M
234	Ark'gelsk etc	Russia	500	H*
243	Kalundborg	Denmark	300	A,C,D,E*,F,G*,H*,K*,L*,M
243	Erzurum	Turkey	200	K*
252	Tipaza	Algeria	1500	D*,G*,
252	Atlantic 252	Eire	500	A,B*,D,E*,F,G*,J,K*,L*,M
261	Burg(R.Ropa)	Germany	85	D*,F,G*,H*,J,K,M*
261	Taldom Moscow	Russia	2500	K*
270	Topolna	Czech Rep	1500	C,D*,E*,F,G*,H*,K,L*,M
279	Sasnovy	Belarus	500	D*,F,G*,H*,K*,M*

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

Listeners:-

(A) Martin Dale, Stockport.
(B) John Eaton, Woking.
(C) Simon Hockenhull, E.Bristol.
(D) Sheila Hughes, Morden.
(E) Eddie McKeown, Newry.
(F) George Millmore, Wootton, IoW.
(G) Fred Pallant, Storrington.
(H) Robert Shacklock, Westwood, Notts.
(I) John Slater, Scalloway, Shetland.
(J) Tom Smyth, Co.Fermanagh.
(K) Ernie Strong, Ramsey, Cambs.
(L) Phil Townsend, E.London.
(M) Fred Wilmshurst, Northampton.

by **Philip Rambaut** in Macclesfield; R.Sweden, Stockholm **17.870** (Eng to N.America 1230-1300) 54444 at 1242 in Plymouth; BBC via Skelton, UK **17.705** (Eng to Eur, Africa 0900-1515) 44334 at 1335 in E.Bristol; R.Finland **17.660** (Eng to N.America 1330-1400) 55544 at 1350 in Herstmonceux; RFI via Moyabi, Gabon **17.560** (Eng to E.Africa, M.East 1400-1455) 25343 at 1448 in Manchester; Israel R, Jerusalem **17.535** (Eng to Eur, N.America 1500-1530) 44344 at 1500 in Appleby; R.Portugal via Sines **17.725** (Port to Africa 0800-1800 Sat/Sun only) 44434 at 1545 in Colyton; R.Canada Int via Sackville **17.820** (Fr to Eur, Africa 1500-1600) 34444 at 1549 in Woking; VOA via Morocco **17.895** (Eng to Africa 1600-1900) 43443 at 1615 in Kilkeel; Channel Africa via Meyerton **17.860** (Eng to Africa 1700?-1800?) 45444 at 1715 in Bridgwater; BBC via Ascension Is **17.830** (Eng to W/C.Africa 0730-2100) 33333 at 2000 in Stalbridge; VOA via Ascension Is? **17.755** (Eng, Fr to Africa 2000-2200?) 25343 at 2035 by **Fred Pallant** in Storrington.

Many broadcasts in a variety of languages may be received in the **15MHz** (19m) band. Before noon the Voice of Russia **15.470** (Eng to Australia, New Zealand 0600-1000) was 33333 at 0705 in Morden; R.Australia via Shepparton **15.415** (Eng to Asia 0100-0400, 0600-0900) 25432 at 0810 in E.Bristol; Voice of Armenia, Yerevan **15.270** (Eng to Eur 1000-1030 Sun) 53443 at 1015 in Herstmonceux; UAER, Dubai **15.395** (Eng to Eur 1030-1045) 35333 at 1030 in Malta; R.Pakistan, Islamabad **15.530** (Eng to Eur 1100-1120) 34343 at 1105 in Newry; Voice of Africa via Sabrata, Libya **15.415** (Ar to Africa, M.East, Eur) 44544 at 1136 in Bridgwater.

After mid-day RFI via Allouis? **15.195** (Eng to Eur, Africa 1200-1300) was rated SIO 444 at 1200 by **Tom Smyth** in Co.Fermanagh; BBC via Skelton & Rampisham, UK **15.565** (Eng to Russia, Eur 0600-1700) 45444 at 1202 in Northampton; R.Romania Int **15.390** (Eng to Eur 1300-1356) 33433 at 1300 in Galashiels; FEBC Philippines **15.095** (Bur to Myanmer 1230-1430) 24552 at 1333 by **John Parry** in Larnaca, Cyprus; R.Sweden **15.240** (Eng to N.America 1430-1500) 33333 at 1430 in Truro; RCI via Sines, Portugal **15.325** (Eng to Eur, M.East, Africa 1430-1500) 55555 at 1434 by **Martin Venner** in St.Austell; Swiss R.Int via Sottens **15.185** (Eng, Ger, Fr to C/S.Asia 1400-1615) 44444 at 1435 in Rugby; TWR Agana, Guam **15.330** (Eng to S.Asia 1500-1630?) 33333 at 1505 by **David Hall** in Morpeth; Israel R, Jerusalem **15.650** (Eng to W.Eur, N.America 1500-1530) 45545 at 1508 in Manchester; RFO Tahiti, Fr.Polynesia **15.170** (Fr to SE.Pacific) 34554 at 1517 in Woking; WEWN via Vandiver, USA **15.745** (Eng to Eur 1000-2200) 44444 at 1539 in Plymouth; Voice of Nigeria via Ikorodu **15.120** (Eng to Africa, Eur 1600-1700) 44344 at 1615 in Liverpool; UAER, Dubai **15.395** (Eng to Eur 1600-1640) 43434 at 1615 in Colyton; R.Algiers Int, via Bouchaoui **15.160** (Eng, Sp to Eur, M.East, N.Africa 1600-2000?) 44444 at 1640 by **Vera Brindley** in Woodhall Spa; BBC via Ascension Is **15.400** (Eng to Africa 1500-2300) 43434 at 1648 by **Frank Miles** in SW.London; R.Japan via Moyabi, Gabon **15.355** (Eng to Africa 1700-1800) 22222 at 1700 in Appleby.

During the evening WWCR Nashville, USA **15.685** (Eng to N.America, Eur 1100-2200) was 44544 at 1708 in Wallsend; VOA via Botswana? **15.445** (Eng to Africa 1600-1800) 35433 at 1717 in Storrington; Africa No.1, Gabon **15.475** (Fr to W.Africa 1600-1900) 55544 at 1740 in St.Mary's, IoS; R.Norway Int **15.705** (Norw to N.America 1800-1830) SIO 333 at 1815 in Macclesfield; DW via Wertachtal? **15.275** (Eng to W.Africa 2100-2150) 34433 at 2100 in Dudley; BBC via Ascension Is **15.390** (Eng to C.America 2115-2215) 32223 at 2115 in Stalbridge; RCI via Sackville **15.150** (Fr, Eng to Eur, Africa 2000-2230) 44444 at 2130 in Kilkeel.

Quite a few of the broadcasts in the **13MHz** (22m) band may be received very clearly in the UK. During the morning R.Austria Int via Moosbrunn **13.730** (Eng to Eur 0830-0900) was rated SIO 444 at 0833 by **Francis Hearne** in N.Bristol; SRI via Sottens **13.685** (Eng, It, Ger, Fr to Australasia 0830-1030) 54444 at 0850 in Truro; R.Ukraine Int, Kiev **13.590** (Eng to Eur 1000?-1058?) 44434 at 1036 in Oxted; UAER, Dubai **13.675** (Eng to Eur 1030-1055) 25443 at 1037 in Manchester; R.Vlaanderen Int, Belgium **13.745** (Eng to Eur?, N.America? 1130-1200) 44223 at 1130 in Newry.

After mid-day UAER, Dubai **13.675** (Eng to Eur 1330-1355) was 53433 at 1335 in Herstmonceux; R.Sweden **13.740** (Eng to Australia, SE.Asia 1430-1500) 44444 at 1442 in Woodhall Spa; R.Nederlands via Tashkent **13.755** (Eng to S.Asia 1430-1625) 44444 at 1500 in Plymouth; Vatican R, Italy **13.765** (Eng to Africa 1550-1620) 55445 at 1600 in Woking; VOA via Selebi-Phikwe, Botswana **13.710** (Eng to Africa 1600-2130?) 43443 at 1615 in Malta & 44444 at 1925 in Stalbridge; AIR via Bangalore **13.620** (Ar to M.East 1730-1945) 45534 at 1810 in Colyton; WEWN Vandiver, USA **13.615** (Eng to N.America 1600?-2200?) 33433 at 1854 in Bridgwater; Swiss R.Int via Montsinery, Fr.Guiana **13.700** Eng. Ger, Fr to Africa 2000-2130) 32333 at 2000 in Appleby; R.Havana Cuba **13.720** (Eng to Eur 2030-2130) 43333 at 2049 in Morpeth; RCI via Sackville **13.650** (Fr, Eng to Eur, Africa 2000-2230) 44444 at 2110 in Morden; also **13.690** (Fr, Eng to Eur, Africa 2000-2300) 44444 at 2145 in Kilkeel; R.Austria Int via Moosbrunn **13.730** (Eng to Eur, Africa 2230-2300) 44444 at 2256 by **Martin Cowin** in Kirkby Stephen.

Noted during the morning in the **11MHz** (25m) band were the BBC via Masirah, Oman **11.760** (Eng to Africa 0300-0800, 0900-1400) rated 35533 at 0445 in Wallsend; R.Prague, Czech Rep **11.600** (Sp, Fr, Cz to Eur 0830?-0957?) SIO 333 at 0834 in N.Bristol; R.Finland via Pori **11.755** (Fin to Eur 0700-1000) 33333 at 0952 in Truro; AWR via KSDA Agat, Guam **11.660** (Eng to Asia 1000-1100) 54444 at 1030 in Scalloway; AIR via Bangalore **11.735** Eng to Pacific areas 1000-1100) 23333 at 1050 in Storrington; R.Portugal **11.960** (Port to Eur 0800-1300) 55555 at 1100 in Morden.

During the afternoon R.Jordan via Al Karanah **11.690** (Eng to W.Eur, E.USA 1100-1700) was 53543 at 1230 in Herstmonceux; REE via Noblejas **12.035** (Sp to Eur 0700-1700) 54454 at 1256 in Newry; R.Pakistan, Islamabad **11.570** (Ur, Eng to M.East 1330-?) 44454 at 1335 in Cyprus; BBC via Skelton & Woofferton, UK **12.095** (Eng to Eur, N/W.Africa 0600-2000) 55555 at 1400 in Malta; WWCR Nashville, USA **12.160** (Eng to N.America, Eur 1400-2200) SIO 333 at 1500 in Co.Fermanagh;

LOCAL RADIO CHART

Freq (kHz)	Station	ILR BBC	e.m.r.p (kW)	Listener
558	Spectrum, London	I	0.80	A,B*,C,F,H,I,K,M
603	Capital G,Litt'brne	I	0.10	B,F,G,H,L
630	R.Bedfordshire(3CR)	B	0.20	A,B,D,F,G,H,I,K,L,M
630	R.Cornwall	B	2.00	H
657	R.Clwyd	B	2.00	F,H,I,J,K
657	R.Cornwall	B	0.50	F,H
666	Gemini AM, Exeter	I	0.34	C,F,H,M
666	R.York	B	0.80	A,F,I,K
729	BBC Essex	B	0.20	B,F,H,I,K,L,M
738	Hereford/Worcester	B	0.037	A,B,C,F,K,M
756	R.Maldwyn, Powys	I	0.63	A,H,I,K,M
765	BBC Essex	B	0.50	A,B,F,H,I,K,M
774	R.Kent	B	0.70	B,D,F,H,I,K,L*,M
774	R Leeds	B	0.50	A
774	Cl.Gold 774, Glos	I	0.14	A,H,I
792	Cl.Gold 792,Bedford	I	0.27	A,B,F,I,K,L*,M
792	R.Foyle	B	1.00	J
801	R.Devon & Dorset	B	2.00	C,F,H
828	Cl.Gold 828, Luton	I	0.20	F,K,L*,M
828	Magic 828, Leeds	I	0.12	A
828	Asian Netwk Sedgley	B	0.20	A,I
828	2CR CG, Bournemouth	I	0.27	B,H
837	Asian Netwk Leics	B	0.45	A,B,C,F,H,I,K,M
855	R.Devon & Dorset	B	1.00	H,N*
855	R.Lancashire	B	1.50	A
855	R.Norfolk, Postwick	B	1.50	F,K
855	Sunshine 855,Ludlow	I	0.15	A,C,F,I,M
873	R.Norfolk, W.Lynn	B	0.30	A,B*,F,H,I,K,M
936	Brunel CG, W.Wilts	I	0.18	F,H,I,K,M
936	Yks Dales R. Hawes	I	1.00	A,F,I
945	Cl.Gold GEM, Derby	I	0.20	A,I,K,M
945	Capital G, Bexhill	I	0.75	B,F,G,H
954	Gemini AM, Torquay	I	0.32	F,H
954	Cl.Gold 954, H'ford	I	0.16	A,C,F,K,M
963	Asian Sd, E.Lancs	I	0.80	A
963	Liberty R, Hackney	I	1.00	B,F,G,H,I,K,M
972	Liberty R, Southall	I	1.00	A,B*,C,F,G,I,K,M
990	R.Devon, E.Devon	B	1.00	F,H
990	Magic AM,Doncaster	I	0.25	A,K
990	Cl.G, Wolverhampton	I	0.09	A,M
999	C.Gold GEM Nott'ham	I	0.25	A,I,K,M
999	Red Rose 9-99 P'stn	I	0.80	A
999	R.Solent	B	1.00	B,D,F,G,H
1017	Cl.G. Shrewsbury	I	0.70	A,C,F,I,M
1026	R.Cambridgeshire	B	0.50	A,F,K,L*,M
1026	Downtown R, Belfast	I	1.70	J
1026	R.Jersey	B	1.00	C,F,H
1035	RTL Country 1035	I	1.00	B*,F,G,H,K,M
1035	R.Sheffield	B	1.00	A,I
1035	N.Sound 2, Aberdeen	I	0.78	F*
1116	R.Derby	B	1.20	A,F,I,K,L,M
1116	R.Guernsey	B	0.50	F,H,K*
1116	Valley R, Ebbw Vale	I	0.50	C,D*
1152	Cl.G Amber, Norwich	I	0.83	A,K
1152	LBC 1152 AM	I	23.50	B*,F,G,H,M
1152	Pic'ly 1152,Manch'r	I	1.50	A
1152	Xtra-AM,Birmingham	I	3.00	I
1161	R.Bedfordshire(3CR)	B	0.10	F,I,K,L,M
1161	Brunel Cl.G,Swindon	I	0.16	H
1161	Magic AM,Humberside	I	0.35	A,F,I
1161	Southern Counties R	B	1.00	F,H
1161	Tay AM, Dundee	I	1.40	F
1170	Cl.G Amber, Ipswich	I	0.28	K
1170	Capital G,Portsm'th	I	0.50	B*,F,H
1170	Signal 2,Stoke-on-T	I	0.20	A
1170	1170AM,High Wycombe	I	0.25	D,F,M
1242	Capital G,Maidstone	I	0.32	B,F,H
1251	C.G Amber,Bury StEd	I	0.76	D,F,G,K,L*,M
1260	Brunel CG, Bristol	I	1.60	H
1260	Marcher G, Wrexham	I	0.64	A
1260	SabrasSnd,Leicester	I	0.29	A,I*,K,M
1278	Cl.Gold 1278 W.York	I	0.43	A
1296	Radio XL,Birmingham	I	5.00	A,D,F,H,I*,M
1305	Magic AM,Barnsley	I	0.15	A
1305	Premier via ?	I	0.50	B*,D,F,G,H,K,M
1305	Touch AM, Newport	I	0.20	H
1323	Capital G,Southwick	I	0.50	A,D,F,H,M
1323	SomersetSnd,Bristol	B	0.63	A
1332	Premier, Battersea	I	1.00	F,H
1332	Cl.Gold 1332,Pr'bo	I	0.60	A,K
1332	Wiltshire Sound	B*	0.30	H
1359	The Breeze,Chelms'd	I	0.28	F
1359	Cl.Gold B9, C'try	I	0.27	A,K,M
1359	R.Solent	B	0.85	B,E*,H
1368	R.Lincolnshire	B	2.00	K,M
1368	Southern Counties R	B	0.50	B,D,F,G,H,L*
1368	Wiltshire Sound	B	0.10	H
1377	Asian Sd, Rochdale	I	0.10	A
1413	R.Gloucester via ?	B	?	C,M
1413	Premier via ?	I	0.50	B,E*,F,H,K
1413	Yks Dales R,Skipton	I	0.10	A
1431	The Breeze,Southend	I	0.35	F,H,K,L*
1431	Cl.Gold, Reading	I	0.14	B,F,H,K,M
1449	R Peterboro/Cambs	B	0.15	A,F,H,K,M
1458	R.Devon & Dorset	B	2.00	H
1458	1458 Lite AM Manch'	I	5.00	A
1458	Sunrise, London	I	50.00	B,F,H,M
1458	Asian Netwk Langley	B	5.00	K
1476	CountySnd,Guildford	I	0.50	B,D*,F,H,K*,L,M
1485	Cl.Gold, Newbury	I	1.00	C,F,M
1485	R.Humberside (Hull)	B	1.00	A,K
1485	R.Merseyside	B	1.20	A,H,J
1485	Southern Counties R	B	1.00	B,F,H
1503	R.Stoke-on-Trent	B	1.00	A,D,F,H*,K,M
1521	Heartbeat 1521AM,NI	I	0.50	A
1521	Fame 1521, Reigate	I	0.64	B,F,H,M
1530	R.Essex	B	0.15	B,F,H,K
1530	Cl.Gold W.Yorks	I	0.74	A
1530	Cl.Gold Worcester	I	0.52	C,F,H,M
1548	R.Bristol	B	5.00	H
1548	Capital G, London	I	97.50	B,F,H,K
1548	Magic AM,Merseyside	I	4.40	A,J
1548	Cl.Gold, Sheffield	I	0.74	A
1557	R.Lancashire	B	0.25	A
1557	Cl.Gold 1557,N.hant	I	0.76	A,F,K,M
1557	Capital G, So'ton	I	0.50	F,H
1584	London Turkish R	I	0.20	F
1584	R.Nottingham	B	1.00	A,F,I,K
1584	R.Shropshire	B	0.50	F
1584	Tay, Perth	I	0.21	F
1602	R Kent	B	0.25	D,F,H

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

Listeners:-

(A) Martin Dale, Stockport.
(B) John Eaton, Woking.
(C) Simon Hockenhull, E.Bristol.
(D) Sheila Hughes, Morden.
(E) Rhoderick Illman, Oxted.
(F) Brian Keyte, Gt.Bookham.
(G) Frank Miles, SW.London.
(H) George Millmore, Wootton, IoW.
(I) Robert Shacklock, Westwood, Notts.
(J) Tom Smyth, Co.Fermanagh.
(K) Ernie Strong, Ramsey, Cambs.
(L) Phil Townsend, E.London.
(M) Fred Wilmshurst, Northampton.
(N) Tom Winzor, Plymouth.

R.Australia via Shepparton **11.660** (Eng to Asia 1330-1700) 33433 at 1500 in Dudley & 43443 at 1630 in Kilkeel; Vatican R, Italy **11.640** (Eng to Asia 1550-1620) 55555 at 1610 in Bridgwater; RCI via Skelton, UK **11.935** (Russ to E.Europe 1600-1659) 24333 at 1610 in Oxted; ERT Tunisia **11.730** (Nat prog 0600-1710) 43343 at 1613 in Woking; Voice of Vietnam, Hanoi **12.020** (Eng to Africa 1600-1630) 32222 at 1615 in Stalbridge; R.Pakistan, Islamabad **11.570** (Eng to M.East 1600-1630) 24222 at 1626 in Woodhall Spa; VOA via Udon Thani, Thailand **11.920** (Eng to E.Africa 1600-2000) 33433 at 1700 in Liverpool.

Later, the Voice of Vietnam, Hanoi **12.020** (Fr to Eur 1830-1900) was SIO 333 at 1833 in Macclesfield; R.Nederlands via Flevo **11.655** (Eng to Africa 1830-2025) 34423 at 1930 in Colyton; VOA via Morocco? **11.855** (Eng to Africa 2000-2030) 44444 at 2010 in Rugby; BBC via Skelton, UK **11.835** (Eng to W.Africa 2000-2300) 34444 at 2042 in Manchester; AIR via Bangalore **11.620** (Eng, Hi to Eur 1745-2230) 33333 at 2052 in Morpeth; R.Kuwait via Kabd **11.990** (Eng to Eur, N.America 1800-2100) 54444 at 2056 in Plymouth; RCI via Sackville **11.945** (Fr, Eng to Eur, Africa 2000-2300) 45444 at 2115 in Northampton; BBC via Ascension Is **12.095** (Eng to S.America 2000-0200) 54434 at 2314 in Kirkby Stephen.

R.New Zealand has been reaching the UK in the **9MHz** (31m) band. Their broadcast to Pacific areas on **9.700** (Eng 0707-1015?) was rated 34333 at 0710 in Galashiels & 35333 at 0845 in St.Mary's, IoS. Also heard during the morning were Swiss R.Int via Julich, Germany **9.885** (Fr, It, Eng, Ger to Africa 0600-0815), rated 44444 at 0750 in SW.London; Swiss R.Int via Montsinery, Fr.Guiana **9.885** (Eng, Ger, Fr, It to Australia 0830-1030) 34333 at 0933 in Oxted; BBC via Skelton, UK **9.410** (Eng to Eur, N/C.Africa 0400-2200) 33333 at 0956 in Rugby; R.Vlaanderen Int, Belgium **9.925** (Eng to Eur, M.East 1130-1200) 44444 at 1130 in Morden; R.Nederlands via Wertachtal **9.855** (Eng to Eur 1130-1325) 55555 at 1131 in St.Austell.

Later, VOA via ? **9.760** (Eng to Eur, N.Africa 1700-2200) was 54444 at 1745 in E.Bristol; R.Australia via Shepparton **9.500** (Eng to Asia, Pacific 1600?-2130) 22222 at 1755 in Truro; AIR via Delhi? **9.950** (Eng to Asia 1745-1945) 44444 at 1800 in Woodhall Spa;

MEDIUM WAVE CHART

Freq (kHz)	Station	Country	Power (kW)	Listener
520	Hof/Wurzburg(BR)	Germany	0.2	H*
531	Ain Beida	Algeria	600/300	B*
531	Berg	Germany	20	A,B,H*,J,M*
531	RNE5 via ?	Spain	?	H*,J
531	Beromunster	Switzerland	500	D,J*,O,P
540	Wavre	Belgium	150/50	A,B,H*,J,M*,N*,O,P,Q
540	Sidi Bennour	Morocco	600	B*,H*,J*,M*
549	Les Trembles	Algeria	600	A*,B*,J*,M*
549	Thurnau (DLF)	Germany	200	A,B,H*,J*,M,O,P,Q
558	Espoo	Finland	100	H*,J*,O*
558	RNE5 via ?	Spain	?	A,H*,J*,M*,O
567	Berlin	Germany	100	B*
567	Tullamore(RTE1)	Eire	500	A,B,D,G,J,M*,N,O,P,Q
567	RNE5 via ?	Spain	?	A*,B*,H*,M*
576	Muhlacker(SDR)	Germany	500	A,H*,M*,O,P
576	Barcelona(RNE5)	Spain	50	A*,J*,M*,O*
585	Orf Wien	Austria	600	J*
585	Paris(FIP)	France	8	B,J
585	Madrid(RNE1)	Spain	200	A*,H*,J*,M*,N*,O*,P,Q*
585	Dumfries(BBCScot)	UK	2	A,H*
594	Frankfurt(HR)	Germany	1000/400	B,H*,M*,O,P
594	Oujda-1	Morocco	100	B*,J*
594	Muge	Portugal	100	J*,O*
603	Lyon	France	300	M
603	Sevilla(RNE5)	Spain	50	A*,H*,J*,M*,N*
603	Newcastle(BBC)	UK	2	A,G,H*,M,O
612	Athlone(RTE2)	Eire	100	A,B,D,G,J,M*,N,O,P,Q
612	RNE1 via ?	Spain	10	A*,J*,M*,O*
621	Wavre	Belgium	80	A,B,H*,I,J,M*,O,P,Q
621	RNE1 via ?	Spain	10	A*,O*
621	Barcelona(OCR)	Spain	50	H*,J*,M*
630	Dannenberg(NDR)	Germany	100	A*
630	Vigra	Norway	100	A,H*
630	Tunis-Djedeida	Tunisia	600	A*,H*,J*,M*,O*
639	Praha(Liblice)	Czech	1500	A*,B,H*,J*,M*,O*
639	RNE1 via ?	Spain	?	A*,H*,J*,M*,O,P
648	RNE1 via ?	Spain	10	A*,M*
648	Orfordness(BBC)	UK	500	A,B,E*,G,H*,I,J,M*,N,O*,P,Q
648	Kharkiv	Ukraine	150	J*
657	Napoli	Italy	120	E*,J*
657	Madrid(RNE5)	Spain	20	A*,E*,H*,J*,M*,O*,P
657	Wrexham(BBC,Wales)	UK	2	A,B,D,G,H*,Q
666	Messkirch/Rohrd(SWF)	Germany	150	E,H*,N*,P
666	Sitkunai(R.Vilnius)	Lithuania	500	H*,O*
666	Lisboa	Portugal	135	H*,J*,O*
666	Barcelona(SER)	Spain	50	A*,B
675	Marseille	France	600	H*
675	Lopic(R10 Gold)	Holland	120	A,B,D,E*,H*,I,M*,N*,O*,P,Q*
684	Sevilla(RNE1)	Spain	500	A*,B,D,I*,H*,J*,M*,O*
684	Avala(Beograd-1)	Yugoslavia	2000	H*,J*,P
693	Droitwich(BBC5)	UK	150	A,B,J,M,O*,Q
702	Yerevan	Armenia	100	O*
702	Flensburg(NDR)	Germany	5	B,H*
702	TWR via Monte Carlo	Monaco	300	H*,J*,O*
702	Zamora(RNE1)	Spain	10	A*
711	Rennes 1	France	300	A,B,D,H*,J,M,P,Q
711	Murcia(COPE)	Spain	5	A*
720	Lisnagarvey(BBC4)	N.Ireland	10	J*,N
720	Norte	Portugal	100	H*
720	Lots Rd,Ldn(BBC4)	UK	0.5	A,B,J,M,Q
729	Cork(RTE1)	Eire	10	A,G,H*,J,O*,N*
729	RNE1 via ?	Spain	?	A*,I*,H*,J*,M*,O*,Q*
738	Paris	France	4	B,J
738	Barcelona(RNE1)	Spain	500	A*,D*,H*,J*,M*,O*
747	Flevo(Hilv2)	Holland	400	A,B,I*,H*,J,M*,N,O*,P*,Q
756	Braunschweig(DLF)	Germany	800/200	A*,D,H*,J*,M*,O*
756	Bilbao(EI)	Spain	5	O*,P*
756	Redruth(BBC)	UK	2	B,G,H*,J
765	Sottens	Switzerland	500	A*,D,H*,J*,M*
774	Enniskillen(BBC)	N.Ireland	1	H*,N
774	RNE1 via ?	Spain	?	A*,B*,H*,J*,M*,O*,P*
783	Leipzig(MDR)	Germany	100	A*,B*,H*,J*,M*,O*
783	Miramar(R.Porto)	Portugal	100	H*,J*
783	Dammam	Saudi Arabia	100	J*
792	Limoges	France	300	D,J
792	Lingen(NDR)	Germany	5	B*,H*
792	Sevilla(SER)	Spain	20	A*,H*,J*
792	Londonderry(BBC)	UK	1	N
801	Munchen-Ismaning	Germany	300	A*,B*,H*,J*
801	RNE1 via ?	Spain	?	A*,H*,J*,M*,O*
810	Volgograd	Russia	150	J*
810	Madrid(SER)	Spain	20	A*,B*,H*,I,J*,O*
810	Westerglen(BBC,Scot)	UK	100	A,B*,G,J*,M*,N,O*,P*,Q*
819	Batra	Egypt	450	J*,O*
819	Toulouse	France	50	H*
819	S.Sebastian(EI)	Spain	5	B*,J*
828	Hannover(NDR)	Germany	100/5	A*
828	Rotterdam	Holland	20	H*,I
828	Barcelona(SER)	Spain	50	A*
837	Nancy	France	200	B*,P*
837	COPE via ?	Spain	?	A*,H*,J*
846	Rome	Italy	540	A*,E*,H*,J*,M*,O*,P*
855	Berlin	Germany	100	A*,H*
855	RNE1 via ?	Spain	?	A*,B*,H*,I*,J*,M*,O*,P*
864	Santah	Egypt	500	H*,J*
864	Paris	France	300	B*,D,I,J,M,O,P*,Q
864	Socuellamos(RNE1)	Spain	2	J*,M*
873	Frankfurt(AFN)	Germany	150	A*,G,H*,J*,P*
873	Zaragoza(SER)	Spain	20	A*,H*,J*,M*
873	Enniskillen(R.UI)	UK	1	G,H*,N
882	COPE via ?	Spain	?	A*,H*
882	Washford(BBC,Wales)	UK	100	A,B*,G,I,J,M*,N,O*,P*,Q*
891	Algiers	Algeria	600/300	A*,B*,D*,H*,M*,O*
891	Huisberg	Netherlands	20	H*,J*
900	Milan	Italy	600	A*,D,E*,H*,J*,M*,O*,P*
900	COPE via ?	Spain	?	B*,H*,J*,O*
909	B'mans Pk(BBC5)	UK	140	B*,J,M*,N,O*,Q
909	M'side Edge(BBC5)	UK	200	A
918	Domzale	Slovenia	600/100	A*,H*,J*,O*,P*
918	Madrid(R.Int)	Spain	20	A*,B*,H*,J*
927	Wolvertem	Belgium	300	A,B*,D,H*,I,J,M*,O*,P*,Q
936	Bremen	Germany	100	A*,B*,H*,J*,O*,O*
936	Venezia	Italy	20	J*
936	RNE5 via ?	Spain	?	O*
945	Riga	Latvia	50	O*
945	Toulouse	France	300	H*,O*
954	Brno (CRo2)	Czech Rep.	200	A*,H*,J*,O*
954	Madrid(CI)	Spain	20	A*,B*,H*,J*,O*
963	Sofia	Bulgaria	150	J*
963	Pori	Finland	600	A*,H*,J*,M*,O*
972	Hamburg(NDR)	Germany	300	A*,H*,J*,M,O*,O*
972	RNE1 via ?	Spain	?	H*
972	Nikolayev	Ukraine	500	M*
981	Alger	Algeria	600/300	A*,B*,H*,J*,M*,O*
981	Megara	Greece	200	O*
990	Berlin	Germany	300	A*,B*,H*,J*,O*
990	R.Bilbao(SER)	Spain	10	A*,H*,J*,M*,P*
990	Redmoss(BBC)	UK	1	H*,N
990	Tywyn(BBC)	UK	1	G
999	Schwerin (RIAS)	Germany	20	A*,H*
999	Madrid(COPE)	Spain	50	A*,B*,O*,P*
1008	SER via ?	Canaries/Spain	?	A*
1008	Flevo(Hilv-5)	Holland	400	A,B*,D,H*,I,J,O*,P*,Q*
1017	Rheinsender(SWF)	Germany	600	A*,B*,H*,J*,O*,P*
1017	RNE5 via ?	Spain	?	J*
1026	SER via ?	Spain	?	A*,D*,H*,M
1035	Tallinn	Estonia	500	J*,O*
1035	Lisbon(Prog3)	Portugal	120	H*
1044	Dresden(MDR)	Germany	20	A*,B*,H*,M*,O*
1044	SER via ?	Spain	?	M*,P*
1044	S.Sebastian(SER)	Spain	10	B,J*
1053	Zarogoza(COPE)	Spain	10	A*
1053	Talk R.UK via ?	UK	?	A,B*,I,J,M*,N,O*,Q
1062	Kalundborg	Denmark	250	A,B,D,H*,J*,O*,O*
1062	R.Uno via ?	Italy	?	B*,J*
1071	R.France via ?	France	?	B*,H*,J*
1071	Bilbao(EI)	Spain	5	A*,J*,P*
1071	Talk Radio UK via ?	UK	?	A,M*,Q
1080	SER via ?	Spain	?	A*,B*,J*,M,O*,P*
1089	Talk Radio UK via ?	UK	?	A,B*,I,J,M*,N,O*,Q
1098	Nitra(Jarok)	Slovakia	1500	A*,B*,H*,J*,M*,O*
1098	RNE5 via ?	Spain	?	A*
1107	AFN via ?	Germany	10	A*,H*
1107	Talk R.UK via ?	UK	?	A,B*,I,J,O*,Q
1125	La Louviere	Belgium	20	A*,B*,H*,J*,O*,O*
1125	RNE5 via ?	Spain	?	A*,B*,J*,P*
1125	Llandrindod Wells	UK	1	G
1134	COPE via ?	Spain	2	A*,B*,J*,M*
1134	Zadar(Croatian R)	Yugoslavia	600/1200	A*,D,H*,J*,M*,O*,P*,Q*
1143	AFN via ?	Germany	1	A*,E*,H*,J*,M*
1143	COPE via ?	Spain	2	A*,H*,J*,M*,O*,P*
1152	RNE5 via ?	Spain	10	A*
1170	,	Sasnovy	Belarus	1000 O*
1179	SER via ?	Spain	?	A*
1179	Solvesborg	Sweden	600	A*,B*,D,H*,I*,J*,M*,O*,P*,Q*
1188	Kuurne	Belgium	5	B*,H*,J*,O*,P*
1188	Szolnok	Hungary	135	O*
1197	Munich(VOA)	Germany	300	H*
1197	Virgin via ?	UK	?	A,B*,I,J,M*,N,O*,Q
1206	Bordeaux	France	100	D,J
1215	Virgin via ?	UK	?	A,B*,J,M*,N,O*,Q
1224	Lelystad	Holland	50	B*,H*,O*,P*
1224	COPE via ?	Spain	?	M*
1233	Liege	Belgium	5	H*,J*
1233	Virgin via ?	UK	?	A,B*,M*,O*,Q
1242	Marseille	France	150	D,H*,M*,P*
1242	Virgin via ?	UK	?	A,M*,O*
1251	Marcali	Hungary	500	M*
1251	Huisberg	Netherlands	10	A*,J,M*,P*
1260	SER via ?	Spain	?	A*,H*,J*,M
1260	Guildford (V)	UK	0.5	B*
1269	Neumunster(DLF)	Germany	600	A,H*,I,J*,M*,O*,P*,Q*
1269	COPE via ?	Spain	?	A*,M*
1278	Strasbourg	France	300	J
1278	Dublin/Cork(RTE2)	Eire	10	A,B*,G,H*,J*,M*,N,O*,P*,Q*
1287	RFE via ?	Czech Rep.	400	D,H*,J*,M*,O*
1287	Lerida(SER)	Spain	10	B*,J*
1296	Kardzali	Bulgaria	150	J*
1296	Valencia(COPE)	Spain	10	B*,M*,O*,P*
1296	Orfordness(BBC)	UK	500	A,G,H*
1305	RNE5 via ?	Spain	?	J*,M*
1314	Kvitsoy	Norway	1200	A,B*,D,E*,H*,I,J,M*,O*,P*,Q*
1323	Zyyi(BBC)	Cyprus	200	K
1323	W'brunn (VRussia)	Germany	1000/150	A,B*,D,E,H*,M*,P*,O*
1332	Rome	Italy	300	B*,E*,H*,J*,M*,O*
1341	Lisnagarvey(BBC)	N.Ireland	100	A,E*,G,J,M*,N,P*
1341	Tarrasa(SER)	Spain	2	B*,J*
1350	Nancy/Nice	France	100	B*,J*,O*
1350	Cesvaine/Kuldiga	Latvia	50	B,F*,H*,J*
1359	Madrid(RNE)	Spain	600	A*,H*,J*,M*,O*
1368	Foxdale(Manx R)	I.O.M.	20	A,G,H*,J*,N
1377	Lille	France	300	B,F*,I,H*,J,N,P*,Q
1377	Tanaf	Iraq	1000	M*
1377	Chernivtsi	Ukraine	50	O*
1386	Bolshakovo	Russia	2500	A,D,E*,F*,H*,J*,M*,P*,O*
1395	Fllake	Albania	1000	A
1395	TWR via Fllake	Albania	500	H*,O*
1395	Lopic	Netherlands	120/40	B,D,F*,H*,I,J,M*,P*,Q*
1404	Brest	France	20	A,B,H*,I,J,M*,O*,P*,Q*
1413	RNE5 via ?	Spain	?	H*,M*
1413	Pristina	Yugoslavia	1000	J*
1422	Heusweiler(DLF)	Germany	1200/600	A,B,D,F*,H*,I,J*,M*,O*,P*,Q*
1440	Marnach(RTL)	Luxembourg	1200	A,D,H*,J,M*,N,P*,O*
1449	Squinzano (RAI)	Italy	50	J*
1449	Redmoss(BBC)	UK	2	M*
1458	Fllake	Albania	500	O*
1467	Monte Carlo(TWR)	Monaco	1000/400	A*,H*,J*,M*,P*,O*
1476	Wien-Bisamberg	Austria	600	A*,H*,L*,M*,P*,O*
1485	SER via ?	Spain	?	D,M*
1494	Clermont-Ferrand	France	20	A,D,J,D*
1494	St.Petersburg	Russia	1000	E*,H*,J*,M*,Q*
1503	RNE5 via ?	Spain	?	M*,O*
1512	Wolvertem	Belgium	300	A,B,D*,E*,H*,J*,L*,M*,N*,P*,O*
1521	Kosice(Cizatice)	Slovakia	600	A*
1521	Duba	Saudi Arabia	2000	J*,M*
1530	Vatican R	Italy	150/450	D*,E*,F*,G,H*,J*,M*,O*,P*,O*
1530	Penheira(VOA)	Sao Tome	100	C*
1539	Mainflingen(ERF)	Germany	350(700)	A,D*,H*,J*,M*,P*,O*
1539	SER via ?	Spain	?	F*,J,O*
1539	Valladolid(SER)	Spain	5	M*
1548	Kuwait(VOA)	Kuwait	600	K
1356	Sarnen	Switzerland	300	H*
1575	Genova	Italy	50	J*
1575	SER via ?	Spain	5	A*,H*,M*,O*,Q*
1584	SER via ?	Spain	2	A*,J*,M*,O*
1593	Holzkirchen(VOA)	Germany	150	H*,J*,M*,O*,P*,Q*
1602	SER via ?	Spain	?	J*,M*
1602	Vitoria(EI)	Spain	10	H*,J*,M*,O*
1611	Vatican R	Italy	15	E*,G*,H*,J*,M*,P*,O*

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

Listeners:-

(A) Martin Dale, Stockport.
(B) John Eaton, Woking.
(C) Paul Hawkins, Cinderford.
(D) Simon Hockenhull, E.Bristol.
(E) Sheila Hughes, Morden.
(F) Rhoderick Illman, Oxted.
(G) Brian Keyte, Gt.Bookham.
(H) Eddie McKeown, Newry.
(I) Frank Miles, SW.London.
(J) George Millmore, Wootton IoW.
(K) John Parry, Larnaca, Cyprus.
(L) Clare Pinder, while in Appleby.
(M) Robert Shacklock, Westwood, Notts.
(N) Tom Smyth, Co.Fermanagh
(O) Ernie Strong, Ramsey, Cambs.
(P) Phil Townsend, E.London.
(Q) Fred Wilmshurst, Northampton.

TROPICAL BANDS CHART

Freq (MHz)	Station	Country	UTC	DXer
3.210	REE via Costa Rica	Costa Rica	0346	A,F,L
3.210	Em.Nacional, Maputo	Mozambique	2040	B
3.220	R.Kara, Lome	Togo	2045	B
3.223	AIR Simla	India	1525	D,U
3.240	TWR Shona	Swaziland	0300	L
3.245	AIR Lucknow	India	1535	U,V
3.255	BBC via Meyerton	S.Africa	2020	L,N,S,U,V
3.270	Namibian BC,Windhoek	Namibia	2019	B,K,L,N
3.290	Voice of Guyana	Guyana	0730	U
3.290	Namibian BC,Windhoek	Namibia	2019	B,L,N,R,W
3.300	R.Cultural	Guatemala	0150	D,L,U
3.306	ZBC Prog 2	Zimbabwe	2050	B
3.315	AIR Bhopal	India	0045	D,N,O,U,V
3.320	SABC (RSG) Meyerton	S.Africa	2345	B
3.335	CBS Taipei	Taiwan	2026	A,N,U
3.345	AIR Jaipur	India	0043	D,N,O
3.365	R.Cult. Araraquara	Brazil	2329	D
3.365	GBC R-2	Ghana	2024	B,L,N,S
3.365	AIR Delhi	India	1732	N,O,U,V
3.375	Em Nacional,Mulenvos	Angola	0447	F
3.900	Haixia 1	China	1617	U
3.915	BBC via Kranji	Singapore	2105	A,B,D,H,L,R,T,V,Y
3.945	AIR Gorakhpur	India	1510	U
3.950	Qinghai PBS, Xining	China	2317	D
3.955	BBC via Skelton	England	1932	A,B,D,G,H,J,K,L,T,W,X,Y
3.955	Nexus, Milan	Italy	2150	R
3.955	Channel Africa	S.Africa	0152	V
3.960	Xinjiang PBS, Urumqi	China	0050	V
3.965	RFI Paris	France	2110	A,D,H,K,L,W
3.970	R.Korea via Skelton	England	2100	A,B,C,G,H,L,P
3.975	R.Budapest	Hungary	2005	B,G,H,J,K,L,P,Q,V,W
3.985	Nexus, Milan	Italy	0830	G,L
3.985	China R.Int via SRI	Switzerland	2143	A,B
3.990	Xinjiang BS, Urumqi	China	1512	U
3.995	DW via Julich	Germany	1910	A,C,D,G,K,L,M,T,V,W,Y
3.995	DW via Meyerton	S.Africa	2015	B,I
4.000	RRI-Kendari	Indonesia	1537	U
4.005	Vatican R.	Italy	1830	A,D,H,J,K,L,T,V,W,Y
4.330	Xinjiang BS, Urumqi	China	0005	T,U
4.441	R.Ecologia	Bolivia	1845	V
4.500	Xinjiang BS, Urumqi	China	2331	B,D,L,T,U,V
4.725	R.Myanmar, Yangon	Burma	1345	U
4.735	Xinjiang, Urumqi	China	0125	B,E,L,T,U,V
4.750	Xizang BS, Lhasa	China	0008	D,L,T
4.755	R.Educ CP Grande	Brazil	0059	A
4.760	Yunnan PBS,Kunming	China	2350	B
4.760	AIR Port Blair	India	1550	T,U
4.765	R.Rural, Santarem	Brazil	0155	A
4.770	Centinela del Sur	Ecuador	2355	B
4.770	FRCN Kaduna	Nigeria	2112	A,B,D,F,G,J,K,L,N,R,S,T,U,W,Y
4.775	AIR Imphal	India	1647	N,U
4.783	RTM Bamako	Mali	2027	A,B,L,N,U
4.790	AIR Itanagar	India	0015	A,B
4.790	Azad Kashmir R.	Pakistan	1514	N,U,V
4.800	AIR Hyderabad	India	1700	B,N,U,V
4.800	LNBS Maseru	Lesotho	0304	B,L,V
4.815	R.Difusora, Londrina	Brazil	0015	B
4.815	R.diff TV Burkina	Ouagadougou	2055	N
4.820	R.Botswana, Gaberone	Botswana	2115	B,H,J,L,S,V
4.820	AIR Calcutta	India	1511	N,U
4.820	Xizang, Lhasa	Tibet	0010	T
4.825	V of Selva	Peru	0115	A
4.828	ZBC R-4	Zimbabwe	1951	N,U
4.830	R.Tachira	Venezuela	0108	A,B,D,F,J,V
4.832	R.Reloj	Costa Rica	0450	E,U
4.835	R.Tezulutlan, Coban	Guatemala	2205	D
4.835	RTM Bamako	Mali	2020	A,B,F,G,H,K,L,N,S,T,U,W
4.840	AIR Bombay	India	0201	A,B,L,N,T,U,V
4.850	R.Yaounde	Cameroon	2020	A,B,D,L,V,W
4.850	AIR Kohima	India	0005	B,J,T,V
4.860	AIR Delhi	India	1827	A,L,N,S,T,U,V,W
4.865	PBS Lanzhou	China	2310	B,D,G,J,L,T,U
4.870	R.Cotonou	Benin	2112	A,F,K,N,U
4.870	Voz del Upano	Ecuador	0015	B
4.879	R.Bangladesh	Bangladesh	1550	U
4.880	AIR Lucknow	India	0104	L,V
4.885	R.Clube do Para	Brazil	0116	A,U
4.885	R.Difusora Acreana	Brazil	0225	B,F
4.890	RFI Paris	via Gabon	0358	F,L,U
4.890	R.Port Moresby	New Guinea	2025	N,U
4.895	Pakistan BC	Pakistan	0114	V
4.900	Haixia 2,V of Strait	China	2215	J,L,N,T,U
4.910	Tennant Creek	Australia	2134	N
4.910	R.Zambia, Lusaka	Zambia	2105	B
4.915	R.Anhanguera	Brazil	1857	V
4.915	GBC-1, Accra	Ghana	2110	A,B,F,H,K,L,N,S,T,U,V
4.915	R.Cora de Peru, Lima	Peru	0116	D
4.920	R.Quito, Quito	Ecuador	0505	A,D,F,U
4.920	AIR Chennai	India	1655	B,D,U,V
4.925	R.Nacional, Bata	Eq.Guinea	0120	V
4.930	R.Internacional	Honduras	0111	V
4.935	KBC Gen Sce Nairobi	Kenya	1949	N
4.940	Haixia 1,V of Strait	China	2110	N
4.940	AIR Guwahati	India	0106	D,L,N,U,V
4.940	SLBC (Eng.Comm.Svce)	Sri Lanka	0226	D
4.945	R.Illimani, La Paz	Bolivia	0010	B
4.950	R.Baha'i	Ecuador	0107	V
4.950	AIR Srinagar	India	1720	N,U
4.950	VOA via Sao Tome	Sao Tome	2028	A,G,K,L,N,P,T,U,V,W
4.955	R.Nac. de Colombia	Colombia	0005	A,B,D,L
4.960	R.Federacion, Sucua	Ecuador	2304	D,V
4.960	VOA via Sao Tome	Sao Tome	0302	A,L,Q,U
4.965	R Alvorada	Brazil	0055	B
4.965	Christian Voice	Zambia	1942	A,G,L,N,U
4.970	PBS Xinjiang	China	0010	D
4.975	R.Timbre, Sao Luiz	Brazil	0100	V
4.975	Fujian 1, Fuzhou	China	0130	V
4.975	R.Uganda, Kampala	Uganda	1950	A,F,L,N,Q,S,T,U
4.980	PBS Xinjiang, Urumqi	China	2335	B,D,U
4.980	Ecos del Torbes	Venezuela	0041	A,B,D,E,G,I,K,L,N,U,V
4.985	R.Brazil Central	Brazil	0015	A,B,D,N,T,U,V
4.990	AIR Ext.Service	India	0055	U,V
5.005	R.Nacional, Bata	Eq.Guinea	0107	L,U
5.005	R.Nepal, Kathmandu	Nepal	0040	B,U
5.009	R.TV Malagasy	Madagascar	1705	N,U
5.010	R.Garoua	Cameroon	1655	B
5.010	AIR Thiru'puram	India	0045	A,B,D,L
5.020	PBS-Jiangxi Nanchang	China	2324	T
5.020	La V du Sahel,Niamey	Niger	2118	D,F,N
5.025	R Parakou	Benin	2049	A,N,U,V
5.025	R.Rebelde, Habana	Cuba	0035	A,B,U,V
5.025	R.Uganda, Kampala	Uganda	2043	L
5.030	AWR Latin America	Costa Rica	0040	A,B,F
5.030	RTM Kuching	Sarawak	2111	N
5.035	R.Bangui	C.Africa	2000	N
5.040	PBS Fujian, Fuzhou	China	2320	T
5.040	Voz del Upano, Macas	Ecuador	0045	B
5.047	R.Togo, Lome	Togo	2025	F,L,N,U
5.050	Guangxi FBS, Nanning	China	1607	N,U
5.050	Haixia 1,V of Strait	China	2328	T
5.050	R.Tanzania	Tanzania	2025	B,J,L,N,U,W
5.055	RFO Cayenne(Matoury)	French Guiana	0134	U,V
5.060	PBS Xinjiang, Urumqi	China	1615	B,G,L,T,U
5.075	Caracol Bogata	Colombia	0015	A,B,F,J,U,V
5.090	Taiwan 2 Sce,Beijing	China	1640	U
5.100	R.Liberia, Totota	Liberia	2109	A,J,N
5.320	CNR 1	China	0020	B

DXers:-

(A) Michael Casey, Manchester.
(B) Robert Connolly, Kilkeel.
(C) Bernard Curtis, Stalbridge.
(D) John Eaton, Woking.
(E) David Edwardson, Wallsend.
(F) David Hall, Morpeth.
(G) Brian Heath, Stapleton.
(H) Simon Hockenhull, E.Bristol.
(I) Robert Hughes, Liverpool.
(J) Sheila Hughes, Morden.
(K) Rhoderick Illman, Oxted.
(L) Eddie McKeown, Newry.
(M) Frank Miles, SW.London.
(N) Fred Pallant, Storrington.
(O) John Parry, Larnaca, Cyprus.
(P) Clare Pinder, while in Appleby.
(Q) Peter Pollard, Rugby.
(R) Vic Prier, Colyton.
(S) Philip Rambaut, Macclesfield.
(T) Robert Shacklock, Westwood, Notts.
(U) John Slater, Scalloway.
(V) Emie Strong, Ramsey, Cambs.
(W) Phil Townsend, E.London.
(X) Martin Venner, St. Austell.
(Y) Fred Wilmshurst, Northampton.

Voice of Vietnam, Hanoi **9.840** (Eng to Eur 1900-1930) 33343 at 1905 in Liverpool; R.Thailand, Udon Thani **9.535** (Eng, Ger to Eur 1900-2100) 44423 at 1920 in Colyton; R.Cairo, Egypt **9.990** (Eng to Eur 2115-2245) SIO 222 at 2115 in Co.Fermanagh; RCI via Sackville, Canada **9.725** (Eng to Eur, Africa 2100-2200) 53444 at 2149 in Kirkby Stephen; RCI via Skelton, UK **9.805** (Fr, Eng to Eur, Africa 2000-2200) 45544 at 2155 in Northampton; BBC via Sackville **9.590** (Eng to N.America 2200-0000) 54454 at 2324 in Woking; CBC via Sackville **9.625** (Eng, Fr & others to N.Quebec 1155-0610) 35553 at 0219 in Wallsend; BBC via Kranji, Singapore **9.740** (Eng to Asia 0500-2330) 33553 at 0505 in Cyprus.

Many of the broadcasts in the **7MHz** (41m) band are for European listeners. Some originate from R.Japan via Woofferton, UK **7.230** (Jap, Eng to Eur 0500-0700) rated 43433 at 0655 in Herstmonceux; WYFR via Okeechobee, USA 7.355 (Eng 0600-0800, also to Africa) 54444 at 0717 in Plymouth; AWR via Forli, Italy **7.230** (Eng 0730-0800 Sun) 33222 at 0730 in Appleby; Polish R, Warsaw **7.270** (Eng to Eur 1330?-1430?) 54544 at 1331 in Bridgwater; Sudwestfunk via Rohrdorf **7.265** (Ger 24hrs) 55555 at 1513 in Woking; REE via Noblejas, Spain **7.275** (Sp 1700-2230) 55455 at 1715 in Liverpool; R.Slovakia Int **7.345** (Eng 1730?-1757?) 54434 at 1750 in E.Bristol; AIR via Bangalore **7.410** (Hi, Eng 1745-2230) 33323 at 1832 in Woodhall Spa; Voice of Russia **7.340** (Eng [WS]) 44444 at 1911 in St.Austell; Israel R, Jerusalem **7.465** (Eng 2000-2025) 54544 at 2000 in Galashiels; Polish R, Warsaw **7.285** (Eng to Eur 2030-2128) SIO 444 at 2030 in Co.Fermanagh; Vatican R, Italy **7.250** (Eng 2050-2110) 44444 at 2050 in Morden; Voice of Russia **7.300** (Eng [WS]) 44434 at 2100 in Stalbridge; R.Prague, Czech Rep. **7.345** (Eng, Sp 2100-2157) 44444 at 2135 in Kirkby Stephen; BBC via Skelton, UK **7.325** (Eng 2000-2200) 44333 at 2150 in Northampton; RCI via Skelton, UK **7.235** (Eng 2100-2230) 35444 at 2109 in Storrington; R.Budapest, Hungary **7.250** (Eng 2200-2230) 42334 at 2200 in SW.London; Voice of Turkey **7.280** (Eng 2300-0000) SIO 333 at 2313 in N.Bristol; Christian Science BC via WSHB **7.510** (Eng 2200-0000?) 44444 at 2350 in Truro.

Whilst beaming to other areas the Voice of Nigeria, Ikorodu **7.255** (Eng, Fr, Hau to W.Africa 0500-0900) was 44444 at 0500 in Newry; KNLS Alaska **7.365** (Eng to F.East? 0800-0900) 34333 at 0800 in Scalloway; United Nations R. via Nexus, Italy **7.120** (Eng [u.s.b.] to Africa) 23432 at 0835 in Colyton; VOA via Thailand? **7.125** (Eng to E/SE.Asia 1400-1800) 34333 at 1600 in Dudley; Voice of Nigeria, Ikorodu **7.255** (Eng to W.Africa 1900-2100) 33443 at 2017 in Manchester; KTBN via Salt Lake City **7.510** (Eng to N.America 0000-1600) 33333 at 0040 in Kilkeel.

There are many more to Europe in the **6MHz** (49m) band. Some come from R.Japan via Skelton, UK **5.975** (Eng 0600-0700) rated 43333 at 0600 in Appleby; Bayerischer Rundfunk, Germany **6.085** (Ger 24hrs) 44333 at 1025 in Oxted; R.Nederlands via Julich **6.045** (Eng 1130-1325) 55555 at 1225 in Northampton; Deutschland R. Berlin **6.005** (Ger to Eur 24hrs) 54444 at 1520 in Woking; BBC via Rampisham & Skelton, UK **6.195** (Eng 0200-0730, 1530-2230) 44444 at 1630 in Malta & SIO 444 at 1800 in Co.Fermanagh; Vatican R, Italy **5.883** (Various [Ger 1830]) 43443 at 1830 in Colyton; RAI Rome **5.970** (Eng 1935-1955) 54454 at 1940 in Kirkby Stephen; SRI via Lenk? **6.165** (Ger, It, Fr. Eng 1830-2030) 44444 at 2010 in Truro; R.Finland via Pori **6.135** (Eng 2000-2030) 54544 at 2025 in Herstmonceux; R.Sweden via Horby **6.065** (Eng 2030-2100) 55555 at 2047 in St.Mary's, IoS; R.Bulgaria, Sofia **5.850** (Eng 2000-2100) 43323 at 2055 in Stalbridge; BBC via Cyprus **6.180** (Eng 1800-2100) 54454 at 2055 in Liverpool; Polish R, Warsaw **6.095** (Eng 2030-2129) 43333 at 2100 in Morden; China R.Int via Russia? **6.950** (Ger, Eng 1900-2157) 33323 at 2115 in Rugby; R.Austria Int, via Moosbrunn **6.155** (Ger, Eng, Fr, Sp 0400-2300) 43343 at 2131 in Newry; R.Japan via Skelton, UK **6.155** (Eng 0000-0100) 34444 at 0032 in Manchester; RCI via Sackville **5.995** (Eng, Fr 2200-2300) 54554 at 2201 in Bridgwater; R.Taipei via WYFR **5.810** (Eng 2200-2300) 34433 at 2200 in Dudley.

Also noted in this band were WEWN Birmingham, USA **5.825** (Eng to USA 0000-1000), rated SIO 333 at 0945 in Macclesfield; BBC via Antigua, W.Indies **5.975** (Eng to C/N.America 2100-0800) 44344 at 2205 in St.Austell; BBC via Sackville, Canada **6.175** (Eng to N.America 2200-0500) 43443 at 0020 in Kilkeel; R.Nederlands via Bonaire, Ned.Antilles **6.165** (Eng to N.America 2130-0128) SIO 333 at 0028 in N.Bristol; WHRI South Bend, USA **5.745** (Eng to E.Canada, Eur 0000-0400 Tues-Sun) 44444 at 0325 in Morpeth.

Spoiling The Classics

Bob Ellis takes a break from the efficient, but unromantic, world of modern communications to remember a childhood spent spoiling the classics.

I have just clicked on what my PC chums call a Radio Button. This virtual version has none of the feel of a real button on a real radio, but it has sent an E-mail bulletin to about thirty customers. While I wait for them to get back to me, here's a few notes on what atrocities a young man can rain down on a classic AR88D.

It was Clive's. Clive was the least anoraky of the R&D Guys. I think it was marriage that meant he and it would never see each other again! Paid around £45? Sounds about right - it was a long time ago.

The only place for it was on the radiogram cabinet, the best speaker for it was the one inside. Disconnecting it from the record-player, even then declaring vinyl dead, and hooking it into the back of the AR88 resulted in a mere 2.5 to 15Ω mis-match. It seemed rather quiet, certainly for a rock-loving listener to Radio Northsea International.

First Evening

On that first evening, the AR88 was slid out of its oak case, on the hunt for easy mods. The output was a 6K6G, a valve I'd never heard of. It was capable of about 2W. Quite healthy - but for me, never enough.

A 6V6 was an easy solution. If it seemed okay, try a KT66...this was the one that went into heavy anode current and cooked the output transformer. That caramelised smell of expense! A sorry lesson was well learned, a 6K6 will fill a kids bedroom with The Who, just.

Was there a fault on my AR88? It seemed to work best with a 2.2µf capacitor from a.v.c. to ground. This was available by a connector on the back of the thing. It motor-boated without it.

Without understanding what I was doing, I must have extended the a.v.c. time constant to about a week. I was happy because it seemed quieter now. The diode output was fed to a Vortexion tape machine to record Kenny Everett from the new Radio 1 on 247m, 1214kHz for the record.

As this was a feed direct from the detector, the recorder neatly shorted out the a.v.c., but I was happy because it sounded louder now...

No 'S'-Meter

My AR88, like so many others, had no 'S'-Meter. The over-long long-wire antennas so swamped the front-end and the ant. trim seemed to have no effect. Metering was needed.

At first, this was a traditional bridge circuit sensing changes in the cathode voltage of an i.f. stage due to the a.v.c. Not a.g.c., you will note.

The AR88 had no schematic or manual, so every signal-handling valve cathode was tried. Some moved the meter, others didn't. When the meter did move with signal level, it was affected by the r.f. gain setting.

With no documentation, how was I to know which stages were controlled and which, if any, weren't. With no knowledge, what was I doing inside it anyway?

Meter Calibration

Meter calibration was carried out by finding the strongest station, then inserting a series resistance chosen to just ease the pointer off the end-stop. None of this '50µV for S9 at 14.2 Mc/s' stuff...

Although every set I ever saw had this phenomenon of the 'S'-Meter gracefully rising as the r.f. gain was reduced, for some reason this could not be tolerated in my AR88. The cure was to replace the double-diode detector (a 6H6?) with one that had a triode in it to drive a right-hand-zero milli-ammeter in the anode circuit. A rare 6SQ7 was chosen, on the engineering premise of having one in the junk room.

Not a junk box, you'll note, a junk room. The a.v.c. was applied to the grid turning the valve off, causing the meter to rise. Calibration? This was done by shorting the antenna to deck and padding the anode load with a resistor until f.s.d. (full-scale deflection, sorry) was achieved.

Having f.s.d. on a right-hand-zero meter gives you a traditional left-hand 'zero', and you can't end-stop it. All the a.v.c. in the world would only cut the triode off, reducing the anode current and the meter to zero - on the right-hand side of the scale.

Turning down the r.f. gain had no effect on the reading. This was a valve-voltmeter reading the a.v.c. directly, sort of!

Just 20p

The meter was from the Derby Radio Rally - 20p got me one with an uncalibrated scale, the first two-thirds in white, the last third in bright red. In the centre was an authority-lending legend: "A M." Below that, in seriously toxic luminous paint, the daunting words: "CARRIER THRESHOLD".

The military logo used to put the fear of God into visiting listeners. They really thought that prolonged operation 'in the red' would cause some dramatic failure. The sort of blow-out that puts inpromptu serving hatches into bedroom walls!

Thirty years has gone by since then, along with a career in Instrumentation. I have to say this was the most elegant indicator I ever came up with, totally uncalibrated, of course, but really effective. A victory like this gives you the confidence to really go to town. Front panels are drilled to take switches for product detectors, a cardinal sin.

The Motto

The rectifier valve is changed for silicon diodes with no current limiting. It seems to hum a bit now, so a weepy electrolytic capacitor is slapped across the h.t. While I answered the 'phone, that capacitor failed. A direct short across the power supply burned out the mains transformer, writing off a classic radio.

Why didn't the fuse go? Ah, well, an easy 'upgrade' you can do as a child is to fit higher-value fuses. This stupidity cost me a radio I dearly miss now. And the motto? If you don't understand it - leave it alone. Enjoy it for what it is - rather than what you were hoping for.

There were no radio buttons on an AR88. The one on this PC is 'pressed' with a mouse. A curious second-hand experience. I am doing it now to see if anybody has responded to my last E-mail. Er, no...apparently, I have a Fatal System Error at Module E004765007-00014. Never got those on my dear departed AR88. I did other things to the poor thing, but the Editor can't stand to read any more! ***SWM***

If you would like to read more of Bob's radio writings, why not take at look at his web page at **http://homepages.lycos.com/~bobellis/lypersonal/index.html**

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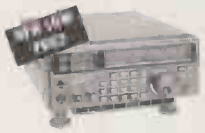

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Comments from John Griffiths

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

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Comments from John Griffiths

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

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AR8000	VGC	£189.95
Opto Scout	As new	£199.95
PRO-46	VGC	£99.95
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MilAir Photo Gallery

With recent events in the Gulf in mind, here is a selection of photographs showing some of the colour schemes and aircraft markings applied during and shortly after the 1991 Gulf War.

MilAir - Into The Unknown

The World Of Discrete Frequencies

When writing the 'MilAir' column it is sometimes difficult to get the balance of information right to please both the new, and experienced military airband listener. Those, who like myself have been listening for almost thirty years, (is it really that long?), tend to forget that each year sees more and more radio enthusiasts tuning into the airbands.

This also means that each year there are new listeners who want to find out what can be heard on the military airwaves. Consequently, for this airband special, I am going to enter the middle ground and take an exploratory look at some of the more interesting areas of the military airband - the discrete frequencies. By definition, the discrete frequencies are those which are not used for general Air Traffic movements, (i.e. Tower, Approach, Area Radar, etc.).

Best Source

For the new or experienced 'MilAir' listener by far the best source of instant frequency information is to buy one of the Airband guides such as *AIRWAVES* and the like. For instant action, most listeners will start by programming their radios with the military area radar frequencies, i.e. London and Scottish Military. Add to this the ATC frequencies from your local RAF or USAF bases and on most days, some MilAir action will be assured.

But, and it's a big but, there is much more to listen to beyond general Air Traffic Control - there is quite simply a whole new world of absorbing and sometimes very different MilAir listening. There are four main requirements for the average listener to enter the fascinating world of discrete frequencies. Firstly and probably most important, patience, closely followed by location, radio and antenna. Sometimes you can be lucky on your first day, and at other times it may take a little while.

In the 'MilAir' column over the past couple of years I have touched on several of the items in this article, but in this instance I have taken the opportunity to present a general overview of the subject. In an article of this length, it is not possible to go into great frequency detail on each subject and so the information will be somewhat generalised. Nevertheless, I hope to include enough information to be of interest to MilAir enthusiasts, especially those new to the hobby.

Air Defence Radar (ADR)

Whilst this article is not intended to be directly about ADR, there is little doubt that many areas of discrete military listening are inextricably linked to the UK Air Defence Radar system, (UKADGE). The primary use of the UK ADR is to provide Ground Controlled Interception

(GCI), from the various radar units located around the country.

The v.h.f./u.h.f. Air Defence system is split into 148 primary channels known as Tactical Air Designators, (TADS). Of these, about 140 are in use at any one time. In addition to GCI, these channels have specific frequencies that relate directly to some of the subjects mentioned in this article. (For example Air Refuelling and the Low Level Areas).

Whilst the TADS account for up to 148 discrete frequencies, this is only a small proportion of those in use nationally. There are at least a further 1400 discrete frequencies in use around the UK, some of which remain unidentified, (at least by me!).

So, let's look at some of the main areas of discrete frequencies. Whilst I have generalised under specific headings some of the subjects blend into each other in grey areas. You could define some frequencies as being multi-purpose, so please bear with me if your interpretation is different to mine.

Air Refuelling

The subject of Air Refuelling frequencies can be split into two main sections. The pre-designated UK Air Refuelling Areas and the Air to Air frequencies used by individual units or squadrons (see under Air to Air).

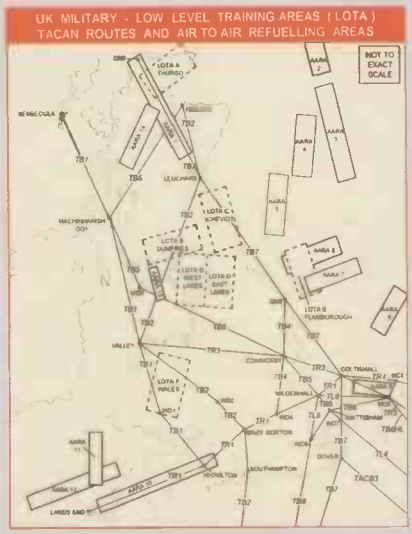
The UK Air to Air Refuelling Areas (AARA), were renumbered during 1998, (see *SWM* October 1998 for full details). Starting with Area 1 in Central Scotland they number in a clockwise direction around the UK. Areas 2 through to 8 are in the North Sea off the eastern coast of Scotland and Northern England. Area 9 is off the coast of East Anglia, Area 10 stretches from Somerset into Cornwall, Areas 11 and 12 are off the North Cornwall Coast, Area 13 between the Isle of Man and the English mainland and Area 14 is over Western Scotland. RAF and other NATO tankers can be heard working straight or racetrack patterns around these areas, refuelling their receivers (aircraft being refuelled).

At the time of writing I have had little new information regarding any changes to the Refuelling Area frequencies since the re-numbering exercise took place. Some of the frequencies are confirmed as still in use but others as yet still have a question mark against them. With this in mind the following frequencies should bring some results: **240.4, 245.25, 264.825, 283.05, 296.4, 297.75, 299.6, 306.5, 308.0, 316.35, 316.6, 326.9, 355.2, 356.45.** Don't forget, the Refuelling Areas are not in use every day, so it may be a while before you hear them being utilised.

Base Frequencies

Many of the military airfields in the UK have Air/Ground operations frequencies. Whether they are Base Operations, Command Posts or individual squadrons, they are primarily used for passing the status of aircraft, crew and, if applicable, passengers to an airfield ground station.

One of the best and most regularly heard examples are the Air Combat Command (ACC) **312.45** and Air Mobility Command (AMC) **370.95** operations frequencies at Mildenhall. Don't automatically assume that you will only hear these frequencies in use in the close



I am grateful to Photavia Press who have kindly let us reproduce a provisional map from their forthcoming publication, *Airwaves 99*. This map shows various UK military routes and operational areas, including the changes to the Refuelling Areas.

proximity of the airfield concerned. In the example I have given above, aircraft inbound to Mildenhall can often be heard making their first call to ground operations over 240km out.

Other airfields such as Coltishall may have an air/ground operations frequency for each of the based squadrons. In this instance, **268.6** 'Canopener Ops' 6 Squadron/**389.35** 'Redbird Ops' 41 Squadron/**372.35** 'Lion Ops' 54 Squadron. There is also a Coltishall Wing operations frequency of **364.8**.

Low Level Areas (LOTA)

There are seven primary Low Level Training Areas located around the UK, they are designated Alpha through Foxtrot. (Delta is split into East and West areas). Recent experience seems to indicate that these areas are mainly used by fighters engaged in Combat Air Patrol (CAP), as well as other low level training exercises. It has been noted that aircraft in the LOTA's engage in CAP as part of a larger mission profile, and often go on to other activities such as attacking ranges.

As these areas are quite large, aircraft can often operate over a wide area, but listening in to the following frequencies can prove quite interesting. The frequencies in use are as follows: LOTA Alpha **337.85**, LOTA Bravo **306.65**, LOTA Charlie **300.55**, LOTA Delta **369.05**, LOTA Echo **364.975**, LOTA Foxtrot **279.25**. If you are in the fortunate position of being able to identify the units operating in the LOTA, then it is well worthwhile listening to the relevant squadron **air to air** frequencies.

Air to Air

Squadron Air to Air frequencies in many instances are multi-purpose and therefore come into my definition of the grey area. They can be used at any time that aircraft need to remain in contact with each other, especially whilst using another primary frequency for their current ATC transit or mission. These frequencies can be heard in use during a wide selection of tasks such as Air refuelling, GCI, CAP or even in some instances just for a general chat.

There are literally hundreds of Air to Air frequencies in use around the UK and to go into them in any detail is well beyond the scope of this article. Bases such as Leeming, Valley or Lakenheath, each have upwards of 20 Air to Air frequencies available for use and so without filling their scanner's memories to the brim, listening in can pose a bit of a problem for the average enthusiast.

It is worth remembering that squadron Air to Air frequencies are mainly used by aircraft whilst away from their home base. I have often found that a bit of lateral thinking is the best way of locking onto Air to Air conversations. It may seen obvious but - if you are aware that a unit or squadron regularly uses a specific military area, (LOTA, Range, AARA, etc.), then try their Air to Air frequencies in the scan, it can often come up trumps.

As a brief example, 48FW, F-15's often carry out ADR/GCI training in Lyme Bay off the coast of Dorset. They are easily identified inbound to the training area by their US accent and aircraft callsigns. Consequently, scanning a selection of the 48 FW Air to Air frequencies whilst they are in the training area often brings some interesting results.

HAVEQUICK

Readers may have heard of the system of discrete frequencies used by the United States Air force called HAVEQUICK. Without going into extensive detail, this is basically a system designed to provide secure voice communications on a pre-set network of frequencies.

The latest version is 'HAVEQUICK II' and the current system used at Lakenheath appears to be made up of at least 32 u.h.f. frequencies. A computer controlled system of frequency hopping rapidly swaps voice communications from frequency to frequency at such a speed that all the listener hears is a brief clip of conversation, which is usually unintelligible.

Do It Yourself

As I stated at the beginning of this article, this is just an overview of the general situation, and by no means covers all of the different situations where discrete frequencies are in use. One subject I have purposely not touched on are the many discrete frequencies in use with RAF/NATO and USAF E-3 AWACS aircraft. This is yet another area where a significant number of discrete frequencies are in use - plus, the AWACS and the aircraft they are controlling use a whole language of their own. This is a subject which is worthy of an article on its own, which I will present in the future.

Remember, don't always spend your time listening to dozens of pre-set frequencies, some of which may not be audible at your location. I know several enthusiasts whose first job on buying a new scanner is to immediately enter all of the UKADGE/ADR frequencies into the memory. If you regularly travel the length and breadth of the UK this is fair enough, but for most of us this is just not feasible. Think about your location and what you can realistically hear within a radius of, say, 400km. If you live near Yeovilton you are not going to hear aircraft in LOTA Alpha, and if you live in Kinloss you are most unlikely to hear aircraft in AARA10!

Ownership of a good v.h.f./u.h.f. airband guide is an excellent starting point but don't let this prevent you from experimenting yourself. Every so often, spend some time searching the u.h.f. band between 225 and 400MHz, you may be surprised at what you can find!

Don't always rely on your home base station, if possible go mobile and re-locate to some high ground to improve your chances of good reception. The perfect scenario for searching the band would be a sunny weekday during a major air exercise located near the top of a hill. (Yes, I know the perfect world isn't always possible and things like work tend to get in the way!).

On suitable days, I regularly run a search on the u.h.f. airband and even after many years I still come across new frequencies - not all of which have been identified! Lastly, if you come across some interesting frequencies, don't forget to write in and let the readers of 'MilAir' know about your findings. ***SWM***

MilAir

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

For the third month running, current events have overtaken my copy deadline, (not that I ever get my copy in time - no comments thanks Kevin!). Almost as if my comments last month were rather prophetic, on this occasion it was not another false start and dramatic events have taken place in Iraq. As I stated last month it was about time that firm, decisive and extensive action was taken and this clearly seems to be the case. The action that has just been taken was not a warning shot across the bows but the threatened major offensive.

Desert Fox

After the Iraqi government once again failed to abide by their unconditional agreement to allow access to the UN

weapons inspectors, as threatened in November a strike against their military sites was made without warning. At 2200 hours UTC on Wednesday 16th December, the first strikes were made at Iraq by in excess of 220 United States cruise missiles. Operation *Desert Fox* proceeded throughout the night with strategic targets including air defence radar sites being eliminated by ship launched cruise missiles. By the morning extensive damage had been caused to a large number of targets opening the way for aircraft attacks on night two.

The second night saw British Tornados in action alongside a wide selection of US aircraft including, B-52s launched from Diego Garcia and aircraft from the US Navy aboard the carrier *USS Enterprise*. A second carrier, the *USS Carl Vinson*, arrived on scene during the second nights air operations. The British Tornado GR.1s from 12 Squadron, launched on several missions from a base in Northern Kuwait. First reports indicated that their laser guided bombs have wreaked extensive damage. As I re-write this, it looks as though attacks have ceased after the fourth night with more cruise missiles having been launched than during the Gulf War! Hopefully, more information next month.

Rather ironically, (and ignoring the politics of timing), having ordered one of the largest air offensives ever seen in times of alleged peace, by the time you read this Bill Clinton may no longer be the president of the USA. With a trial due in the senate during January, his future looks doubtful. So President Clinton may be impeached for 'an inappropriate act' and then lying about it (allegedly), and Saddam will no doubt remain in power having used chemical and biological weapons against the Kurds and Iranians! - I must say it's a very strange world we live in!

Waddington

A letter from **DSW** tells me that he is to shortly move from the north of Scotland to a small village near Lincoln. This will enable him to take up a new job in that City. Despite the trauma of a major house move, he is looking forward to it as it means he will be near to RAF Waddington and of course can listen into the many visiting aircraft who visit to operate on the ACMI range. He asks me if I know the best frequencies to listen to and also if I know what aircraft are expected in the future.

Fig. 1: Waddington Frequencies

Tower	388.225
Approach	312.5, 362.3 (NATO Common)
Radar	125.35, 127.35, 249.85, 296.75, 300.575, 309.675
Operations	244.275, 259.65, 318.1, 364.725
ACMI Range	252.1, 290.95, 340.55, 359.4, 361.975

According to my records, the main frequencies for Waddington are as shown in **Fig. 1**.

I am grateful to the Dutch Aviation Society for the information detailed in **Fig. 2** of Deployments and Exercises so far scheduled for Waddington during 1999.

Don't forget, these deployments can be cancelled or changed at short notice.

Eclipse 1999

The first UK Total Eclipse of the Sun since June 1927, will be visible in the Southwest of England this year. Within an overall 150 minute parameter which includes the partial eclipse, between 1011 and 1015UTC on the 11th August 1999 a total eclipse will take place in South Devon and Cornwall. To coincide with the eclipse, RAF St. Mawgan is to host what is likely to be the second largest airshow in the country this year. The organisation for this show appears to be under the guiding hand of the IAT and would therefore presumably produce an excellent selection of participating aircraft. The event starts on Monday 9th and will include live music, fireworks and a light show in addition to the airshow, with the main day being the 11th. It is expected that the event will attract a large crowd with visitors from all around the world, with many flying into St. Mawgan

Provisional information is that a three day ticket will be £40 and for the 11th only it will be £30. This by my reckoning makes it the most expensive one day airshow in the history of the UK! One word of warning, it is estimated that several million people in excess of the normal tourists will visit the area to view the eclipse and consequently road and accommodation chaos is likely to ensue. If you hope to make the trip to the Southwest, you are strongly advised to make plans well in advance! A couple of good web sites with more eclipse information are:
http://www.hermit.org/Eclipse1999 and
http://www.cornwalleclipse99.com

Fig. 2: Waddington Exercises & Deployments

Date	Detail	Squadron
22 Mar - 02 Apr	10 x Mirage 2000	French AF
22 Mar - 02 Apr	10 x F-16	Belgian AF
06 Apr - 08 Apr	Exercise	NATINADS 99
16 Apr - 19 Apr	8 x Helicopter	AAC
26 Apr - 30 Apr	6 x Harrier GR7	RAF/20 Sqn
10 May - 28 May	Exercise	NOMAD 99
10 May - 28 May	6 x Tornado F3	RAF
10 May - 28 May	4 x F-16	Belgian AF
10 May - 28 May	4 x Mirage 2000	French AF
10 May - 28 May	2 x F/A-18	Swiss AF
01 Jun - 18 Jun	6 x F/A-18	Swiss AF
18 Oct - 12 Nov	10 x Mirage 2000	French AF
18 Oct - 12 Nov	10 x F-16	Belgian AF
01 Nov - 12 Nov	8 x Sea Harrier	FAA/899 Sqn

Portland

Lastly, and rather sadly comes the news of the final closure of the Royal Navy Air Station at Portland in Dorset. On the 12th February 1999, air traffic will cease and the Military Air Traffic Zone will be removed. All local air traffic requiring radar assistance will be controlled from Plymouth Military Radar, (primary frequencies 379.85 and 121.25). According to the closure information, a Search and Rescue presence in the form of Sea King, G-BBHL is expected to operate from Portland for the foreseeable future.

Lastly, this months photograph is an F-14 seen a few years ago at the former US Naval Air Station at Miramar. The Tomcat carries an experimental scheme which simulated the camouflage of an Iraqi MIG.

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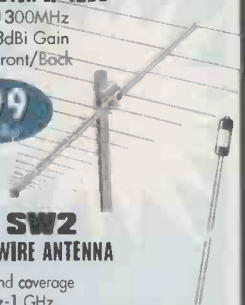

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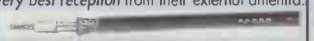

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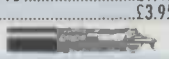

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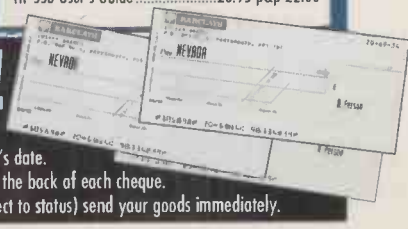


Talkback's FTrunk

MPT1327/1343 Trunk Tracker

Scanning man Faris Raouf reviews another solution to following trunked radio. This time the tracker offers capability to monitor a more popular flavour of system.

Only days after the ink had dried on my review of the Optoelectronics OPTOTRAKKER in the December issue, I was asked if I'd like to review another trunk tacking unit, this one designed for use with MPT1327 and MPT1343 networks (two of the most commonly used trunking protocols) rather than the proprietary Motorola Type I/II/IIi networks the Optoelectonics unit works with. Never one to say no to getting my hands on new and interesting products, of course I said yes.

Before I go on to describe the rather boringly-named Ftrunk (it was named after the software that comes with it), it is worth mentioning that this system was conceived and designed in the UK, but is currently built and marketed exclusively by an Australian company called **Talkback Systems Australia**. As such, you can't yet buy one from a supplier in the UK, or anywhere else in Europe for that matter, instead having to order it directly from Australia. I should also mention that the unit we were loaned for photography and testing was a pre-production prototype model, full production models being far more polished in terms of appearance.

Packing List

Enough background, let's have a look at the unit itself. The package consists of six items; a black box containing the decoding hardware, a power cable for connecting the decoder to an 8-15V p.s.u., an audio cable terminated at both ends with a 3.5mm jack plug to link the decoder to a scanner's audio output, a 25-pin to 25-pin RS-232 cable for linking the decoder to a PC, a 25-pin to 9-pin RS-232 adapter for use with PCs that don't have a free 25-pin port, and a floppy disk containing the decoder's Microsoft *Windows*-based control software.

Not very exciting is it?

As you can see from this list, in order to make use of Ftrunk, just as with the Optoelectronics OPTOTRAKKER, you'll need to own a PC capable of running *Windows*, and a scanner. Unlike the case with the OPTOTRAKKER, however, Ftrunk will work with just about any scanner as long as it has a standard audio output or headphone socket - no discriminator output is required. This is because rather than listen to and decode sub-audible slow speed handshake data as the OPTOTRAKKER does, the Ftrunk hardware is designed, via this scanner, to listen to and decode the data being sent to a trunking network's audible, digital control channel. There is a catch, of course; with the scanner used in this way, it cannot be used to actually monitor any conversations, and all Ftrunk can do is to show you various real-time details about the messages and frequency-change commands being transmitted via the control channel. If you own a second scanner, you can of course use this to monitor frequencies manually, though ideally this needs to be a computer-controllable model. In this case, as long as you have a second free RS-232 port on your PC through which you can attach your second scanner, the software that forms part of the Ftrunk package can automatically tune it in for you, allowing you to automatically monitor and track conversations as well as see the decoded trunking commands on your screen.

As is always the case for software that features some type of scanner control facility, not all computer-controllable scanners can be used with Ftrunk in this way, though the list of models with which it is compatible is extensive, consisting of AOR AR2700, AR3000, AR3000A or AR8000 models, Icom R10, R7000, R7100, R8500 or R9000 models, the Yaesu FRG-9600, and any scanner or receiver featuring a CI-V interface if used with an RS-232-CI-V converter unit such as the Optoelectronics OPTOLYNX.

Installation

Installation of the unit is relatively straightforward. The first step is to create a new directory on your hard disk, and copy the contents of the supplied floppy into this. For ease of access, it is worth creating a shortcut to the main executable, FTRUNK.EXE, from your desktop or Start Menu. All this is very simple stuff, but ideally I'd have liked to have seen an automatic installation utility supplied in order to do all this for you, something just about all other commercial software includes.

The next step is to connect one end of the power cable to the decoder unit, and the other to an 8-15V p.s.u. A power supply unit isn't provided as standard with the unit, so unless you have a suitable p.s.u. already you'll have to add the cost of this to the overall cost of Ftrunk. At this point, a small, bright-green l.e.d. at the front of the decode unit should light up to tell you all is well, and you've not accidentally reversed the polarity of the power connection.

You can now connect the male end of the RS-232 cable to the decoder box, and the female end to your PC, via the 9-pin to 25-pin adapter if necessary. Ideally, even though the *Ftrunk* software will support COM3 and COM4, if you happen to have this many serial ports installed, **Talkback Systems** recommend you use COM1 or COM2 if possible, mainly because of the occasionally problematic way *Windows* and the PC's hardware handles serial ports above COM2.

If you only have one scanner, or two non-computer controllable ones, the final step is to plug one end of the supplied audio lead into a scanner's audio output socket, and the other into the decoder unit's audio input. If the only socket your scanner happens to have is a headphone socket, this will work fine, though of course doing so will mute your scanner's main speaker, making it impossible to search for control channels without first disconnecting this connection, then re-attaching it once you've found a control channel.

All Connected Up

If you want to use Ftrunk to automatically track conversations for you, at this point you'll need to attach your second scanner to your PC, either directly or via a third-party, Optolynx-type interface if necessary. If you connect it directly, you'll have to supply your own RS-232 cable to this purpose, though since these are wired identical to the way cables used for connecting external modems to your PC are, you'll find that suitable cables are inexpensive and available in plentiful supply from just about any shop selling computers or computer accessories.

Having set up all the hardware, you'll now need to locate an MPT1327/1343 control channel to monitor. The bulk of these located in the area of the radio spectrum designated as Band 3, which is split into two parts, Sub Band 1, 177.5 - 183.5MHz, and Sub Band 2, 200.5

- 207.5MHz. Sub Band 1 is mainly used by a company called Fleetcom, while Sub Band 2 is mainly used by a company called National Band 3, both of which provide trunked radio facilities to third parties throughout the country. Also to be heard on these frequencies are control channels and voice and data communications used by smaller, regional trunked systems, such as councils and bus companies. London Buses, for example, operate a trunked network in Sub Band 2, and several councils operate in Sub Band 1. You'll also find non-MPT1327/1343 trunked networks operating in these sub bands, while conversely you can also find MPT1327/1343 networks operating at other frequencies, Heathrow and Gatwick airports in the South East of the country operating such networks at around 440MHz, for example.

You won't be able to tell one user's control channel from another from just listening, and at first you may not even be able to differentiate a control channel from another type of data stream. Thoughtfully, the Ftrunk software's on-line Help facility provides .WAV file recordings of two types of control channel to help you get going, not to mention suggesting a number of frequencies for you to try monitoring.

Down To Business

Having located a control channel with your scanner, and if necessary re-connected the audio cable to its headphone socket, you can fire up the *Ftrunk* software and, from the 'Network' drop down menu, select one of the 23 pre-set network options. These are divided into sections labelled Australia, Grand Prix, Great Britain, Netherlands, New Zealand, Norway and Uganda to make it easy to select the ones you need and to avoid confusion. The UK section is by far the largest, the network options listed being Fleetcom, General Band 3 Networks, Humberside Communications, National Band 3 Ltd, Power companies, RAC, Railtrack, Scottish Ambulances, Securicor and Water companies. Ideally, you should select the network whose control channel you are listening to, though at first you may not know which one you are listening to, in which case some experimentation will be required. In many cases Ftrunk will tell you to switch networks if you've selected the wrong one, however.

Incidentally, if you tune into a control channel that is part of a network *Ftrunk* doesn't know about, although a special menu option will allow the software to decode and display the data, including which channels various radios and talk groups are hopping to or from, *Ftrunk* will not know, and therefore cannot display or automatically tune your scanner to, the frequencies associated with these channels. If you have the patience, you can determine these associations, and if you E-mail them to the author of the program he will incorporate them into the next available update of the software.

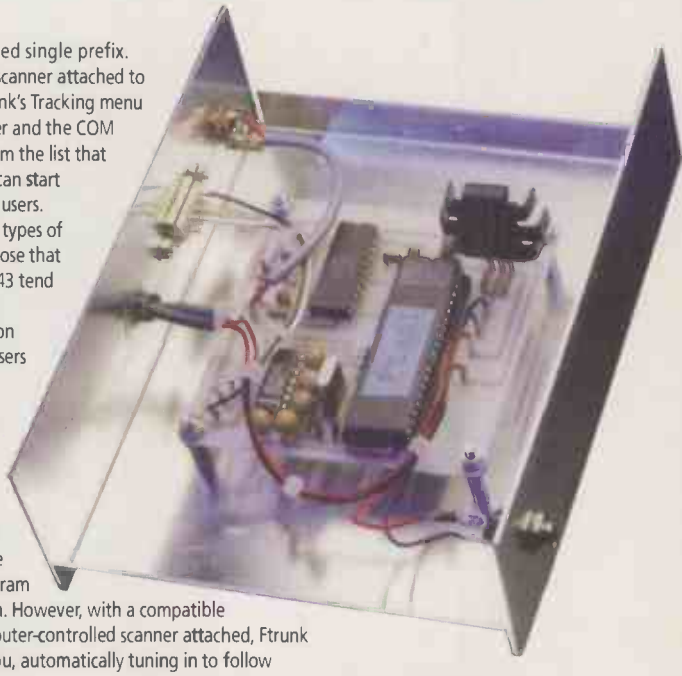
Having selected the required network, you need to select the 'Connect' option on in the program's Main menu, then select the COM port the decoder unit is connected to. Unfortunately, you are forced to do this every time you run Ftrunk, a very annoying problem that, I'm told, should be fixed in a future release of the software.

At this point, Ftrunk's main display area will erupt with data, as long as, that is, you've selected the correct network and you've selected a busy network. The data takes the form of lines of characters and numbers, and ranges from messages simply stating that a transceiver is attempting to log into the network, to a more interesting one such as "Prefix#27 Unit 1234 Calling Unit 4321 Goto 200.1000MHz".

In this example, individual radio or talk group (user-group) 1234 wants individual radio 4321 or all radios in talk group (user group) 4321 to go to 200.1000MHz. The significance of the prefix number depends on the network. Large nation-wide networks tend to give each company using their system a different prefix number, while large companies who own their own network might use the prefix number to differentiate between regions. In countries where the company that owns the networks allows third party companies to sell and install the transceivers used on it, the prefix can alternatively be used to identify which company made the sale.

Usefully, *Ftrunk* allows you the user to blacklist prefixes, allowing you to filter out data about uninteresting users as long as they don't share prefixes with interesting ones. Conversely, you can get *Ftrunk* to display data and instructions from or for only a selected single prefix.

If you have a second scanner attached to your PC, by selecting Ftrunk's Tracking menu and selecting your scanner and the COM port it is connected to from the list that will be displayed, Ftrunk can start tracking conversations or users. Significantly, unlike some types of trunked conversations, those that make use of MPT1327/1343 tend not to switch frequencies between each conversation segment, as long as the users conversing don't remain silent before replying for too long. You could, therefore, simply tune a non-computer-controlled scanner, or one that isn't compatible with Ftrunk, to one of the frequencies that the program displays, then just listen in. However, with a compatible and correctly set-up computer-controlled scanner attached, Ftrunk will do all the work for you, automatically tuning in to follow conversations in a number of ways. Some of the most useful options include tracking all conversations, tracking only conversations linked to a single prefix, tracking conversations as long as they don't have certain prefixes, and tracking only conversations involving a particular radio or talk group ID. Under some circumstances, when monitoring all conversations without restriction, you'll find your radio rapidly tuning from one frequency to another, hardly giving you a chance to listen to a word that is being said. This will be simply because a large number of users are trying to communicate, and Ftrunk is trying to follow them all. You can solve this problem very simply by telling Ftrunk to stay with a single conversation once it tunes in to it.



Here's all the hardware...

Two annoying things mar the tracking process. The first is that you have to tell Ftrunk which radio you have and which COM port it is attached to each time you run the program, just as you have to tell it which COM port the decoder unit is attached to each time you run the program. The second is that in order to monitor individual radios or talk groups, you'll have to manually edit a special ASCII text file to include the ID's you are interested in. Again, these are both problems that I'm told will be eventually rectified in a future software release.

What I Think

With a few, in some cases major, exceptions, Ftrunk is an excellent product, and although it isn't strictly necessary to buy one in order to listen to MPT1327/1343 trunked networks (unlike the Optoelectronics OPTOTRAKKER, without which you can't make much sense out of Motorola Type I/II/IIi networks), it is an extremely useful box of tricks. Connected to my Yupiteru MVT-7100 to listen to control channels, and controlling my Icom IC-R8500 to track conversations, I found it works very well, and although it didn't allow me to listen to anything new, it did have me riveted to the computer, just watching the commands for radios, and requests by them, flashing across the screen. Those living in the far North of the country, incidentally, would get an even larger amount of information, since Ftrunk can also decode the short text messages the Scottish Ambulance service's network occasionally transmits across the network along with voice traffic.

Whether you think Ftrunk is worth Aus$370, plus Aus$40 for shipping to the UK, plus £10 or so for a 12V p.s.u. (a total of about £165 at today's exchange rate ignoring any import duty you may have to pay), really depends on whether you are a hardened scanner user or not, and of course whether you have two scanners, one of them ideally computer-controllable, handy. I have to say I fall firmly into the hardened scanner user category, and will almost certainly start saving my pennies for one of these.

My thanks go to **Talkback Systems Australia, PO Box 8054, Northland Centre, Victoria 3072, Australia** for the loan of the Ftrunk system. Check out their web site: **www.tbsa.com.au/trunk.html** or E-mail them at **mpt1327@tbsa.com.au** or FAX: **+61 3 94583907**.

SWM

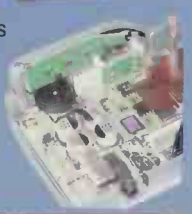
AR8200 *The Superior Concept* AOR®

✓8.33kHz steps ✓Slot cards ✓FREE PC control software ✓Opto Scout reaction tune ✓Dynamic memory sizing ✓AFC and Noise limiter

The AR8200 is the ***'first'*** and ***'only'*** (so far) receiver to correctly implement the new **8.33 kHz** airband channel step enabling spot on reception with correct tuning and searching. The flexibility of operation is proving to be marvellous with a multitude of slot cards and options available... the obvious safe investment beyond 1999.

The AR8200 is a capable receiver straight from the carton box offering 1000 memory channels, 20 memory banks, dynamic memory resizing, 40 search banks, priority, select scan, step adjust, frequency offset etc. Full frequency coverage from 530kHz to 2040MHz without gaps (minimum accepted input of 100kHz), all mode reception, programmable tuning step in all modes to a resolution of 50Hz (including 8.33kHz). All mode reception is included AM, FM, WFM, USB, LSB, CW with additional selective bandwidths for narrow AM and Super Narrow FM. Automatic Frequency Control and a Noise Limiter are also provided as standard. The bandscope facility adds a further dimension with save trace capability. Two frequency lines are provided with alphanumeric tags of up to 12 characters, edit and write protect is also featured. Side mounted arrow keys aid navigation through on-screen menus.

Supplied with the receiver is a set of 4 x AA 700 mAh NiCad batteries, mains charger, 12V dc lead for mobile operation, whip aerial, bar aerial, belt hook with screws, wrist strap and (probably) the most comprehensive illustrated operating manual which has ever been provided with a hand-held receiver. The addition of a wide range of plug-in options with supporting hardware & software places the AR8200 into a class of its own, a superior concept of design. Construction has a quality feel with internal build being miniaturised surface mount circuitry.



AR8200	Receiver	**£399.00**
EM8200	External memory slot card. Enables storage of up to 4000 memory channels for backup and restoring to the AR8200. The whole receiver's data can be saved four times over including spectrum trace. Very useful for security or when travelling around	**£49.90**
CT8200	CTCSS slot card. Enables detection of which sub-audible tone is in use and to control the squelch operation (particularly useful when scanning). Very useful for UHF amateur repeaters and PMR	**£59.90**
RU8200	Record / playback slot card. Your may record and playback up to 20 seconds of audio, grab that interesting transmission!	**£49.90**
TE8200	Tone eliminator slot card. Enables the AR8200 to 'skip' over active channels which contain a pilot tone... used by some commercial services. ***This is not an audio notch filter***	**£34.90**
VI8200	Voice inverter. Reconstruct certain analogue transmissions	**£49.90**
CC8200	PC lead with CD-ROM. Connection lead with built-in level shift for direct connection to a computer. Supplied with PDF protocol listing and PC Windows software	**£69.90**
RT8200	Opto Scout connection lead. Simply connect between the AR8200 and Opto Scout (V3.1 or higher) or Mini Scout for 'reaction tune'	**£20.26**
OS8200	ACC lead (open wire termination). Can be used for discriminator output, Scout, own PC interface building etc	**£12.90**
CR8200	Tape record lead. For remote controlled and voice activated tape recorders	**£34.90**
SC8200	Clear plastic protective case	**£17.95**

Computer control is available via a metallic side mounted robust connector. The CC8200 PC lead features a 9-pin D-type plug with built-in level shift and is powered from the radio. The CC8200 is also supplied with a CD-ROM featuring ***free*** PC control software (see screen shots in this ad), RS232 protocol listing plus other files including Adobe® Acrobat® reader and promotional PDF material. This software and protocol listing is also available as a ***free download*** from the AOR internet website ***www.demon.co.uk/aor*** Within the first 37 hours of this appearing on the web, over 450 operators had downloaded it... very popular and a testament to the success of the AR8200!

What's this about 8.33 kHz tuning steps?

From **7th October 1999** for parts of Europe (and a little later in the UK), the VHF airband is being revised. If your radio cannot tune in 8.33 kHz steps, you cannot correctly search the new allocation, although tuning within 1 kHz (or tuning in 1 kHz steps) will enable you to hear the traffic, you will ***not*** be able to search. Of course the AR8200 correctly support 8.33kHz steps.

AOR (UK) LTD 4E East Mill, Bridgefoot
Belper, Derbyshire, DE56 2UA England
Tel: 01773 880788 Fax: 01773 880780
info@aor.co.uk www.demon.co.uk/aor *E&OE*

The fantastic **AR5000** receiver, **(superior - Passport'99 says so!)** wide band all mode coverage from 10 kHz - 2600 MHz.

True base receivers are few and far between, some have simply evolved from the hand held equivalents with little tangible improvement in performance or facilities over their smaller counterparts - *the AR5000 is not like this!* High performance, top quality build and true wide coverage all mode receive. The "+3" version offers even more with synchronous AM, AFC and Noise Blanker. Popular with government agencies throughout the world.

The enhanced AR5000+3 has been **awarded 4-stars** by **Passport to World Band Radio'99**.
"Front-end selectivity, image rejection, IF rejection, weak-signal sensitivity, AGC threshold and frequency stability all superior".
"Unlike virtually every other receiver we have tested over the past 21 years, the frequency readout is unfailingly accurate to the nearest Hertz. This should make the AR5000+3 of exceptional interest to broadcast engineers".

Voted **best wide band receiver** by the readers of the German "**Funk**" magazine.

Chris Lorek **HRT**...
"Throughout the wide frequency range, the receiver was adequately sensitive, especially so at the upper end, with good overall strong signal handling characteristics."

AR5000+3

- ✓ Wide frequency coverage 10 kHz - 2600 MHz
- ✓ All mode reception: USB, LSB, CW, AM, Synchronous AM, NFM, WFM with automode tuning (any mode and bandwidth on any frequency is possible)
- ✓ Automatic Frequency Control
- ✓ Noise blanker
- ✓ High stability TCXO reference, 1 Hz NCO tuning
- ✓ 1,000 memories, 10 memory banks, 20 search banks, 5 VFOs (all twice!), alpha tag, EEPROM chip storage
- ✓ Fast scan and search rates up to 45 increments per second with extensive CPU facilities including bank link, delay, pause, voice, level, priority, autostore
- ✓ Multiple IF bandwidth 3 kHz, 6 kHz, 15 kHz, 30 kHz, 110 kHz, 220 kHz with an option position for 500 Hz CW. (30 kHz is ideal for WEFAX).
- ✓ High sensitivity and excellent strong signal handling assisted by a preselected front end from 500 kHz - 1 GHz
- ✓ Analogue signal meter
- ✓ Clocks with timer and alarm operation
- ✓ Extensive RS232 control list
- ✓ Two aerial inputs with switching from the front panel, can be automatically switched based upon a user definable bandplan
- ✓ Audio & discriminator out as well as tape switching
- ✓ Standard DTMF decode / display with optional CTCSS
- ✓ Built-in tone eliminator
- ✓ SDU ready with IF output for spectrum display unit

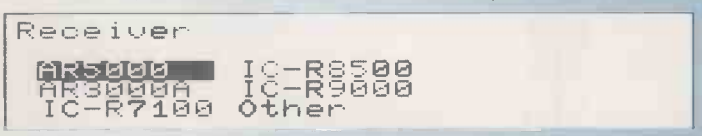
AR5000 £1345 AR5000+3 £1574

The 'all new' **SDU5500** *Spectrum Display Unit £799*

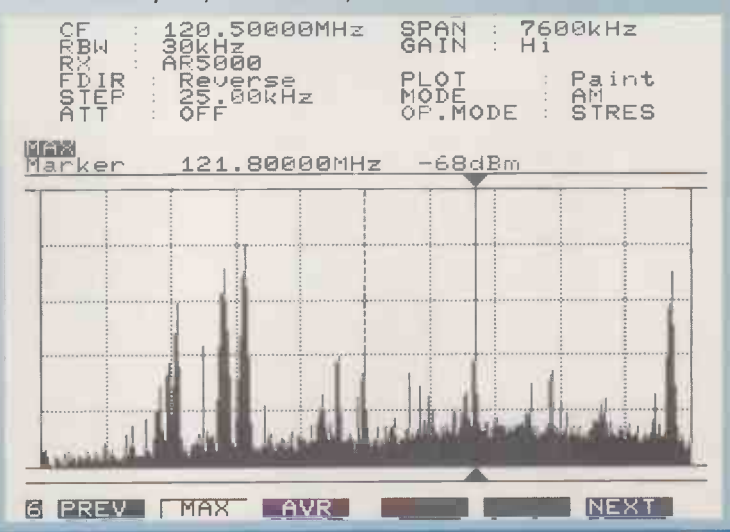
The SDU5500 is an 'all new' Spectrum Display Unit and a worthy successor to the SDU5000 (which offered practical and cost effective monitoring). Coupled to the AR5000 receiver, it provides a spectrum display of 10 MHz bandwidth anywhere between 10 kHz and 2600 MHz.

Already pressed into commercial usage by the government, the professionalism of the unit has truly been grasped. The SDU5500 has a high resolution monochrome (white/blue) LCD with improved status read-out on the top-half of the display with a spin wheel tuner controlling the marker position, similar to a dedicated high-priced spectrum analyser. Compared to its predecessor, new facilities have been provided:

- Step resolution mode, plots the wanted channel steps and ignores the gaps for more efficient analysis.
- Channel step mode, plots the wanted channels for close in use on channelised bands.
- Spectrum mode is of course available with peak, max, average etc.
- On screen support for AOR AR5000/5000+3, AR3000A, ICOM IC-R7100, IC-R8500, IC-R9000 and 'Other' companion radio.



Briefly... the SDU5500 adds a variety of features to extend your receiver's capabilities, such as visually identifying new active frequencies and taking measurements. The SDU5500 may be used with a number of receivers (which have a 10.7 MHz I.F. output) and provides a bandwidth up to ± 5 MHz in 1 kHz increments with a resolution of 5 kHz or 30 kHz. When using selected AOR and ICOM receivers, the frequency, mode (& attenuator with some sets) may be controlled from the SDU5500. It may also be used with receivers which have an IF 'close' to 10.7MHz (in the range 5.7 to 15.6 MHz with reduced bandwidth) such as the Kenwood TS870S where the SDU5500 makes an excellent companion **band scope** so that adjacent channel activity may be constantly monitored.



Old Lessons, often repeated for the beginner

JW starts a new year with a new series of articles sharing with us all his vast knowledge.

In my experience not enough attention is paid to the simplest end of the radio receiver, the audio, and many a good receiver has been let down by "ratty tatty let's not bother too much" design. I know that I've written this before in my articles but something happened which made me re-address the subject. Whilst walking across the little industrial estate on which the EMC test centre is located, I saw a chap moving in to one of the other units. I found that he was involved in the audio business and he was expanding his manufacturing set-up to make high performance loudspeakers and turntable plinths. Turntables in this era of digital everything? To cut a long story short, Trevor, of Aphelion Audio (classical scholars will understand, otherwise look it up and take a look at Perihelion whilst you are at it) arranged a weekend of demonstrations of 'high end' audio equipment which I was pleased to attend. Was I stunned? Let me tell you.

Turning The Table

Drifting out of the doorway of one of the demonstration rooms was the sound of a female voice singing music I know well, but I knew that Janet Baker couldn't really be in Bideford so what was it? It turned out to be a favourite performance of Elgar's *Sea Pictures* (Baker/Barbirolli) being played on a Garrard turntable, mounted on one of Trevor's plinths and appearing through the ends of the best sounding speakers I have yet heard. I have to admit that they were large and costly, but the sound they produced was utterly magical, and on enquiry I found that they were actually a new design of corner horn fitted with Lowther drive units. I was immediately reminded that my old friend Angus McKenzie used to hate horn loaded speakers because he said they "Honked like fat pigs", but I had great pleasure in telling him later that day that I had found someone who had tamed the "Honk" and made wonderful music with them. The man's name is Jim Carfrae, and if you want to blow your savings and really enjoy recorded music, he can be reached on (01803) 868461. For those of you in the west country, Trevor, at Aphelion Audio, can be contacted on (01237) 422772, and he will be delighted to talk to you and/or demonstrate lovely sounding audio. If you visit him at his place, you might also call in and take a look round the EMC Centre. What has all this got to do with short wave listening?

Simply that the bit of equipment I haven't mentioned which fitted between the Garrard deck and the Carfrae speakers was an amplifier running a single triode in Class A in each channel, generating about nine watts. Direct comparison at the time with a solid state device convinced me that the valve (tube, if you prefer) amplifier sounded much more pleasant, as did a direct comparison, when I got home, between a valve short wave receiver (Hallicrafters SX-117) and a solid state receiver (Trio R-1000), listening to the same broadcast station. You see, it used to be commonplace for any receiver, domestic or commercial, to have a single valve (even push pull pairs in the top grade receivers) running in Class A, producing a watt or two of clean audio, but nowadays you probably have a single chip producing 250mW of not particularly good sound. There has been endless discussion about 'valve sound' in the pages of many worthy and not so worthy magazines, and many theories advanced and retracted as to whether or not the 'valve sound' exists at all. I'll fall back on the title of my series and say that in my experience a valve audio system still sounds better; well perhaps not 'better' because that means it's quantifiable; let's just say more pleasant to my ears than much solid state equipment.

I was prompted to take a quick look at the handbook for the AR88 which declared the "Undistorted Power Output" to be 2.5W. "Undistorted" probably means about 10% t.h.d. if the valve manufacturer's figures for the 6K6 are anything to go by, but nevertheless it did sound nice. You couldn't endure 10% distortion from a semiconductor amplifier, so why the difference? Any suggestions from the readership?

Not Helped

The situation is not helped by the fact that many receivers used by readers of *Short Wave Magazine* will have been graced by the inclusion of an internally fitted loudspeaker of the most appalling quality, both material and audible. There are, of course, notable exceptions to this general rule but by and large if you want to improve the audio, even from 200mW of solid state electrickery, then an external loudspeaker is well worth considering. Now hold on before you go rushing to the suppliers of your receiver and buying the 'matching' loudspeaker for it, because the only thing that matches speaker to receiver is the size and colour of the metal box, and a speaker in an undamped metal box is not quite what I had in mind when I said external loudspeaker. The performance of these so called 'matching' speakers is usually quite dreadful, with quite pronounced resonances which make the Lowther 'honk' seem almost unimportant.

Of course with my marketing hat on I would probably tell you that the 6dB peak at 2.5kHz was the result of advanced computer simulation to achieve precisely tailored characteristics for speech articulation - but it still means that the speaker sounds most peculiar.

It's also worth mentioning that the prices asked for these metal monstrosities are completely outrageous and very hard to justify, particularly when we live in the country which has always made the very best in loudspeakers, with all the great names still in existence. Tell you what I did when we were considering an external loudspeaker option for the Lowe receivers; John Thorpe and I spent a lot of time listening to the small 'bookshelf' speakers from British manufacturers and finally settled on a unit from Mordaunt-Short. We obtained a reasonable price discount for purchasing in modest quantities but of course these speakers come in pairs, so we simply split the pairs and sold them as single units. When Mordaunt-Short stopped making the speaker we had chosen we switched to a similar unit from Wharfedale and had the same excellent quality from these as well. I admit that small upright black wood boxes don't exactly match the receivers of today but at half the price of the so called 'matching' speaker, and with infinitely better sound quality you would have to be mad not to consider this option.

Tacky Options

What I would stay away from are the speakers sold to go with computer sound systems, because these are very strange beasts indeed; well suited to playing the synthesised opening jingle when *Windows98* loads, but not for broadcast audio - no - no - no. I'm constantly amused by the descriptions of computer speakers as "200 Watt with Sub-Woofer" boasting an "amazing four inch speaker cone". Sub-Woofer?? 200 Watts?? In a tacky plastic box??

MUCH MORE PLEASANT

Finally on this subject I will commit the ultimate heresy in these times of buying expensive toys - you could always make your own loudspeaker box; there are plenty of simple designs around, and it's actually a lot of fun trying out a bit of woodwork and a cheap loudspeaker to see what you can produce. It's certainly a lot more sensible than shelling out 150 smackers for a tin box with a nice brand name on the front.

...And Cans

No listener will be without a pair of headphones, but if you are thinking of going down this route, probably because your partner is being driven mad by the sound of Shanwick ATC coming from the superb British bookshelf loudspeaker, then choose with care. For receiver use you really don't need the latest products from manufacturers like Koss or Sony with extended frequency response to suit a bat's radar, because your receiver i.f. filters will have chopped-off most of the h.f. end of the audio spectrum, and you can do without l.f. response down to d.c. since all you will hear is the residual hum from the receiver power supply. What you certainly do need is well padded earpieces to avoid looking like Spock after an extended listening session. You can always spot a keen short wave listener, not by bloodshot eyes from peering at a dim digital display, but by the bloodshot ears caused by the latest 'communications' headphones. Mind you, most listeners of my age will be missing most of the short hairs above their ears having had them surgically removed by the twin metal headbands of the S.G. Brown Type 'F' 'phones. Taking these off was rather like having a nurse rip off a well stuck plaster on your hairy chest...some of you will know what I mean.

But seriously, it's worth repeating the advice of sticking some attenuation between the headphone jack on your receiver and your new headphones, because you only need a few milliwatts to drive sensitive 'phones. The 'attenuator' can simply be a 100Ω resistor in series with the live feed, with a 10Ω resistor from the 'phones side of that to earth. Even though many modern receivers do have resistive attenuators built into the headphone socket I would still fit my own; you never know when you might meet a receiver which doesn't have the resistors fitted. Another trick I always use, but only after I had my head ringing by suffering a loud **bang** when using a headphone and microphone combination, is to put a pair of back-to-back silicon diodes across the headphone feed. The diodes will clip at about 600mV in each direction, and will certainly prevent any nasty, and sometimes irrevocable, damage to your precious lugholes. Costs about 20p to fit, so do it now. What do you mean, you haven't got a soldering iron. Kindly leave the theatre. If you think my comments only apply to short wave radio, then you scanner enthusiasts watch out as well. I've seen grown men weep when they turned up the audio on their scanner, wondering why it was so quiet, and then remembered to open the squelch. That's when they needed the back-to-back diodes to protect their back-to-back ears.

And So To Other Things

Seek and Ye shall find; Knock and it shall be opened unto you.

In one of my other pursuits, that of postal historian, it has long been said that if you want to find out what knowledge exists about a particular subject, the surest way to gain access is to publish a research paper, following which there will be a flurry of correspondence from those who wish to add their own particular piece to the jigsaw puzzle. Such is the case with my review of the Racal RA1792, which generated a series of very interesting letters and telephone calls from people who had, in some cases, a great deal of experience in using and supporting the RA1792. It is very clear that there is a group of dedicated enthusiasts out there who consider the RA1792 to be, at least for their purposes, one of the best all round h.f. receivers it is possible to obtain, and I have to confess that having used one I am of the same opinion.

The most detailed response by letter came from **Michael O' Beirne** who wrote "I read your article in this month's *Short Wave Magazine* with much interest because I have myself owned a '1792 for around five years and it is one of my favourite receivers." He goes on to comment that Racal "...keep no spares

In My Experience

for anything over ten years old, though they can procure many spares, but at non-amateur prices". Michael reinforces my warnings about the wide variety of filter options which were originally supplied with the RA1792, depending upon the customer requirements, and quotes an occasionally encountered receiver in which the lower sideband filter has been replaced by one having 300Hz bandwidth and an RTTY offset of 1.7 or 2kHz. That wouldn't be much use for amateur listening on 80 or 40m. He makes the point that, "Between the 1772 and 1792 I have counted 132 different filter sets...so Lord knows how many more exist". Further down the letter Michael has more interesting information that early receivers (like the one I reviewed) used Collins mechanical filters, whereas later production switched to ITT

(STC) crystal filters which seem to be unavailable on the second user market. You could of course get new filters made, but at what price?

I had interesting talks to **Pat McAlister**, who has very detailed knowledge and experience in refurbishing and repairing the RA1792. He reminded me that later production of the RA1792 included 'BITE' (Built In Test Equipment) facilities, which can be both a help and a hindrance, depending on whether you are using a working receiver or repairing one which is faulty. He told me that a signature analyser is useful when digging into a BITE equipped RA1792, but I don't imagine that too many hobby users will have such things tucked away on the work bench.

Tony Edge wrote to say that he finds the Racal RA1772 preferable to the '1792, particularly since it has front-end r.f. tuning, and I have written before on this subject in this magazine. For demanding h.f. broadcast listening, the slight losses incurred by having front-end selectivity are more than offset by the improvement in out of band second order intermodulation performance. However, for a professional receiver which has to be able to jump frequency quickly, the provision of a fully tuneable front-end would involve added complexity - but it can be done, as demonstrated by airborne h.f. radio systems, which have to include auto tuning facilities for matching the transmitter to the typical h.f. antenna system on board. Tony also repeats a familiar plea when he writes, "Any designer who sticks to the signal path and does not try to produce a 'Jack of all Trades' receiver with memories, timers, scanners, FAX, etc. should surely be able to produce a receiver of equal or superior performance to the RA1772. There seems to be nothing on the market which is adequate for the serious h.f. broadcast DXer."

An E-mail arrived from **Jim Dunnett** who asked about the RA1792 "Although I've been using these for the last 15 years, I've never noticed an i.f. shift on s.s.b. How is this activated?". Well, I simply followed the instructions on page 3-9 of the *Operators' Manual*, which reads "s.s.b. modes. Bandpass tuning is provided in the RA1792 only for the l.s.b. and u.s.b. single sideband modes, and this may be utilised to minimise the effects of an interfering signal present within the pass band. The procedure is as follows". After which the setup for pass band tuning is described, and as I said in the review, it works very well. However, I should perhaps have mentioned that the pass band tuning uses the narrower filters rather than the normal asymmetric l.s.b. and u.s.b. filters, so the Racal interpretation of pass band tuning is not quite the same as the amateur radio user might understand. Jim commends the reliability of the RA1792, saying "They're extremely reliable - we have them running continuously for tens of years at a time without a fault", but then goes on to say, "The receiver shown in the photograph has a fault. The b.f.o. setting readout is showing nonsense." Well, you can't have it both ways Jim, either they're uncompromisingly reliable or they occasionally have faults. In fact, the photography for the RA1792 article was carried out by the *Short Wave Magazine* photographer before I had the receiver for evaluation so I can only assume that there was some kind of switch-on glitch which caused the funny b.f.o. reading. It certainly never happened to me during the review period, but nevertheless it's a fair comment on reliability.

Average Position

In my reviews I try to place myself in the position of the average short wave enthusiast, so I decided to adopt this approach to obtaining spares for an RA1792. Knowing that the receivers were manufactured at Seaton in Devon, I rang directory enquiries and was given a number which I called. The young lady who answered at Racal listened to my request and said that she would transfer me to the Seaton plant. Funny, I thought I had just rung the Seaton number. 'Click' went the telephone. The next young lady told me that whilst Racal manufactured their receivers at Seaton they did not offer any service support, nor were there any spare parts at Seaton, so she transferred me to the Racal Radio help desk at Bracknell. 'Click'. Another sweet young thing informed me that she thought that sales and marketing might help me (what this has to do with spare parts I don't know) and transferred me to the Racal Customer Support Office. 'Click'. Not actually being a customer I suppose I shouldn't have expected much support - and I didn't get any, although I was once again transferred, this time to the Racal Product Support desk. 'Click'. I explained (somewhat untruthfully) that I had been asked to quote for repair and refurbishment of some Racal RA1792 receivers and was trying to ascertain if spares were available and if so, what were typical costs for some items, such as the l.c.d. panels. Her exact words were "Give me your telephone number and I'll pass on your enquiry to someone". 'Click'. I'm still waiting for that "someone" to call me. If I have any news between now and the Millenium I'll be sure to let you know. In the meantime, I shall risk the repair problems and lust after an RA1792 (with the right filter complement).

Still Waiting

As a postscript to the search for spare parts I can tell you that I wrote those words in early September but the article was held over due to lack of space in the magazine. I am writing this bit in late November and I still haven't had any contact from Racal, so you can decide for yourself what my chances are of ever getting that "someone" to call me. I'm not presumptuous enough to think myself of any importance to Racal, but the various girls who took my call didn't know who I was or what company I might have represented, and to be treated to the usual 'psycho babble' by staff who had all been on the same course to rehearse the standard 'customer care' words without the real intention of doing anything about it seems (a), symptomatic of today's treatment of customers in general, and (b), a poor reflection of the real attitude of a company I always thought one of the Best of British. Does anyone in Racal really care? The Japan Radio Company, who are a much larger concern than Racal, showed that they do care, regardless of the relative insignificance of the customer or the query. Not only care, but act swiftly and positively to actually **do** something. What a contrast.

Happy listening (to JRC, AOR, Icom, Kenwood, Yaesu Musen equipment, if you need proper customer support). ***SWM***

Antenna Modelling, Simulation and Design Software

Joseph J. Carr

Antenna design can be done in any of four basic ways. First, you could consult an engineering level antenna book (e.g. Kraus or Jasik) and follow the procedures outlined. The maths level is daunting for most people, however, and that fact puts those books beyond their reach. The field of antenna design is said to be arcane and esoteric.

Second, you could use what is uncharitably called the 'naïve approach'. This method includes most antenna designs found in the amateur radio, short wave and scanner books (including my own). In the naïve method of design some standard formulas for lengths and spacings are given. If you follow the rules then a workable antenna can be designed. The naïve method is perfectly wonderful if it meets your needs (as it does about 95% of readers).

The problem with the naïve method is that it forces you to accept the assumptions of the person who wrote the book. Typically these are well founded in reality, but may fall down for special cases. For example, the length of a horizontally polarized half wavelength dipole is given by the equation $L_{metres} = 144/F_{MHz}$. This formula follows from wave theory in which length and frequency are related by the velocity of the wave.

In free space the velocity of a radio signal is the speed of light (300 000 000 m/s), so the correct constant is 300 for one wavelength and 150 for half wavelength. So why do we use 144 (or 141, 142 or 143 depending on book) instead of 150? Assumptions!

The wire has two factors that affect the velocity of the current flowing in the wire:

a) There is the velocity factor (VF) of the wire, which can amount to several percent. The wire VF is related to the length-to-diameter ratio (L/D).

b) There is also a velocity factor change caused by the 'end effect', which is a combination of proximity to the ground and the fact that the end of the wire is typically terminated in a dielectric other than air (i.e. the end insulator).

Taken together, these effects reduce the physical length of the antenna 3 to 6%, with 4% being most common (i.e. the physical length is a factor of 0.96 times the electrical length (0.96 x 150 = 144).

Third, you could use 'frequency scaling'. In this method you find a published design (or one of your own that was successful) and alter its dimensions by the ratio of the existing design frequency (F_D) to the new frequency (F_N), or $L_{NEW} = F_D/F_N$. For example, a half wavelength dipole for 9.5MHz is 144/9.5 = 15.16m long. To raise the resonant frequency to, say, 24MHz:

$$L_{New} = 15.16\text{m} \times \frac{9.5}{24} = 6\text{m} \qquad (1)$$

(If you check this result: 144/24 = 6m)

Fourth, you can use modelling or design computer software to accomplish the chore. There are two varieties of modelling software. One type is based on the naïve method and is useful by the majority of people involved in radio hobbies. My book *Antenna Toolkit* (*available from the SWM Book Store - **Ed***) comes with an antenna design CDROM that includes a *Windows 3.1* program based on the naïve method that will serve the needs of most hobbiests. It also contains the code for an early version of an antenna modelling program called *miniNEC*. The *miniNEC* program is used to experiment with antennas big time, especially new and untried designs. It allows you to get an idea of the design's performance before getting up on the roof and committing time, energy, money and a possible wrenched back to test it.

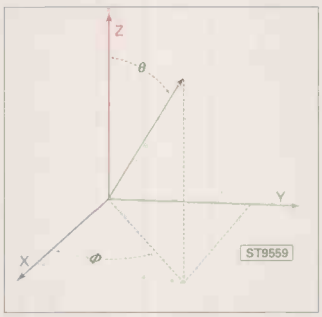


Fig. 1: Coordinate system for *mini*NEC simulations.

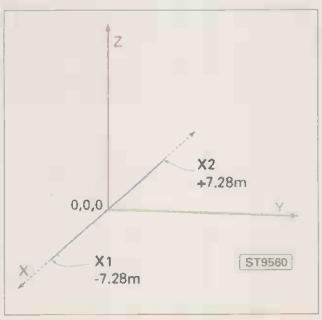


Fig. 2: 9.75MHz dipole placed in a *mini*NEC model.

*mini*NEC and its Derivatives

Antenna modelling has always been a daunting art, especially in the days before computers. The *method of moments* was published by Harrington in 1968. Shortly thereafter a *FORTRAN* program called Numerical Electromagnetic Code (NEC) was written at the Lawrence-Livermore Laboratory in California. This mainframe computer program was not suited to small computers. Eventually Burke and Poggio (1981) at the Naval Ocean Systems Centre in Point Loma, California (near San Diego) wrote a PC DOS version and called *miniNEC*. It was originally written in *Apple II BASIC*, and later was translated into the IBM dialect of *BASIC*.

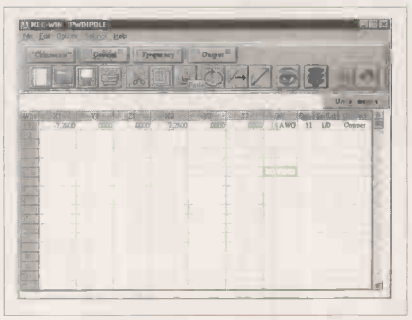


Fig. 3: *Nec*Win design screen.

The *miniNEC* program is based on a system of 'wires' broken into segments. These wires are laid out in a three dimensional Cartesian coordinate system (**Fig. 1**) in which the Y-axis is horizontal, the Z-axis is vertical and the X-axis is horizontal and orthogonal to both Y and Z axes. The idea is to specify the starting and ending points of the wires making up the antenna, in terms of the XYZ coordinate system.

Figure 2 shows a single wire antenna laid out in the X-axis. This model could be used for a longwire, dipole or other horizontal antenna depending on the frequency specified and length that is set. The antenna is on the X-axis so is in the horizontal plane, but orthogonal to the Y-axis.

The antenna designer will specify X1 and X2 in **Fig. 2**, which are the starting and ending points of the wire. For this model I assumed a half wavelength dipole tuned for 9.75MHz. Note that the feedpoint is placed at the (0,0,0) coordinate centre, while the ends are at X1 = -7.28m and X2 = +7.28m (values of Y1,

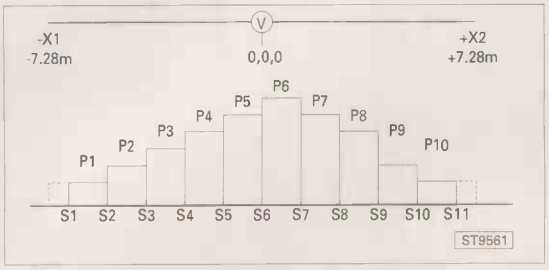


Fig. 4: Conceptual view of the 9.75MHz dipole model using eleven segments and ten pulses.

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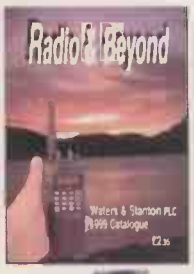

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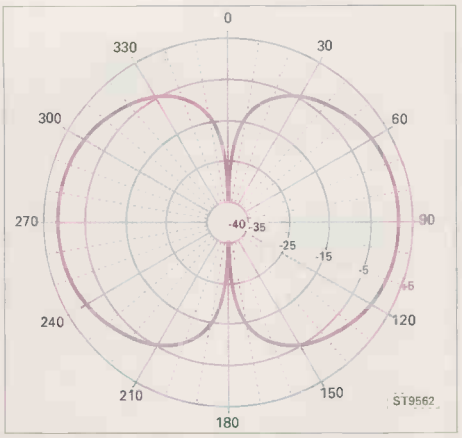

Fig. 5: Azimuthal pattern of 9.75MHz dipole.

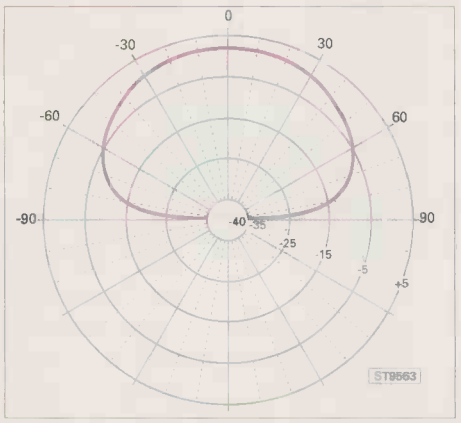

Fig. 6: Elevation pattern of 9.75MHz dipole.

Freq. (MHz)	VSWR	Freq. (MHz)	VSWR
9.25	6.9376	10.00	1.4633
9.30	6.2095	10.05	1.5035
9.35	5.5444	10.10	1.5985
9.40	4.9389	10.15	1.7354
9.45	4.3902	10.20	1.9050
9.50	3.8951	10.25	2.1016
9.55	3.4508	10.30	2.3224
9.60	3.0543	10.35	2.5654
9.65	2.7031	10.40	2.8296
9.70	2.3949	10.45	3.1139
9.75	2.1278	10.50	3.4178
9.80	1.9011	10.55	3.7405
9.85	1.7155	10.60	4.0814
9.90	1.5751	10.65	4.4399
9.95	1.4878	10.70	4.8154

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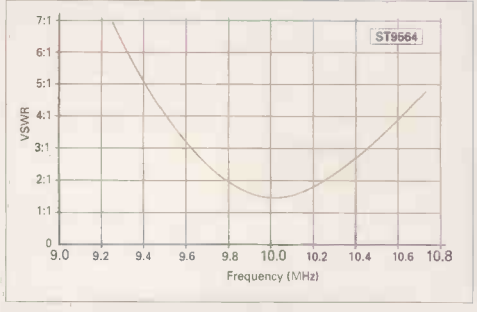
Table 1

Fig. 7: v.s.w.r.-vs-Frequency plot. Table I is data to support Fig. 7.



Y2, Z1 and Z2 are not shown because they are zero). You could just as easily place the antenna along the +X-axis by writing X1 = 0 and X2 = +14.56m.

A current pulse is modelled for each segment, and the cumulative effect is plotted. This establishes the overall performance of the antenna. The greater the number of segments and pulses, the greater the accuracy. Unfortunately, the computation rises rather rapidly with increased numbers of segments.

Several restrictions and criticisms of the DOS-based *miniNEC* program can be noted:

1. The performance over ground is somewhat suspect. The raw *miniNEC* program assumes a perfect ground (which does not exist).
2. Bent or right angle wires are not permitted. These are modelled as two wires connected together.
3. Crossed wires (which connect to each other at a point other than the ends) are modelled as four or more wires.
4. Connections are valid only at the end points of the wires.
5. Earlier versions of the miniNEC program did not do well with large loops and quads.

Most of these problems were cleared up in the versions sold by Beezely and Lewallen (see list at end of article).

NecWin for Windows™

For a long time I groused over the inconvenience of using the various *miniNEC* programs in the DOS environment. This is, after all, the *Windows* era, not the DOS era. I was recently quite delighted to obtain a copy of the *NecWin Basic for Windows™* program. This program appears to be a DOS-based NEC engine run with a *Windows* graphical user interface written in *Visual Basic 3.0*. The vendor offering *NecWin Basic for Windows™* is **Nittany Scientific, Inc. Airline Highway, Suite 361, Hollister, CA, 95023-5621**; Tel +1 408 634-0573; Web site: **www.nittany-scientific.com** The basic version (which I test drove and now use) costs less than $US100, while there is a professional version for a higher price.

NecWin Basic for Windows™ allows you to specify the geometry of the antenna in the *miniNEC* XYZ Cartesian coordinate system. This process is made a lot easier by the fact that it uses a 'spreadsheet-like' grid (**Fig. 3**). Once the geometry is entered, you can select from several different ground situations (including 'none' for free space calculations), the operating frequency, and units of measure used for the antenna wires (metre is the default). You can also customise the calculations using the Output button.

Once the geometry and parameters are entered, you can visualise the geometry in 'stick form' using the 'eye' button on the toolbar. The 'traffic light' button performs the NEC calculations, while the polar coordinates button creates the elevation and azimuth pattern graphics.

When you 'Save Screen' in the 'File' menu you will produce a bitmap (*.BMP) file of the pattern. I found that the 'Print' command in the 'File' menu resulted in an all-black image on my HP Model 6MP laser printer, so I saved it as a bitmap file and then imported into a *Visio Technical 4.1* drawing program file. The patterns shown below were made using that method.

NecWin also allows you to select other aspects of the model. The GROUND button allows you to select no ground (i.e. free space), a perfect ground, a real ground (salt water, fresh water, sandy soil, rocky soil, urban industrial, urban industrial worst case, and hills with rich soil) and the theoretical Somerfield ground model.

When you view the spreadsheet design environment you can click on the 'Dia' field of each wire and select the wire diameter. The standard American Wire Gauge (AWG) sizes can be selected using option buttons operated by the mouse. Alternatively, you can enter a custom wire diameter. The 'Conduct' field allows you to select the type of conductor (perfect, silver, copper and several varieties of aluminum alloy). In my model I used 14AWG copper wire.

NecWin Basic allows you to set the position and type of source or load on the antenna. Because this antenna is a half wavelength dipole I placed a source at the centre point (0,0,0) and there is no load. The 'Src/Ld' field specifies the sources and loads in the model. I used one source and no loads so the figures 1/0 are entered here.

Figure 3 contains the *NecWIN* coordinates for our 9.75MHz half wavelength dipole. **Figure 4** shows the model conceptually. The dipole is centered on (0,0,0) and the ends are at -7.28m and +7.28m, respectively. The minimum number of segments is found from:

$$S = \frac{\text{Length of Wire (m)}}{0.1\lambda} \qquad (2)$$

Where:
S is the minimum number of segments
Length of wire is specified in metres (m)
λ is expressed in metres (m)

In the 9.75MHz example the wavelength is about 30.8m and the length is 14.56m. The minimum number of segments, therefore, is [(14.56-m)/(0.1)(30.9-m)] = 4.7, which is rounded up to 5. I chose to use eleven segments in order to get a more accurate picture of the proposed antenna. This program follows the *miniNEC* convention of providing pulses of uniform amplitude within each segment. There is one less pulse than the total number of segments.

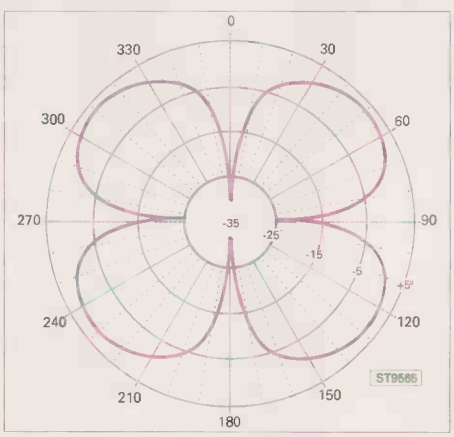


Fig. 8: Azimuthal pattern for a 25MHz 2λ long-wire with λ/4 radial in-line with the radiator.

In this case (**Fig. 4**), there are eleven segments, so ten pulses exist. The 'missing' pulse is the assumption that there is a half-pulse of zero amplitude at either end. This is not an important distinction for the user, but is used internally by *NecWIN* in the computation.

The results are shown in **Figs. 5** and **6**. The azimuth pattern is shown plotted in **Fig. 5**, while the elevation pattern is shown in **Fig. 6**. These assume a single frequency calculation at 9.75MHz. You can also use the program to alter the frequency and discover the changes in pattern that will occur. This feature permits you to predict the performance of the antenna on different bands.

NecWin Basic does not plot the v.s.w.r. graphically, but does provide a rather hard to read tabular output to either

the screen or the printer. I entered the values transcribed from the *NecWin* printed report - selecting the 'Frequency' and 'v.s.w.r.' options) into an *Excel* spreadsheet (see **Table I**), and then used the Chart function of *Excel* to produce a graph of v.s.w.r.-vs-Frequency (**Fig. 7**).

(**Note**: to save space in this magazine a four-column format is used in **Table I**. To make the graph of **Fig. 7** use a two-column format.)

Now we can see the utility of the modelling process. Note that the minimum v.s.w.r. (about 1.5:1) occurs at 10.75MHz, rather than 9.75MHz. Sound familiar? How many times have you erected an antenna and then had to 'tune' it. When I looked at my notebook later on, I realized that I had used the wrong constant in the length calculation (I used 141/F instead of 144/F).

That mistake would have been an annoying oversight if I had cut the antenna and found the resonant point too high. After all, the antenna is easier to trim if the resonant point is lower than the design point (trim excess), but it's harder and sloppier to add wire if the resonant point is higher!

The use of the *NecWin* program for checking an antenna at different frequencies is shown in **Figs. 8** and **9**. The antenna was an Off-Centre Fed Doublet (OCFD) designed for 25MHz. It consists of a two wavelength (2λ) radiator on one side of the transmission line and a quarter wavelength (λ/4) radial on the other side of the transmission line. The radial and radiator were in-line, so could be modelled as a single wire 2.5λ long, fed at the point that is λ/4 from one end.

Figure 8 shows the radiation pattern at the design frequency. Nothing surprising here: a four-leaf clover pattern is what is expected. **Figure 9** shows the same antenna modeled at additional frequencies:

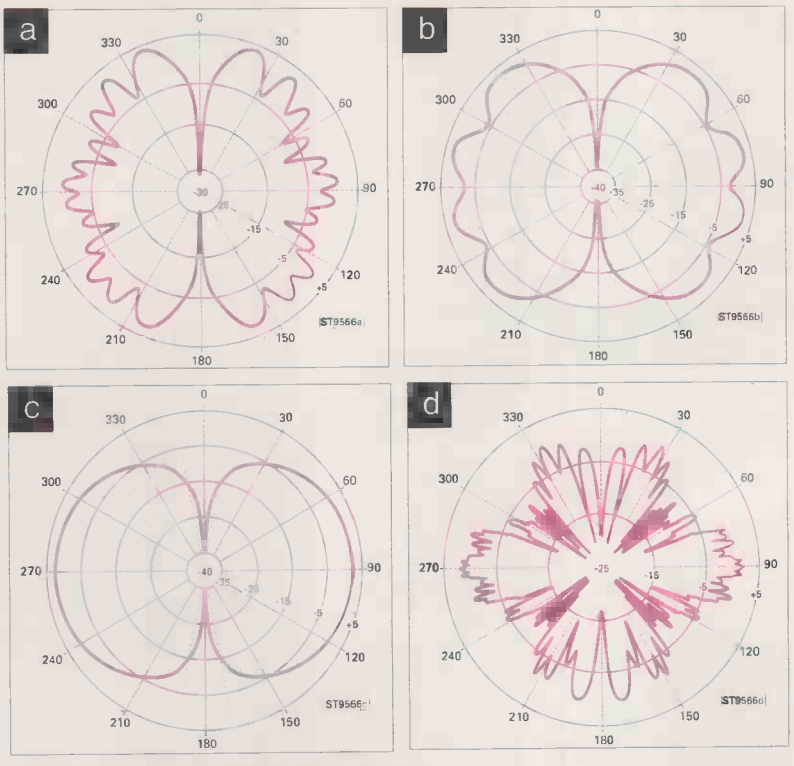
Fig. 9a -150MHz; Fig. 9b - 50MHz; Fig. 9c - 9.75MHz and Fig. 9d - 440MHz.

We can see at a glance the pattern at different frequencies. We can also keep these patterns in our file or tape them in our notebook as we work on various changes to the design.

Conclusion

Antenna modelling software is a low-cost alternative to 'toughing it out' on the roof! The *NecWin* program is an antenna dabler's dream!

Fig. 9: Patterns of antenna Fig. 8 at different frequencies: a) 150MHz; b) 50MHz; c) 9.75MHz and c) 440MHz.



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Cebik, L.B., 'EZNEC for DOS', *Communications Quarterly*, 7,2 (Spring, 1997), 28-30.

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Harrington, R.F. (1968). *Field Computation by Moment Methods*. New York: MacMillan Company.

Jones, Jeff, AB6MB. An on-line manual for *miniNEC* is available on several sites. Look for the material by Jeff Jones, AB6MB.

Logan, J.C. & J.W. Rockway, *The New MININEC (Version 3): A Mini-Numerical Electromagnetic Code* (technical report) NOSC TD 938, Naval Ocean Systems Centre, San Diego, CA, 1986. Publication is available from the US Government's National Technical Information Service (NTIS), US Department of Commerce, 5285 Port Royal Rd, Springfield, VA 22161, USA; Tel: +1-703 4874650. Catalog order no. ADA181682.

*Orr, Bill (1996) *W6SAI HF Antenna Handbook*. Hicksville, NY, USA: CQ Communications.

Rockway, J.W., J.C. Logan, D. Tam and S. Li, *The MININEC System: Microcomputer Analysis of Wire Antennas*, available from Artech House, 685 Canton Street, Norwood, MA 02062. It is a comprehensive manual, but rather daunting to the mathematically challenged.

***Don't forget to check out the *SWM* Book Store for these titles.**

If you have access to a World Wide Web search engine, then type in '*miniNEC*' and give it a go. I found some 105 sites, many of which were very good. ***SWM***

Commerical Products Based On MiniNEC Concept

The *miniNEC* program that can be downloaded for free from the Internet is actually a bit crude. More sophisticated programs based on the NEC engine are available from a number of sources. Be aware that the USA may impose some export restrictions on some of these programs, especially the more sophisticated versions, so all of them might not be available either outside the USA or in selected countries.

EZNEC and *ELNEC* programs:
Roy Lewallen, W7EL, PO Box 6658, Beaverton, OR 97007, USA.

Antenna Optimizer (AO) and improved *miniNEC (MN)*:
Brian Beezley, K6STI, 3532 Linda Vista, San Marcos, CA 92069, USA.

NEC-Win Basic **and** *NEC-Win Pro*:
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Web site: **http://www.nittany-scentific.com**

MiniNEC Source Listing

If you want a copy of the BASIC file for this program you can get a copy from the *SWM* website at **www.pwpublishing.ltd.uk/swm** If you don't have Internet access yet, then you'll be able to get a copy included on the **Cover Mounted CD** that will be provided with the *Short Wave Magazine* April issue.

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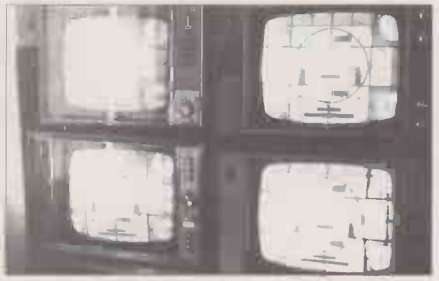
History of TV Systems

For terrestrial broadcasting there are currently only two line standards in use world-wide: 525 lines and 625 lines. Table 1 shows the variable parameters, which make up a television system. Until 1982, two other line standards existed within Europe: 405 lines as used in the United Kingdom and Éire and 819 lines as used in France, see Table 2. The 819-line system ended in the early Eighties while the 405-line system lingered until the early days of January 1985 when all remaining transmitters in Bands I and III were finally switched off.



Part of an elaborate DXTV installation comprising of three Bush TV 125 and one Bush TV 115 monochrome monitors. Each is seen here displaying the Russian '0249' monoscopic test card which has been used since the Fifties.

Early Days

During the early Thirties, experiments in television took place in the United Kingdom using the Baird mechanical disc system with sound and vision transmission frequencies transmitted within the medium wave band. The system was limited to only 30 scanning lines repeated 12.5 times per second.

The resulting low-definition meant that only close-up shots and high-contrast scenes could be successfully transmitted. During this period, experimental work was being carried out on both sides of the Atlantic to try and eliminate the shortcomings imposed by Baird's mechanical system by developing an all-electronic system.

Worried by the competition to produce a system with superior definition, Baird was prompted into increasing his mechanical scanning from 30 to 240 lines with 25 frames per second, scanned sequentially to improve the definition.

Baird System Discontinued

When high-definition broadcasts commenced in November 1936, Baird had just managed to attain the 'high-definition' category with his mechanical system as defined by the government of the day. Meanwhile, Marconi-EMI had proudly come up with the famous 405-line system with 50 frames interlaced scanning producing 25 complete frames per second. Both systems were used on alternate weeks for a short period but the government's decision finally came down in favour of the Marconi-EMI 405-line system.

Europe

Before World War II, France was using a 180-line system while the Germans and Italians had adopted a 441-line standard. Towards the end of the War, the Paris 180-line transmitter on the Eiffel Tower was actually taken over by the Germans and converted to their 441-line standard, which employed negative modulation and an a.m. sound carrier spaced some 2.8MHz away from the vision frequency.

Post-War Growth

The upsurge in the number of television services appearing throughout the world after the War brought with it various standards for sending TV picture and sound information. In the United Kingdom transmissions using the 405-line system were resumed in 1946, but elsewhere things were different.

Continued on page 44...

Table 1: TV Transmission Standards.

The variable parameters which make up a television system are as follows:

a) Number of lines: 625 or 525.
b) Field frequency: 50Hz or 60Hz (depending upon the electricity supply frequency).
c) Video modulation sense: negative or positive-going.
d) Method of sound modulation: intercarrier f.m. (frequency modulation) or a.m. (amplitude modulation).
e) Spacing of the sound carrier from the vision frequency: 4.5MHz, 5.5MHz, 6.0MHz or 6.5MHz.
f) Any of the three colour systems, namely PAL, SECAM or NTSC may be used with *any* of the transmission standards shown below.

Table 2: World Transmission Standards.

System	A	B	C	D	E	F	G/H	I	K	L	M	N
No. of lines	405	625	625	625	819	819	625	625	625	625	625	625
Vision modulation	+	-	+	-	+	+	-	-	-	+	-	-
Sound modulation	a.m.	f.m.	a.m.	f.m.	a.m.	a.m	f.m.	f.m.	f.m.	a.m.	f.m.	f.m.
Sound spacing (MHz)	3.5	5.5	5.5	6.5	11.15	5.5	5.5	6.0	6.5	6.5	4.5	4.5
Vision b/wth (MHz)	3.0	5.0	5.0	6.0	10.0	5.0	5.0	5.5	6.0	6.0	4.2	4.2
Channel b/wth (MHz)	5.0	7.0	7.0	8.0	14.0	7.0	8.0	8.0	8.0	8.0	6.0	6.0

Notes:
1) The sound carrier is located above the vision frequency, except for certain system E and L channels.
2) The field frequency for all systems except system M is 50Hz. System M uses a field frequency of 60Hz.

The upsurge in the number of television services appearing throughout the world after the War brought with it various standards for sending TV picture and sound information. Keith Hamer and Garry Smith explain how we arrived at the standard systems used today.

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All examples do not include P&P.

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History of TV Systems

...continued from page 41.

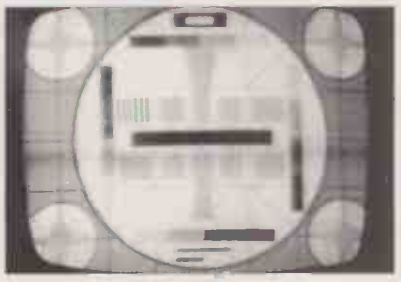
The very popular 'EBU Bar' radiated in the Netherlands during the Sixties and Seventies.

Super-Definition

The French, being different, decided upon a system with a much higher definition. It had 819 lines scanning and a super-wide video bandwidth of over 10MHz! This was known as System 'E'. The 441-line Paris transmissions continued into the early Fifties and there were DX reception reports of this transmitter in some of the technical magazines of the period!

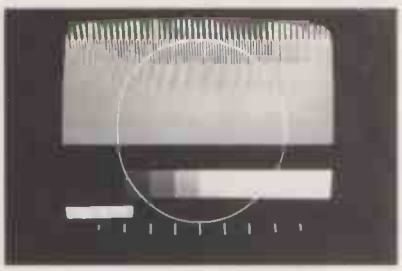
The extremely wide channel width of System 'E' meant that, in theory, fewer channel allocations could be accommodated within Bands I and III compared with other systems. In Band III, the French developed a clever way of interleaving the channels which meant that some sound channels were above, and some were below, the vision carrier frequency!

A 625-line system with positive modulation (System 'L') was later introduced at u.h.f. and nowadays it fully replaces the 819-line system which once occupied the v.h.f. channels.



The Marconi Resolution Chart No. 1.

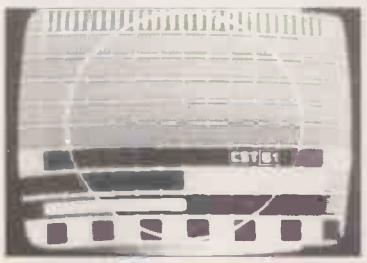
Belgium, Monaco, Luxembourg and Algeria all used an 819-line system at some stage during the Sixties. In early 1969, RTB (the French-language network in Belgium) changed to System 'C' with positive modulation used on all its v.h.f. channels. This system was in use right up until 1977 when conversion to System 'B' took place.



An electronic test card radiated in the Seventies by the former East German TV service, DFF.

Luxembourg changed to System 'C' for its v.h.f. broadcasts in 1971 with an eventual conversion to System 'B' (about 1982/83) mainly because of its decision to broadcast to neighbouring West Germany and Belgium in the German language. It broadcasts in the French language at u.h.f. on both the System 'L' SECAM and System 'G' PAL standard. A similar situation exists in Monaco with transmissions in French and Italian in SECAM and PAL.

An 819-line system was used in Saarland until it came under the control of the Federal Republic of Germany in 1957. Algeria were still using 819 lines in 1969 although some transmitters were being converted for the System 'B' standard. Togo in Africa continued to use the 819-line system until the mid-Seventies.



An electronic test card transmitted by the former Czechoslovakian TV service, CST. The test card was known as the 'CSU01'.

625-Line Transmissions

Most Western European countries decided upon a 625-line system (CCIR System 'B' at v.h.f. and System 'G/H' at u.h.f.). This was a West German development using negative-going vision modulation and f.m. intercarrier sound separated from the vision channel by 5.5MHz. This particular system was also adopted by Australasia, parts of the Far East, the Middle East and some African countries, but with differences in channel numbering and allocations in general.

In Russia and Eastern Europe a 625-line standard was also chosen but with a much wider vision bandwidth than the CCIR system and a 6.5MHz sound and vision spacing. This was known as the OIRT system and designated System 'D' at v.h.f. and System 'K' at u.h.f. There were a few exceptions of course. Yugoslavia eventually opted for the CCIR system, and so did East Germany.

The same technical characteristics of the OIRT system are now used by the many French influenced colonies throughout the world. In Africa, for instance, countries using System 'K' are plentiful nowadays although these are of little interest to the European TV DXer because only the Band III and u.h.f. channels are used. **Table 3** shows areas in use for present-day TV systems, and systems no longer used.

UK Plans

Field tests using u.h.f. Band V took place as early as November 11th, 1957 using the 405-line system from the Crystal Palace transmitter. Less than six months later more experimental transmissions took place at u.h.f., but this time using 625 lines. This was to become the standard that would be adopted for any future television networks in the United Kingdom.

The system chosen was very similar to the CCIR and OIRT systems but with a sound and vision frequency difference of 6.0MHz. It was proposed that the 405-line system in Bands I and III would eventually be phased out and replaced in favour of the higher definition broadcasts offered by the 625-line system. The main technical hitch was that fewer channels could be accommodated within the bands because of the wider channel bandwidth required by the new system.

Originally, the phasing out of the 405-line network was to be a much swifter process than actually happened and it is doubtful whether anyone would have envisaged the system lingering on until 1985! Unfortunately, the idea for a re-engineered network in Bands I and III was eventually ditched during the Eighties when the Government, with misguided loyalties, decided to hand it over to users other than TV broadcasters.

The UK system is also used in Éire at both v.h.f. and u.h.f. This system has also been adopted in other parts of the world. Hong Kong use it and so do a few African countries including South Africa and Angola.

Colour Television

Experimental colour transmissions took place in the UK towards the end of 1955 when the NTSC system underwent field trials using 405-lines at v.h.f., but with a lower sub-carrier frequency than in the original NTSC specification. There were also colour broadcasts on 625 lines during the early Sixties.

Today, there are three colour systems in use

Table 3: Areas In Use.

Present-day TV systems:-

B	VHF in Western Europe, parts of Africa, Asia, Middle East and Australasia.
D	VHF in Eastern Europe, CIS and China.
G/H	UHF in W. Europe. System H has a 1.25MHz vestigial sideband.
I	UK (u.h.f), Eire (v.h.f./u.h.f.), Hong Kong (u.h.f.) and parts of Africa (v.h.f./u.h.f.).
K	Eastern Europe (u.h.f.), CIS (u.h.f.) and French territories overseas (v.h.f./u.h.f.).
L	France (v.h.f./u.h.f.), Monaco and Luxembourg (u.h.f.). NB: The sound channel is 6.5MHz *below* the vision carrier in Band I.
M	North and South America, Caribbean, parts of the Pacific, Far East, US forces Broadcasting (AFRTS) and Japan.
N	Argentina, Uruguay and Bolivia.

Systems No Longer Used:-

A	Used in the UK and Eire until 1985. It was at one stage used by the Rediffusion cable TV service in Hong Kong.
C	Used by Belgium and Luxembourg until mid-seventies.
E	Used by France until early eighties with interleaved channels. NB: The sound channel was ±11.5MHz from the vision.
F	Used by Luxembourg and Algeria until the late sixties, also by Belgium during the early sixties.

throughout the World: PAL, SECAM and NTSC. They all have their merits and weaknesses and many were chosen because of political influences or even a country's topography.

Some countries use variants of these systems in order to suit the technical requirements of a particular transmission system used. One example that readily springs to mind is the PAL system adopted by Brazil where a sub-carrier frequency lower than the usual 4.43MHz has to be used because of the narrower vision bandwidth of the 525-line American system which is employed.

During the Fifties, colour television was introduced to the USA using the NTSC colour encoding system. NTSC was later adopted by most countries using the 525-line system 'M'. This standard is used in the Caribbean area, Canada, Japan, certain countries in the Far East and South America.

Some South American countries use System 'N' which has 625 lines but retains the same channel arrangements and vision bandwidth of System 'M'. The American Forces TV Network (AFN-TV) in Europe also uses the System 'N' NTSC standard. Transmission standard changes have occurred in certain cases, for instance Aramco-TV (Dhahran, Saudi Arabia) changed its Band I transmitter to System 'B' PAL during the Seventies.

The NTSC colour system was field tested in Europe but it was eventually considered to be unsuitable mainly because phase changes in the received signal had some considerable effect on the colour: it changed it! Although the hue control on the American sets could compensate for this shortcoming, it was felt that an improved system should be developed in Europe with automatic compensation to eliminate the need for frequent adjustment.

A relatively simple DX installation consisting of a standard TV receiver, a D-100 DXTV converter fed by an external antenna.

The PAL and SECAM systems were eventually developed which were designed to overcome the shortcomings of the NTSC standard. By the end of the Sixties, many European countries had come to a decision over which colour system they were to use.

In general, most Western European countries opted for the PAL system, including Yugoslavia. France decided on SECAM along with Eastern-bloc countries (including East Germany) and the former USSR. Rumania opted for PAL, along with Albania, North Korea and China.

Within recent years SECAM countries such as Poland, Hungary and the Czech Republic have changed to PAL. Other countries such as Slovakia, Lithuania and Latvia are expected to follow.

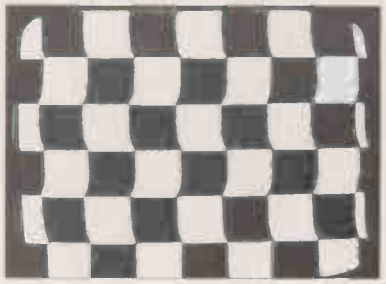
Encryption

Encrypted broadcasts have been with us for a number of years with both satellite and terrestrial stations using sophisticated techniques to prevent unauthorised viewing of the broadcasts. Early attempts at encryption were quite crude.

For example, during the early Seventies in the Middle East one station was reputedly transmitting a jamming signal close to the one required. The descrambler was basically a notch filter connected to the antenna input to remove the interfering signal.

DXing In The 'Good Old Days'

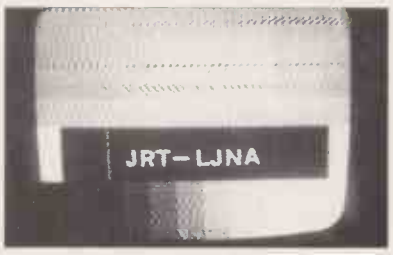
The hobby is totally different these days to what it was three decades ago. It was mainly the hobby of an elite bunch of enthusiasts, usually TV repair technicians with modified receivers and no guidance other than self-experimentation. There were no DXTV columns and enthusiasts were extremely thin on the ground, so much so that if there was another enthusiast living less than 100 miles away to swap reception notes with, you were in luck! Over the past two decades things have changed with enthusiasts emerging from all walks of life and technical ability.



A monochrome chessboard test pattern transmitted in the Sixties by TVE in Spain.

Many countries were still developing TV services in the late Fifties and early Sixties and enthusiasts had the thrill of discovering a new country entering service, rather like a new satellite service coming on-line. Programmes in many countries did not commence until the early evening.

The Spanish second network (TVE-2) commenced programmes as late as 1830UTC back in 1969. Icelandic TV (RUV) would cease programmes during July and August much to the delight of test card hunters. Other countries would radiate a test card for most of the day apart from morning transmissions for schools.

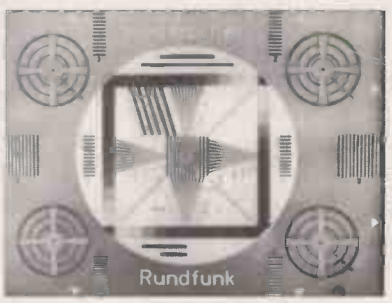


The EBU Bar used by the former Yugoslavian TV service JRT in Ljubljana.

Until the late Sixties, colour test cards were almost non-existent. Many test cards were intriguing designs featuring corner circles, something we did not see in the United Kingdom, apart from a couple of early designs used by ITV in the London area.

The first PM5544 colour test card DXers encountered was in 1970. It was broadcast by ORF in Austria without any identification. Little did we know then that the World was to be overrun with it and its variations!

The last monoscopic test card in regular use was the Russian 0249, last seen in the early Nineties. Today, with round-the-clock programmes, the test card is unfortunately increasingly becoming a rare creature.

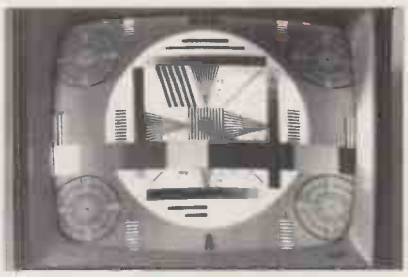


The German 'T05' monoscopic test card radiated in the Sixties and early Seventies by Hessischer Rundfunk.

Countries have come and gone on Band I. Cyprus once operated a 15kW Channel E2 transmitter and Bulgaria had transmitters on Channels R1 and R2 until the early Seventies. Closer to home, Belgium had a 100kW outlet on E2.

New Challenges

The wider use of u.h.f. channels on the Continent meant that UK enthusiasts had a new challenge. Early u.h.f. tuners, using PC88 and PC86 valves, were discarded and replaced by the new transistorised types in the hope that u.h.f. DX would become a reality. Strangely, antenna designs have not changed much since those days. The next challenge was colour reception and who would be the first to resolve SECAM.



The monoscopic test card radiated by the West German TV service WDR was modified to include a colour bar pattern across the centre of the picture. West Germany introduced colour TV in 1967.

Digital Broadcasts

In many ways we face similar challenges with the introduction of digital broadcasts and all the scare stories that are currently being traded. The days of watching a snowy picture emerge from nothing will be over, the digital signal will have to attain a specific signal-level before the picture appears. When the signal-level drops, the image will remain frozen due to lack of data. Will the 'frozen' digital picture be an aid to identification?

SWM

The Kneisner & Doering

Don Phillips explores northern Germany, meets an entrepreneur and a Digital Signal Processing receiver, and gives it a workout in a Danish fishing village.

In the suburbs of the modern thriving German town of Braunschweig is a small quiet industrial estate. At the side of one low white unit is a huge antenna tower. There are few other clues for the curious visitor. Parked outside is a large white, well-used American saloon car. The sign at the entrance to one low white unit announces Kneisner and Doering. It would be a good setting for a detective agency. I met one of the partners here one evening and asked exactly what went on.

Hans-Jürgen Kneisner is a tall energetic man who radiates enthusiasm. He is something of a Renaissance person, stressing his interests in Scandinavian languages, physics and restoring vintage American cars. He runs the small independent company with a partner, Karl-Ernst Doering.

I was told just some of the products that are made. This list is varied and includes ultrasound measuring equipment utilising power amplifiers in the kilowatt range, control systems for driverless transport in automobile manufacture, and measuring systems to measure the tension in rubber cogbelts.

A recent brainchild of Herr Kneisner has been a system to measure the water content of butter. A fascinating field of human endeavour for some, no doubt. But what has this to do with radio listening?

Herr Kneisner explained that although the partners originally came together in 1962 through their long term passion with amateur radio, it is only recently that they have turned their attention to the production of a communications receiver, the KWZ 30. They have proven skills of r.f. design and digital signal processing techniques.

Necessary Skills

The small, skilled and flexible workforce has the necessary wide range of electronic and mechanical engineering production skills to produce this idiosyncratic receiver. Kneisner and Doering's future plans for the amateur radio market include an h.f. transmitter as a companion to the KWZ 30, and an automatic antenna tuner with power handling capabilities.

Herr Kneisner led myself, and ace German DXer Martin Elbe, to an adjacent glass-walled showroom, connected his new creation to a longwire antenna, and took us through the functions of this unimposing receiver. It is a joy to see any instrument in the hands of a master, and our host had the receiver perform every trick imaginable with ease and competence.

Martin and myself explained that we were motoring through north Germany the following day to attend the annual general meeting of the Danish Shortwave Club International, which is also a DX camp. We would be bringing with us our own AOR AR7030s and knew that there would be a variety of other receivers present, including the Japanese Radio Company's NRD-535 and a mint example of their latest receiver the NRD-545, which also employs digital processing techniques.

The Kneisner & Doering Factory.

The DSWCI DX Meeting

And so it came about that Martin Elbe and I crossed the border the following day and drove through Jutland with two suitcases, two AR7030s, a kilometre reel of antenna wire and an unscheduled holiday guest, a borrowed KWZ 30. We passed through the green Danish countryside, broken only by farmhouses with flag-poles outside, and the ever-present silent turning fingers of wind-powered electricity generators.

By late afternoon we drove into the tiny fishing village of Lohals, on the island of Langeland, booked into the only hotel, sat in bright sunshine outside of the only restaurant, and met up with our fellow hobbyists from all over Europe as they converged by car or ferry on this idyllic little resort. If good DXers all go to the same part of Heaven when they die, then I have already seen it.

The DSWCI took over the use of a large well furnished village hall situated at the quay-side. From the rear of the building long wire antennas were hastily strewn between the posts and shrubs which faced the narrow beach. When all the members had arrived, unpacked, eaten and sampled local beer, it was time to unpack the KWZ 30, connect up an antenna and earphones, and set it alongside a wide range of the world's best amateur communications receivers.

First Appearances

The newcomer attracted a lot of attention. I suppose to look at, from a distance at least, the KWZ 30 could be a relative of the Drake R8. At least they come from the stable of black biscuit tins sitting up obediently on two front legs like HMV's timeless Nipper the dog.

Although finished in matt black, the KWZ 30 is made of stainless steel. Herr Kneisner had explained that, as well as being very rugged, stainless steel is easier to work with. The front of the receiver follows the trend for simplicity: a small on/off volume rotary control, a larger multi-purpose tuning knob and a sturdy five by four keypad.

Slightly left of centre is a pleasant-to-use backlit 70 x 37mm greenish l.c.d. graphic display. To the far left are simple slots protecting a front facing internal loudspeaker; beneath this is a quarter inch diameter phones socket.

There has been a tendency for sexy, nice feeling tuning controls to come only from the far east; well, the KWZ 30 is a pleasure to tune. The large locally produced knob is flanged by a pleasing knurled-effect rubber ring, which was sourced from the photographic industry.

The keypad has a firm professional feel to it, and through it all the functions are called up. The arrival of the AR7030 taught us that modern affordable receivers could have excellent specifications while presenting the hobbyist with an exciting challenge, not unlike a computer game.

Good Results

While it was relatively easy to get good early results with the AR7030, the owner could spend many evenings finding his way down a labyrinth of menus and discover new goodies at every turning. The KWZ 30 follows in this spirit, although the game is less complicated. This is partly because of the relatively large and helpful graphic display, and partly because of the top four keys in the matrix, which are shamelessly named F1 to F4 in computer keyboard tradition.

These are each used to record a series of regularly used key entries, which can be stored and recalled when required. These, to a computer user, are the equivalent of a macro. For example, F1 could be set to call up 'u.s.b. with 3.0kHz filter' and F2 could be 'l.s.b. with 3.0kHz filter', both very common useful settings for the DXer.

Without these shortcuts to routine tasks, switching from, say, u.s.b. to l.s.b. could be tedious, as it would involve calling up the mode menu, making a choice and then entering it. Clearly this is not the receiver for somebody who hates the way computer software is accessed, but at least all the menus on this receiver seemed straightforward. For me, the receiver

KWZ 30 Receiver Review

passed the test of all good computer software, it was not necessary to use the handbook to run it!

A Clever Idea

One key on the pad switches in the noise reduction circuitry. When this function is called up it is possible to adjust the threshold by moving the tuning knob - a clever idea. Noise from weak high frequency broadcast stations was considerably reduced by this function.

The owner of this receiver would certainly not need to purchase an add-on digital audio processor. Neither would the owner need an external notch filter as another key toggles this in.

It can suppress any number of tones and is auto-tuning. Nothing to adjust, no need. But don't listen to your favourite Bach organ music with it in, or the long pedal notes will get wiped out.

The Squelch control is similarly called up directly and has the level set by the tuning knob. There are two independent squelch functions which can each be adjusted, one for a.m./s.s.b. and another for f.m.

The Key To Everything

Another button on the matrix is labelled 'ME'. It is not an invitation for the owner to make his own stamp and customise the receiver software, but is short for 'menu'. This button is the key to everything else.

Both the Pass Band Tuning and the Beat Frequency Oscillator offset can be called up through the master menu. They can each be adjusted to ±2800Hz, not as wide a swing as some receivers, but this range was found to be more than adequate in practice.

How many memories should a modern communications receiver have? None? A thousand? The KWZ 30 has 250 memories, which will satisfy all but the most catholic of listeners.

Although there has been no attempt to include an alphabetical system of identifying stored stations, all other receiver information is stored along with the frequency to enable a station to be recalled with exactly the same settings as when it was first heard. Memories can be recalled either by typing in the memory number or adjusting the main tuning knob (like the Drake R8). In every memory location a scan time can be recorded.

The KWZ 30 has some other nice features, for example, the language employed in the menu system can be selected from French, German and English. The 'S'-meter is represented by a bar along the bottom of the graphic display, and can have its delay time adjusted numerically. Similarly the rise, hang, and decay time of the a.g.c. can be modified, as can the overall gain of the d.s.p. module.

Circuit Description

From the 50Ω antenna input, the signal passes through a protection circuit and a 32MHz low pass filter. It is then mixed with a tuneable v.f.o., adjustable from 75-105MHz in 1Hz steps. The product forms the first i.f. of 75MHz, and it has a bandwidth of 15kHz at this point and is passed through a luxurious 8-pole crystal filter.

After further amplification, the signal is converted to 456kHz. The oscillator responsible for this, running at 74.544kHz, is temperature compensated, and serves as the receiver's master oscillator. This second i.f. stage provides more amplification and incorporates the a.g.c. provision.

Then the analogue signal is converted to digital form. This is the point in the circuit where traditional methods of signal processing are left behind, and d.s.p. - Digital Signal Processing - takes over.

Most of the clever things happen at this point. There are fourteen bandwidths of filter available, ranging from 50Hz to 9.0kHz, with an incredible shape factor of 1.15 (6-60dB) and 0.2dB of passband ripple. Herr Kneisner explained that while it would have been possible to set up an almost infinite number of bandwidths using digital processing, for ease of use he has decided to offer a fixed number designed to meet every reasonable need.

Herr Kneisner with the KWZ 30.

The receiver allows reception of the following modes: u.s.b., l.s.b., a.m., four c.w. or Data modes with pre-adjustable offsets and narrow band f.m.

The a.m. demodulator functions in a novel way. Filtering is such that both sidebands are available to the d.s.p. unit. They are added together and from this the square root is calculated to define the modulation envelope. This occurs 12000 times a second.

The advantage of this method is that the broadcast signal carrier is not required at all for demodulation. Therefore, narrow band fading will not adversely affect the signal. As carrier fading is therefore irrelevant, this means the designer has avoided asking himself 'should this receiver include synchrophase detection?'.

Here I'm shown comparing the NRD-545, KWZ 30 and the AOR AR7030 in the DX camp.

The disadvantage with this method is that both sidebands are required for satisfactory a.m. demodulation. If one is severely damaged by interference, reception will be unsatisfactory.

Herr Kneisner suggests that in such circumstances, u.s.b. or l.s.b. mode be employed for listening. In these circumstances of course, only one sideband is utilised and an internal signal, generated by the b.f.o., is added for demodulation. This method is already well known to most serious DXers.

The DX hut (building on left).

The audio amplifier provides a more than adequate 2W. There is an external speaker socket and a constant volume buffered output at line level, which is ideal for recording. There is an external power supply, which converts mains voltage to the required 12V d.c. supply to drive the receiver.

There is also an RS-232 PC connection allowing computer control of the receiver. The company point to the Swiss *SHOC Radio-Manager* programe which now has a suitable driver for the KWZ 30.

The tiny fishing village of Lohals, on the island of Langeland, taken from the steps of the DX camp.

How Well Does It Work?

Obviously we were unable to give this receiver any form of laboratory test, nor were we able to check out the

Some members of the DSWCI AGM (from Denmark, Netherlands, Great Britain, Sweden, Belgium and Germany).

specifications. What we were able to do was to listen to it extensively over several days in less than ideal (but realistic) DX conditions, and compare it with other known good performers.

One of the strongest tropical band stations which could be heard during the early evenings is Kampala, Uganda, on 4.976MHz. While the AR7030 was able to receive the station perfectly well, the KWZ 30 immediately made its virtues apparent. Somehow the d.s.p. circuitry seems to allow much more detail in the signal to come through.

It has been suggested that because the i.f. filters are so good, so close to the theoretically perfect filter, the maximum of audio is effectively passed at this stage of the circuitry, without the usual tailing off of performance at each end of the conventional pass band profile. As Brazilian stations on the 25m band faded in later in the evening, the KWZ' was more revealing. In some critical instances it would have been possible to hear programme details and content which would have eluded the listener using the AR7030.

Don Phillips with the 'hands on' approach.

It was possible to observe similar characteristics between the NRD-535, the JRC 'conventional' flagship receiver of recent years, and their recent introduction, the NRD-545, which also uses digital signal processing.

I suppose the ultimate question is how did the KWZ' do against the NRD-545? Well, we did attempt as close a comparison as hastily switching antennas and earphones will allow. The NRD, the more expensive, is evidently well made with facilities readily available through a host of front panel controls. But in terms of performance, from the tests we carried out, there was not a clear winner.

Don Phillips and ace German DXer Martin Elbe at DSWCI.

We really did try, but after trying to be as fair to both receivers as possible, setting controls identically to receive short wave signals in changing conditions, it was not really possible to say which performed better.

A Digital Sound

What did become apparent was that the d.s.p. receivers imparted a slight, but distinctly noticeable 'synthetic' sort of sound to the audio, regardless of the reception mode. In some ways, this effect could be described as similar to hearing everything over a telephone line.

For the short wave listener wishing to enjoy good signals at a natural tone, the AR7030 came out tops. For long term monitoring, there is the possibility that the d.s.p. receivers could leave the listener fatigued.

The KWZ 30 receiver.

I later discussed this observation with Herr Kneisner. He said that he was aware of the 'digital' phenomenon, and had also observed it himself on the Watkins-Johnson and Rhode & Schwarz receivers. Herr Kneisner was confident that pure phase linearity of the i.f. stages - a feature of digital signal processing - gave the listener the true sound of a.m. broadcasting.

The sound we have all come to expect from our analogue receivers does in fact contain a considerable amount of distortion, he maintained. But for hearing details at the threshold of intelligibility, the d.s.p. sets undoubtedly had the edge.

It was not possible to check the sensitivity of the KWZ 30, beyond saying that it was more than adequate for real-world listening conditions where atmospheric and man-made noise swamps receivers way before full gain is achieved. Certainly the KWZ was comparable to the others in this area.

Abbreviations

a.g.c.	Automatic Gain Control
DM	Deutsch Mark (approximately 3 to £1)
d.s.p.	Digital Signal Processing
h.f.	High Frequency
i.f.	Intermediate Frequency
l.s.b.	Lower sideband
u.s.b.	Upper sideband
v.f.o.	Variable Frequency Oscillator

Should No Home Be Without One?

For the serious DXer or short wave listener prepared to spend around £1000 this receiver is well worth considering. Its analogue rivals cost well below this sum, but often a crystal filter and other add-ons are necessary to bring them up to a similar specification, leaving them not far behind the current KWZ 30 list price of £1180. The new NRD-545 undoubtedly has a greater perceived value, but is priced at around £1600.

The time I spent with the KWZ 30 was very enjoyable. Getting to understand its controls was an easy task, and listening to the clean crisp sound of DX stations in my headphones was unforgettable. When my DX holiday was over, the receiver had to be returned. A wonderful holiday romance was over.

Kneisner & Doering Sales

The price of the KWZ 30 receiver at the time of writing is 3485DM, which is about £1180. A remote control cable connected extension keyboard, KWZ TT, costs 269DM. An active antenna, KWZ A1, which was not tested, is also available for use with the receiver for 449DM.

In an endeavour to supply amateur radio equipment at affordable prices, Kneisner and Doering do not currently use retail outlets, but sell directly. The receiver comes with a guarantee and a one month's 'satisfaction or return' undertaking. Postage, insurance and currency transfer arrangements need clarification at the point of purchase.

The company can be contacted at **Kneisner & Doering Elektronik GmbH, Senefelderstrasse 16, D-38124, Braunschweig, Germany, Tel: 0049531-610352,** E-mail: **kud-bs@t-online.de** and on the world-wide web at **www.kd-elektronik.com**

About The DSWCI

The Danish Shortwave Club International has been in existence for over forty years, and prides itself as not only being a meeting place for the more experienced and enthusiastic DXer, but a truly international forum for hobby friendships to flourish. It has 425 members living in 44 countries in all six continents of the world.

Over recent years the Club has had to meet the challenge of declining interest in some aspects of our hobby. Although, in common with other clubs, membership has fallen slightly, it has been currently stabilised by providing a weekly E-mail bulletin, *DX Window*, as well as the printed monthly members' magazine.

The club also annually publishes a *Tropical Bands Survey* and the *Clandestine Stations* list. More information about DSWCI can be obtained from **Kaj Bredahl Jorgensen, Tavleager 31, DK-2670, Greve, Denmark**, E-mail: **dswci@centrum.dk** ***SWM***

The Timewave DSP-599zx

Dr. F. Crossley provides us with the benefit of his long term ownership of the Timewave add-on audio digital filter.

Anyone who listens to the short wave bands will be aware that many signals are heard combined with unwanted noise and whistles. Some improvement can be effected by using narrower i.f. filters, but often this is not possible. If, however, we tackle the problem at audio frequency, a useful reduction in the volume of some unwanted noises can be obtained. Whistles can be reduced using rejection filters (what else!), but to remove several whistles involves very narrow band filters and ordinary inductance-capacitance filters, or active filters become very complex and difficult to tune, since each interfering noise must be removed individually.

White noise is virtually impossible to remove using conventional analogue electronics. A better solution must be found, and this exists in the digital world. Once this world is entered, the power of the computer can be used.

In the April '96 *SWM*, Mike Richards gave a useful introduction to digital signal processing in his review of the MFJ-784B and I will not repeat his comments here, except to say that a digital system can do things that are very difficult with analogue systems, such as automatic removal of several whistles and reduction of random noise.

Why Use The Timewave DSP-599zx?

Some time ago I decided that a d.s.p. would improve reception of the data modes and utility transmissions I want to hear which, for some strange reason, are often weak and noisy. Presumably if they were easy to copy I would not want to receive them!

I looked at the MFJ-784B, the JPS and Timewave offerings. They all appeared to be good products, on paper at least, and almost any would have done what I wanted, but none of them seemed to have frequency calibrations on them. To me this is a serious omission.

The Timewave DSP-599zx has a liquid crystal display and 13 light emitting diodes so that one can tell at a glance the state of the d.s.p. We shall see that the DSP-599zx also has extra abilities which none of the other contenders had. This is the filter I had to try, even though it is an expensive model, the money saved by revarnishing the kitchen units instead of replacing them helped pay for it!

Facilities Provided By The DSP-599zx.

In common with most digital filters, the '599zx provides a wide band-pass filter with adjustable upper and lower corner frequencies, a narrower band pass filter, in which the centre frequency and bandwidth can be adjusted, an automatic multiple notch filter, a manual notch filter and finally, random noise rejection. Some of these functions can be used together. Those are the functions offered by the '599zx as a filter, but it can do more.

First we find that it has two separate audio channels (but not two processors) for use with two radios. Second it operates as a sine wave generator and as an a.c. millivoltmeter. Third, it can generate some test signals for setting up teleprinter terminal units and for checking s.s.b. transmitters. Finally, it can check the CTCSS frequencies (50 of them) and their amplitude.

The d.s.p. operates in five modes, three of which are filters. The modes are chosen by pushing a button, with light emitting diodes indicating the mode chosen. The available modes are: voice, c.w. and data.

Voice Mode

In voice mode you can use wide band pass filter, automatic multiple or manual notch filters, and random noise reduction. The band pass filter has a lower corner frequency of 100 to 1000Hz and an upper corner frequency of 1000 to 5000Hz, both adjustable in 10Hz steps.

The filter has a linear phase characteristic (reducing ringing) and the attenuation is 60dB at 180Hz from the corner frequency. This band pass filter is actually a low pass and a high pass filter effectively in series so that only where their pass responses overlap will any signal be transferred. This type of filter is used so that the low and high frequency corners can be independently adjusted, a technique which is suitable for voice signals.

CW Mode

The c.w. mode has a band pass filter, manual notch filter and random noise reduction. The centre frequency of the band pass filter can be set between 200 and 2150Hz and has a width of 5 to 600Hz with a linear phase characteristic and attenuation of 55dB, 60Hz outside the pass band.

This form of filter is very convenient for the reception of single tone signals such as Morse code, and the very steep edges to the pass band causes unwanted signals to 'drop off' the edge. The manual notch filter has a single notch or two separated by 180Hz, the width being adjustable to one of five values, the wider notch being the deeper.

In order to facilitate setting the band pass filter, the d.s.p. can produce a tone at the centre frequency of the filter. The centre frequency can then be adjusted to the frequency of the c.w. being received and the bandwidth reduced to the desired value.

In voice and c.w. mode, the liquid crystal display shows the relevant frequencies of the filters in use.

Data Mode

Data mode has 13 preset data types and three set up by the user. The types include: RTTY with differing shifts and speeds, AMTOR, CLOVER, SSTV and WXFAX. The filter for RTTY is actually a pair of narrow band filters, whose mark frequency is between 1200 and 2150Hz with a shift of 170, 200, 425 and 850Hz.

The bandwidth of each filter can be set between 20 and 600Hz. These filters have matched amplitude response, steep skirts and linear phase response. The speed can be set to 45, 50, 57, 75, 100, 110, 150, 200 and 300 bauds.

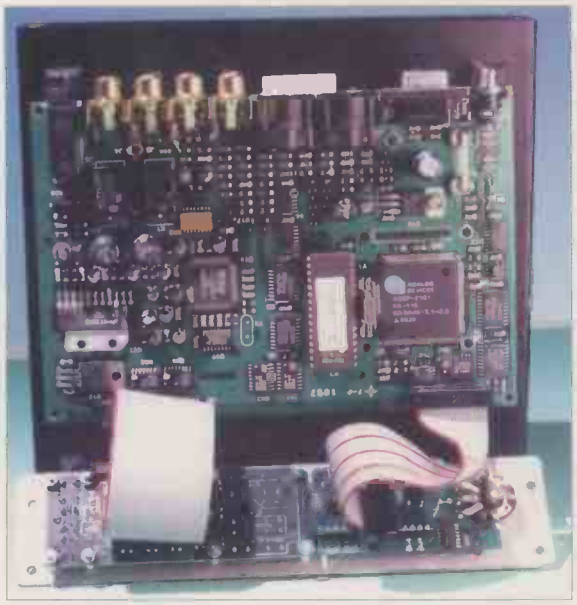


Fig. 1: Neat layout, I wonder what the empty holes on the main p.c.b. are for?

You may well ask why the speed needs to be set when the d.s.p. is only an audio filter. The reason is that the d.s.p. also acts as a modem and can output an RS-232 signal with the speed set by the user, which must be the same as that transmitted.

A user with suitable software can now connect the d.s.p. to the computer's serial port and display teleprinter signals with great ease, and certainly with fewer errors than I used to obtain. The d.s.p. can also receive data from the computer for transmission to a transmitter and has connections for p.t.t. operation.

The d.s.p. can also remodulate and send 'perfect' a.f.s.k. to a terminal unit. The SSTV filter has two bands, 1100-1300 and 1500-2300Hz, and the WXFAX filter has a band from 1500-2300Hz.

While in data mode, the d.s.p. can generate the standard RYRYRY...test message at the lower speeds and a series of alternating mark and space tones at the higher. When in data mode, the l.c.d. shows either the filter frequencies, etc., or a very useful tuning display to enable the teleprinter signal to be correctly tuned.

Fig. 2: A rather busy rear panel.

The display consists of two bars, one for the mark signal strength and one for the space. The radio is tuned until the bars are of equal length, very nice. There is a data carrier detect function. When a data carrier is detected, which exceeds a threshold, signals will be transmitted to the RS-232 port. This threshold can be changed to cope with the weaker signal.

Test & Set Up

There are two more modes, test and set up. In the test mode, one finds the sine wave generator, the millivoltmeter and the CTCSS test facility. The sine wave generator operates between 20Hz and 10kHz in 20Hz steps with an output of 5 to 500mV. A very useful feature is that while the sine wave is output on the line out terminal, any voltage applied to the input terminal is displayed on the l.c.d., this makes plotting filter and amplifier responses very easy.

The millivoltmeter measures an a.c. voltage between 10Hz and 10kHz displaying the peak and true r.m.s. potential up to a maximum of 2000mV. The handbook warns the user that it will not safely measure the mains voltage. (American, that is. It will probably measure ours with much more smoke!). A two tone test signal can also be produced at frequencies of 700 and 1900Hz.

The set up mode enables one to set properties of the d.s.p. such as routing of input and output signals, sensitivity of the input channels and output voltage of the line outputs and polarity of teleprinter signals. Each filter mode, with many changes possible in the data mode, can be modified using the set up facility.

Connection & Use

At the rear of the unit are eight phono sockets, two DIN sockets which duplicate most of the phono connections, a stereo phone jack, RS-232 DB9 socket and the power connection. To use the DSP-599, simply connect the audio output of the radio to channel A input of the filter, adjust the volume so that the yellow l.e.d. flashes frequently and the red one rarely and then use the volume control on the '599 as required.

Press the 'mode' button to illuminate the mode l.e.d. for voice, c.w. or data and then try the filters available in that mode. There is a bypass button to sample the unprocessed signal and marvel at the improvement given by the unit! It is quite easy to over process and thus make the signal far worse, so do not forget that the radio has filters and possibly tone controls which should be used as well to make the signal intelligible.

The filter unit needs a loudspeaker and a power supply giving 12-16V at 1A, since in neither case does it have its own. The unit can save six settings of all parameters, except the volume, and the default parameters to use at switch on.

The frequency setting controls are optical encoders and so introduce no noise and, being multiturn devices, allow very easy frequency setting; however, they are very free moving and are easily disturbed. These also control push switches, which usually select or cancel menu choices.

How Well Does The DSP 599zx Perform?

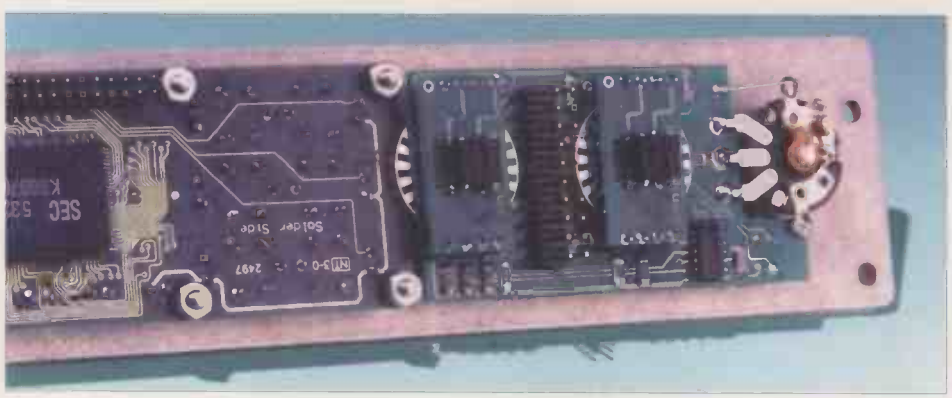
In short, very well! Random noise reduction is very effective if the signal is not buried in the noise, but if it can barely be heard above the noise the d.s.p. will not make a big difference. In most cases, the intelligibility of the signal is improved with very little distortion, the background noise does tend to rise when the signal fades away, as expected, but careful adjustment of the r.f. gain reduces this effect, see John Wilson's articles regarding this control.

The use of noise reduction is not always useful with data signals, especially facsimile, but do try it! Note that noise reduction works by comparing the statistical properties of the signal and the noise. If there is no signal, the noise will not be reduced much.

Auto multiple tone elimination works well but with Morse and teleprinter interference tone goes, although there is a click when the tone starts which might be more annoying. If possible, the receiver's pass band shift should be used to remove this type of interference.

Continuous tones, such as heterodynes, are completely removed; very useful if you tune around the broadcast bands, as I do, in s.s.b. mode. The manual notch filter will remove single tones or two separated by 180Hz, but the width of the notch can be varied from about 60 to 260Hz between half voltage points. However,

Fig. 3: The noise free optical encoders for frequency settings.



only a 1 to 9 scale is provided, and half this is for single tones.

The c.w. band pass filter is remarkably good at reducing all the signals outside its pass band, although noise reduction is available its effects are small. A very narrow pass band can cause the c.w. pulses to run together making decoding very hard, therefore do not reduce it too far.

The centre frequency tone feature really does make tuning the filter much easier. Only the manual notch filter can be used in the c.w. mode.

With the facilities provided in the data mode, it is an easy matter to tune in weatherfax and teleprinter signals. Noise reduction can be tried, but does not always help. The special filters, internal modem and remodulator, all work very well.

Expense Justified?

If your interests include the technical side of radio, such as construction and testing of equipment, then the expense will be justified since the sine wave generator and a.c. millivoltmeter will be valuable adjuncts. The ability to monitor one of two receivers is very useful, and I have arranged two loudspeakers and a switch box so that I can listen to either radio through the DSP-599zx and the other direct.

If you are not going to use all the facilities of this d.s.p. then one of the other models might well be a more cost effective purchase. The only item I would like on my wish list is to have two completely adjustable band pass filters, even if their bandwidths had to be the same.

Conclusion

This sounds quite a formidable list of abilities, but the d.s.p. is really very easy to operate. The d.s.p. is usable as soon as it is connected and I would advise anyone to gain experience with it before changing anything.

The set up menu allows one to set the precise way it is connected to the outside world and the parameters of the filters, particularly those of the data mode. This is all clearly described in the manual, which contains numerous diagrams and a 'blow by blow' account of how to use the modes and change anything which can be changed.

The manual is in loose leaf form and has three holes for a loose leaf file. I have had my DSP 599zx for a number of months now and am very pleased with it. It does everything I expect it to do very well, although the noise reduction facility does not improve readability in every case.

The one ability which the MFJ-784B has which I would like is the double tunable filter, which would be ideal for non standard teleprinter stations, but this is not an insuperable problem, since one need only widen the bandwidth of the filters supplied to embrace the unusual shift. I consider the display of the frequencies in use and the ease of setting them to be very important. Overall I think that this add-on d.s.p. filter unit is good value for money. *SWM*

Specifications In Brief

CW filter:	Up to 50dB at 60Hz outside pass band.	
Bandwidth:	5 to 600Hz in 10Hz steps.	
Centre frequency:	200 to 2150Hz.	
Voice filter		
High pass:	60dB 180Hz outside the passband	corner frequency: 10-1000Hz
Low pass:	60dB 180Hz outside the passband	corner frequency: 1-5kHz
AGC :	Voice mode, 36dB	c.w. & data modes, 18dB
Size:	193 x 216 x 48mm	
Weight:	1.15kg	
Audio output:	1W into 8Ω, both channels operating.	
Distortion:	Less than 1% at full output.	

The random noise reduction is available up to 20dB across the entire frequency range. The heterodyne removal (automatic/manual) is available up to 50dB, again across the entire frequency range.

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Amateur Bands

There is a problem at the moment locally, so I am writing this piece early to guarantee it reaches the Editor in good time. Your letters won't be neglected - any that miss this time will get their mention in our next issue.

Receiver Selection

I'm often asked in the mail what receiver to choose; unfortunately I can't answer because everyone's requirements are different!

Imagine a city listener with a permanent S6 noise level on 14MHz from, say, a nearby factory. Obviously, he can't hear anything below the noise, so a sensitivity anything better than ten micro volts is wasted. Now let him win the Lottery (or something!!), he and his wife are a couple of loners so they buy an island. The 'services' are all carefully treated, so there is virtually no local noise. He copies the late W6AM - rhombic antennas for 7-28MHz, covering every ten degrees round the compass on 30m tall poles, and they all look out over the sea. The old receiver is laid aside, and a new sensitive one bought - but at 7MHz the band is still covered in noise! Signals are now so good that the receiver front-end can't cope and so an attenuator has to be brought into play. The rhombic antenna is wide-band and that doesn't help his amateur band activity. His wife decides to listen to broadcasters so she likes the wideband antenna system. The receiver's i.f. stage is too narrow for a.m. For c.w. and RTTY the filter proves to be too wide. He listens with headphones, while she prefers to use a high-fidelity speaker. When their son comes home for a weekend, he uses the little built-in speaker.

Any receiver is a compromise to please most people most of the time, and reflect it's designer's own ideas. If the fashion is for a digital display, it'll be embodied in the design, regardless of whether it compromises some more subtle area of design. I recall my TS-830S transceiver, in which every control fell beautifully to hand - if you were left-handed; or a KW2000A which I loved for it's clean front panel design - only one push-button. My present rig has so many buttons it's unbelievable how many I never use (!).

Because of the digital circuitry, the modern receiver or rig has a battery which eventually will give out - at the most inconvenient time! Now, consider the blind operator; for him perhaps *the* most important thing is an audio announcement of which button he presses and what frequency he is on. In summary, "yer pays yer money and yer takes yer choice" - or you build your own!

Conditions

Things tend to show annual peaks around the equinoxes simply because then the sun treats all our globe equally. However, we also know of the 11-year cycle - at the minimum no spots are to be seen and the flux is down to around 67; then we rise fairly quickly to the peak - with the extra activity we also get the nasty side of the solar temper by way of flares. Once the peak has been reached, we see the rather slower decline to minimum. However, an individual spot or flare is a random event. Our long-term predictions then are reasoned guesswork, while our short-term ones rely on the sun's rotation to bring a particular active spot round again predictably. Thanks to satellites and computers we know more about the sun and it's works than ever before - and those weekly predictions on GB2RS can be compared with the historical data too. Just to rub home the unpredictability of 'Old Sol', the '11-year cycle' is only a mean - it may in fact be shorter or longer.

Incidentally, if you want to look at sunspots, project an image from your telescope or binoculars on to a white card. **Don't** look at the sun directly or you'll damage your eyesight - also be careful you don't do it accidentally.

Morse

This is probably still the only mode which can be copied when the signal is actually *weaker* than the noise. If you have a decent signal generator that doesn't 'leak r.f.', put an oscilloscope on to the audio coming out, and steadily reduce the generator output level. You will see the audio come down level with the noise, and you can come down a bit more and still see and hear the audio even if you can't measure it! That of course is the reason why the QRP addicts usually stick to the key.

We often hear gripes about Morse, wanting the test requirement removed. Let us be clear about this. The International Telecommunications Union (ITU) set the rules for amateur radio, and those rules include a Morse skill before an h.f. licence can be granted. The ITU is a part of the United Nations. That takes the Morse requirement out of the hands of individual administrations. Some time several years in the future at a WRC we can expect the requirement for Morse testing to disappear - but there will still be c.w. segments of our bands. Also, we must remember that if, as seems likely, the Low Earth Orbit (LEO) satellite operators make a concerted attack on our 144 and 432MHz bands, then the world's radio amateurs, united in the International Amateur Radio Union, may have to put everything else to one side and simply concentrate on defending v.h.f./u.h.f. from such predators.

Coming Events On The Bands

Quite a few to look out for, so I'll just list them. **Dave K8MN** is on as 5H3US, and at the time of writing is on 50MHz; cards via WA8JOC. As for Western Samoa, JI3WLT will be there until March 2000; again there is some 6m activity on offer. JH7OHF is the QSL route for this one. The operator of 9M8QQ (DF5UG) had to cancel his Pulau Satang activity in November but he hopes to make it around March/April. The pasteboards for this one go to Hans's home call. We hear that 3D2VA will be active from Tonga, possibly around publication day, maybe a bit earlier. **Mark ON4WW** is on as EL2WW and he has Top Band activity on the go - try 2205UTC and around 1.827MHz, and if you succeed you can send the QSL via ON5NT. Another buzz says the Lyon DX Gang are planning an expedition to Crozet Is, FT5W. No more details at the time of writing.

It was reported that the 7Z1AB station in the US Embassy, Saudi Arabia, had gone QRT; but *DX News Sheet* notes that what has happened is simply that KA5BQM is not QRV any more. However, K4YT will be operating from there from January. The HA group are due to be on from T30, T31 and T33 during the period to mid-March. A question-mark job is the proposed A5 operation by JH1AJT, but it is believed there is no question-mark at all over the A92GD QRT in June.

Completion

Now, the allotted space has been used and I haven't even had a chance to collect the mail - it has been a mite difficult trying to be in several places at once! However I promise that everyone who writes in gets their mention, so there could well be a bumper bundle next time - not to mention some doubtless ribald remarks! It's the first time since I started writing this column thirty-odd years ago that I've had to do this. Sorry readers, but normal service next time! Finally, thanks for all the cards to me and to my XYL UR5CMM, some sent direct, and no doubt some more in the Box.

As always the deadline is the first of the month, addressed to me at **PO Box 4, Newtown, Powys SY16 1ZZ.**

Prefixes

The Netherlands radio amateurs can now choose their prefixes from the blocks PA1-PA0, and PB1-PB0 for h.f. licences; PE1-PE0 for v.h.f. licensees, and PD1-PD0 for novices., with two or three-letter suffixes. Prefixes with a '6' are special-events stations.

Still with the prefix scene VE3 amateurs within the Peel region were authorised to use XM3, and VA amateurs the XL3 prefix during December to commemorate the 125th anniversary of the incorporation of Brampton.

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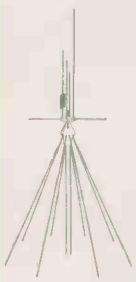

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Attention-123!

In our October column we gave details of the pre-NATO style phonetic alphabet station, E15, which you may recall uses phonetics which the rest of the world abandoned years ago. We also speculated that the curious reverse group count and ending could be a clue to an origin in an Arabic speaking country. We have recently received the results of d.f. fixes taken on this station, which show that the transmissions emanate from an area between Cairo and Alexandria. Therefore, it would be reasonably safe to say that this station is operated by the Egyptian intelligence service.

Numbers From Cuba?

Although ENIGMA is primarily concerned with Number Stations in Europe, several other large networks operate in other parts of the world, one of the most important being that which is believed to be run by the Cuban DGI. It is widely heard in Europe, often with very good signals, and it is hard to believe that all their transmissions are based on the island.

The family concerned, XVIII, operates in both Morse (i.c.w.) and voice (a.m.). Both arms are very busy, with best reception in Europe being between 0100 and 0800. The Morse arm, M8, uses a 'cut-number' system, in which the sending of a number is replaced by that of a fixed letter. A few other stations use such a system, although M8's is the easiest to find, and its system is the most efficient - enabling more groups to be sent in less time:

1=A, 2=N, 3=D, 4=U, 5=W, 6=R, 7=I, 8=G, 9=M and 0=T.

Over the years there have been a number of changes to the format of transmissions. The voice network, V2, is sometimes known as the 'Attencion' station due to its frequent use of this word during the call. The most common format now in use, V2A, consists of three 5-Figure non-random headers, each associated with a 150 (unpaired) group message. Transmissions commence on the hour, ending at h+45 with the word 'final', repeated once or twice. M8 ends with 'AR AR AR SK SK SK'.

Some years ago both voice and Morse transmissions began with 'DE?' sent in Morse, and ended (V2) with "Adios". The humorous callsign '?' is probably the most original and honest of all Numbers Station callsigns!

The present winter schedule, although subject to change, is reasonably stable, see **Table 1**.

M76: Welcome To The Fold!

One of our members, **Guy** (Hampshire) has, at the time of writing, just logged an entirely new Number Station, which we have designated M76. It is a standard 'text type' transmission, and was already sending by 1810 on 3.820MHz (Wed 9th December). Perhaps readers could listen out for this one. As the beginning was missed, only a partial format is so far known: multiple messages of 5-Figure unpaired groups using a short zero (T); each message is preceded by '=' '3-Figure' (once) '2-Figure' (group count, once) '=', and ends with a group in which the last two figures are replaced by XX. Final ending is 'AR'. Keying is automatic and quite fast.

Signal strength was good, and we must assume that other schedules may well be in use. It's getting a bit like car registration numbers - more and more imagination is needed to create unique ending identification, and XX was probably the result of a high level decision of the Transmission Format Sub-committee of the Joint Covert Communications Bureau! Fantasy apart, actual co-operation certainly does take place between these agencies, and has done so for many years, possibly via a covert section of the ITU- we don't yet know.

Message Lengths

Messages can vary considerably in length depending on station and/or schedules. Although some stations such as E3/E4, M4/E23, M8/V2, etc. send fixed group counts, most are variable, at least to a certain extent. With some stations group counts of over 50 are quite rare. Most M3 schedules stick within the 50s, and only they know why! To hear M27/S8 send over 25 groups was a big event, as it would also be to catch M12 or E5, for example, sending below 50 groups. As we get used to a station's familiar habits, anything unexpected is worth recording. If we don't know these habits, then we have no way of knowing what is or is not of any significance in a particular transmission.

This is another area in which Numbers Station monitoring is so different and so much more challenging than most other areas of s.w.l. Of them all, the Russian family (No.1), has the greatest range of message lengths. Excluding their 'control type' transmissions, these range from the two group 'messages' of E6A and S6B (which aren't strictly 'text' messages) to E17's recent mammoth sending of 543 groups. Imagine the concentration and patience needed to transcribe and then decrypt this one! It lasted from 0130 to 0310 repeating at 0330, and again twice on the following day - just in case the recipient missed a figure or two. This is the highest group count recorded by any Numbers Station in the last ten years at least. Will anyone dare exceed this record?!

Incidentally, the length of a message is not necessarily an indication of valid traffic levels. We can never be absolutely sure how much dummy traffic is being sent at any time. A few stations probably never send any, while others, particularly those with fixed group counts, certainly send a great deal.

In reply to **Pavel** (London), who asked us about the h.f. surveillance technology used by France; you forgot to include your address. We can provide full specifications of this equipment, which has impressive spectrum storage and transmission rejection/selection capabilities. When used in triangulation with remote CDAA sites, it can pinpoint a short burst transmission very quickly and with great accuracy.

Table 1:

	Day Of The Week						
	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Time							
0500	6.855	6.855	7.726?	7.581	4.028	6.855	7.726
		7.682	8.065	6.797	8.065	7.682	8.065
	8.012?	8.012?	9.153?			8.012	
0600	4.028?	4.028		4.028?			4.028
	6.795?	7.835	6.786?				6.786
	6.785?	6.785		6.825		6.855	
0700	6.787	6.787	6.983	6.920	6.920?	6.787	6.787
		6.797			6.797		6.825
0800	6.787	6.787?		6.787	6.787?		6.797
	6.920	6.825	6.825	6.854		7.680	7.581
		6.933			6.933	6.933	
0900			6.767	6.854		6.854	6.787
	7.584		7.682	7.584			
1000	6.786	6.786	6.786	6.580	6.786		6.786?
		6.825	6.825	6.825		6.825	
				7.580			
1100		7.846	7.846	7.990	4.173		4.173
				8.010	6.786	6.786?	6.786
	8.067	8.187	8.067	8.187	8.067	8.187	8.067

Note: M8 are shown in red. V2 after 0600 not included as information is incomplete. ? = not confirmed, but likely. Three, sometimes four, transmitters commonly operate simultaneously, however, parallel transmissions are extremely rare. Last figure of header indicates message repeat number - usually two repeats are sent, occasionally more. Frequencies vary by up to 9kHz in order to avoid interference.

ENIGMA Booklet

Talking of patience, *Part Two*, which we hoped would be available in December, won't be! Rest assured, as soon as it is ready it will be sent out to all of you who have received *Part One*. It is taking much longer than expected due to the enormous amount of collation necessary. The size of the result will never reflect the amount of work which went into it. The second part will cover the profiles of all active stations in detail, and we hope, will serve as a reference for the accurate identification and location of schedules.

Meanwhile, we are gratified by the great interest shown in the booklet and in ENIGMA as a whole, and hope that a new area of the radio hobby has been opened up. If only the interest was there years ago, how much more experienced we would be by now!

■ FARIS RAOUF c/o EDITORIAL OFFICES, BROADSTONE
■ E-MAIL: scanning@pwpublishing.ltd.uk

Scanning

It was inevitable, I suppose, but only days after my first column was published, in which I said that Optoelectronics' OPTOCOM and OPTOTRAKKER were the only way of tracking trunked radio networks effectively, I received an E-mail from Peter Hawkes, a reader from South Staffordshire, telling me about a program called *Trunker*. This totally free DOS-based software package can work with nothing more complex than a *Hamcomm*-type interface and allows you to monitor the control channel of a Motorola Type I, II and IIi (SmartZone/SmartNet) Trunked network, giving you information such as whether you are listening to a simulcast or multiple-cell configuration, patches between multiple talk groups and pages between individual radios. What's more, if you have a second, and computer-controllable, scanner, you can even use *Trunker* to fully track trunked conversations in real time. Although I did have a quick look at the documentation, which revealed that this isn't a program for novice computer users by any means, I've not had time to look at the program itself. Peter tells me it works very well, however, and although there is some fiddley decimal to hexadecimal conversion required to get it working properly, it isn't all that hard. If you want more details or fancy trying *Trunker* out for yourself, point your Web browser at **http://www.geocities.com/CapeCanaveral/Lab/1060/trnkv3x.htm** I'll be investigating this program in more detail a little later on in the year.

Adding salt to my wounds, I discovered that there's another trunk tracker on the market too. You'll find a full review of this one, called Ftrunk, on page 28, though rather than the proprietary Motorola systems, this is designed to track networks that make use of the open MPT1343 and MPT1327 trunking standards.

On the subject of trunk tracking, **Geoff Halligey** from Pencoed, South Wales, has written to tell me that he's come across what he thinks is a new trunked system around 31MHz, normally a frequency range used for hospital paging and other low power devices, where he hears BT type announcements saying "The number you have dialled is not recognised". Other than this simply being breakthrough from a nearby cellular site or another type of powerful transmitter, I can't think what it might be. If anybody has any suggestions, please drop me a line.

HeliTeli

Turning to something completely different, and rather sensitive, a reader who wishes to remain anonymous wants to know more about the Police HeliTeli system, where live pictures from a helicopter-based video camera are transmitted to a ground based receiver, and whether it is possible to tap into the video feed. This isn't strictly a Scanning subject, but I'll mention it here because, according to my sources, HeliTeli is a very sophisticated and very interesting system: Once the video feed is initiated at the helicopter end, the ground based system's antenna searches for the signal then locks on. GPS position data from the helicopter is fed back in the VBI (Vertical Blanking Interrupt) of the picture, so the ground station's antenna knows which way the helicopter is going, and can therefore automatically track it. Quite apart from being microwave-based, and therefore requiring relatively specialist equipment to receive, the signal is relatively low-powered, so you can't tap into it unless you are very close. But don't even think about attempting it - doing so would be a very grave offence indeed, and hanging out of your window pointing an antenna at a hovering police helicopter is a guaranteed way to turn attention onto yourself rather than the evildoers the helicopter was out to catch in the first place.

Keeping on the subject of our friends in blue, who are understandably and justifiably concerned about the use of scanners to eavesdrop on their transmissions, word has reached me that more and more forces are turning to the use of mobile digital data terminals for performing on the spot checks on people and vehicles as well as other routine communications. This is partly to ease the load on police radio operators and indeed their main voice radio networks, but apparently is also intended as a tool to combat scanner users.

The PC (politically correct) PC?

I've received quite a few E-mails from people telling me I needn't avoid mentioning PCs in this column, and I suppose at the end of the day, scanner users are highly likely to be PC users as well. So I'm relenting and, unless I get another rush of letters, this time against the idea, I'll be regularly including some interesting scanner-related web-sites and news about scanner-related software. This month I'll start with some useful Internet links:
http://members.aol.com/wwhitby2/for_trs.html, a regularly-updated page that includes information on UK-based trunked networks, which incidentally has a link to **http://www.etsi.org/tetra/tetra.htm** a site about the TETRA (terrestrial trunked radio) standard, which I intend covering in some detail in a few months time.

Of interest to all computer-controllable scanner users, PC-based scanner control programs can make finding interesting new frequencies much easier than with a scanner alone. Some can also be used to back up and restore your scanner's memories (just imagine how terrible it would be if you had to re-program your scanner with several hundred frequencies manually if it should ever develop a fault!), and even provide basic bandscope (i.e. a graphical representation of activity between two frequencies) facility if your scanner doesn't have its own. Admittedly, you'll need a computer-controllable scanner to make use of such a program, but if you do, they are well worth investigating. Next month I'll be doing a round up of some of the best of these programs to give you a better idea of their strengths and weaknesses.

Finally, as ever, be aware that you should not use your scanner, or any other radio reception equipment, to listen to certain frequencies unless you hold a licence to do so. If you ignore this warning, even if you think you are doing no harm to anyone, you risk imprisonment, a fine, confiscation of your equipment, or even 'all of the above'.

Important Feedback

Finally, as well as giving you my usual warning that it is illegal and therefore unwise to listen to frequencies for which you are not licensed, I'd like to say 'thanks' to everyone who wrote or E-mailed me about last month's column. Your feedback is important to me, so whether you want to complain or compliment, ask questions or provide information, please do drop me a line. Please note that I may not have time to reply to each and every letter or E-mail message individually, though I will try my best.

■ JACQUES D'AVIGNON VE3VIA ■ E-MAIL: jacques@pwpublishing.ltd.uk

Propagation Forecasts

How to use the Propagation Charts.

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

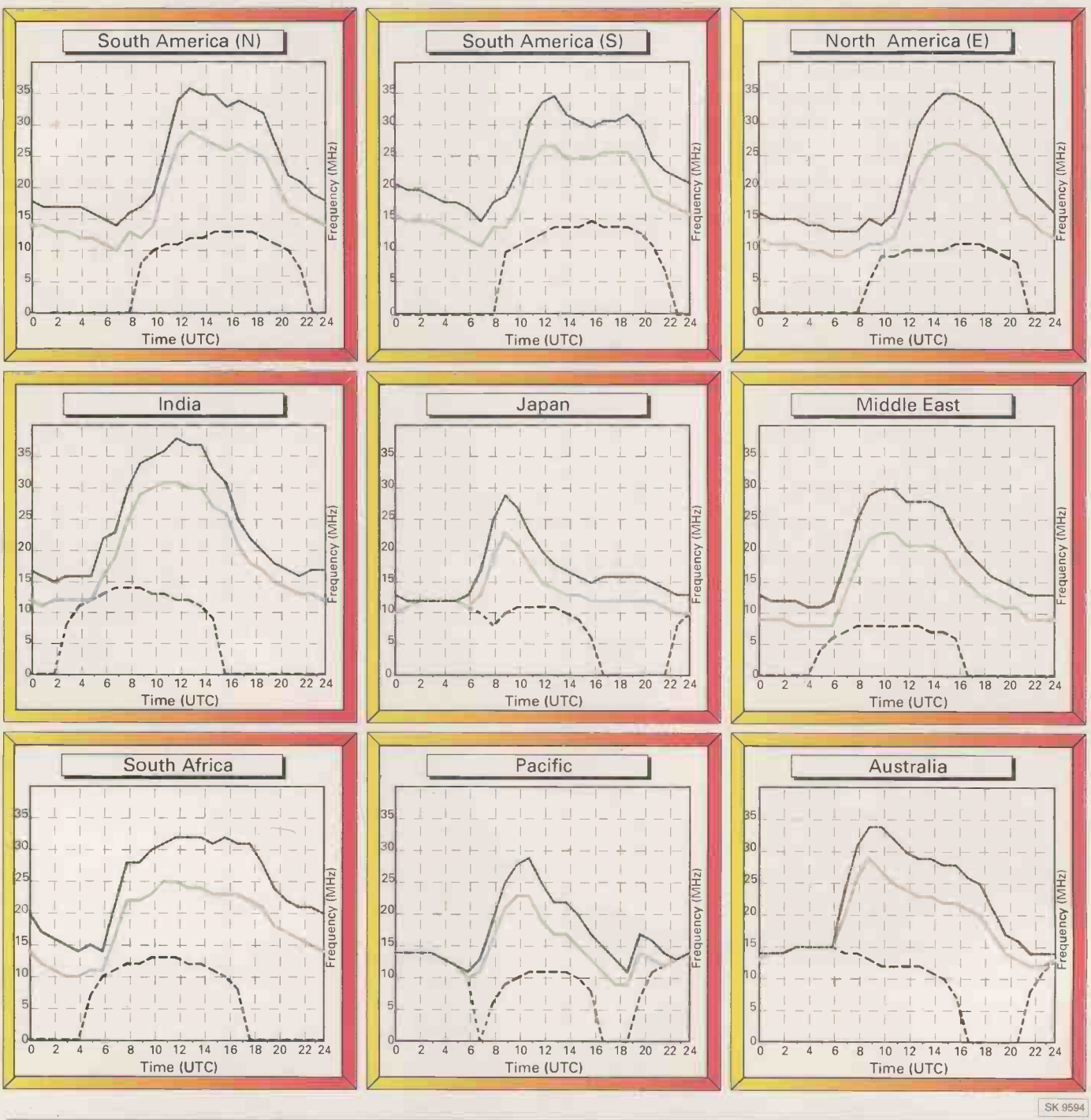
The middle line indicates the optimum working frequency (OWF) with a 90% probability of success for the particular path and time.

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

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

Good luck and happy listening.

February 1999
Circuits to London



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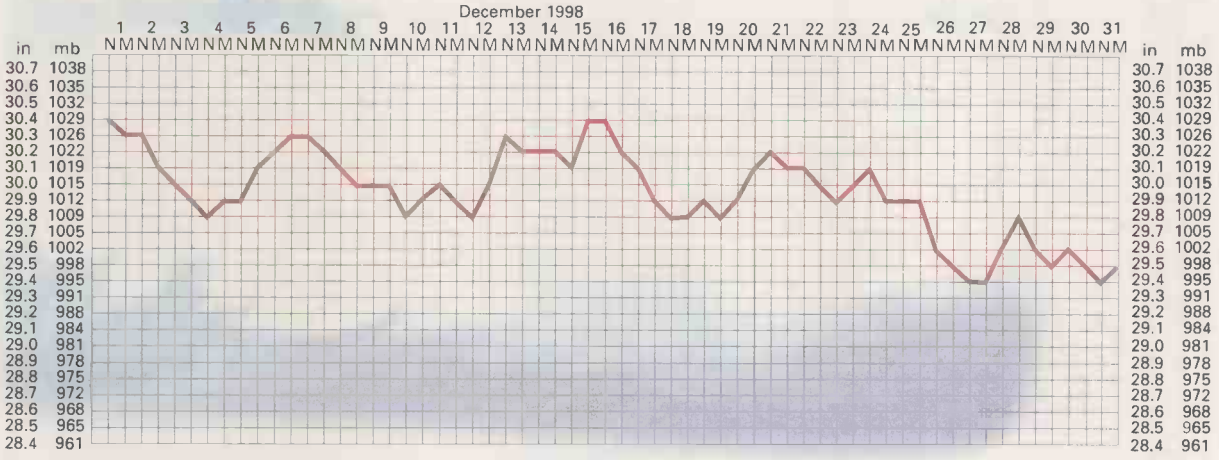
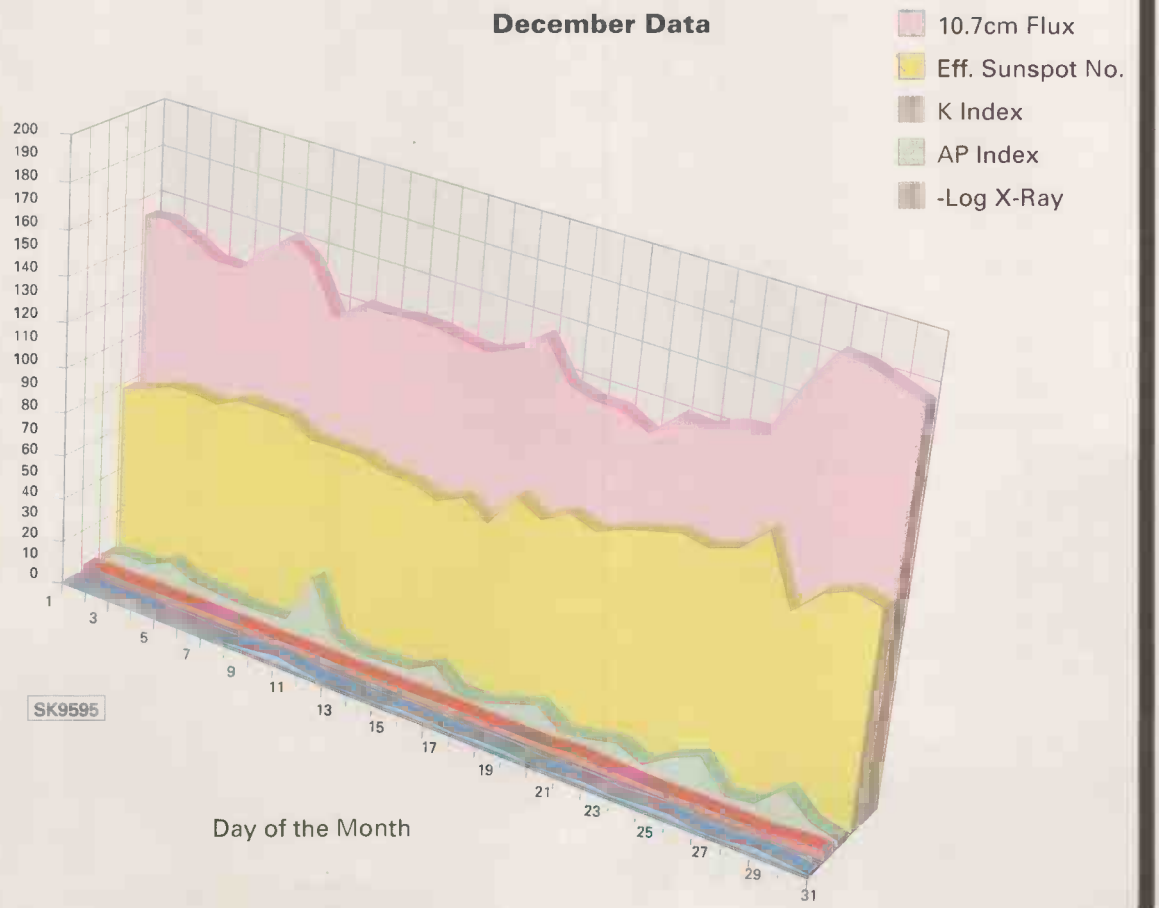
■ KEVIN NICE G7TZC, SWM EDITORIAL OFFICES, BROADSTONE ■ E-MAIL: kevin@pwpublishing.ltd.uk

Propagation Extra

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





guide to the chart

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

The K and AP indices are measures of geomagnetic activity.

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

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

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

■ GRAHAM TANNER, 64 ATTLEE ROAD, HAYES, MIDDLESEX UB4 9JE
■ E-MAIL: ssb.utils@pwpublishing.ltd.uk

SSB Utilities

A few months back I received an E-mail from Brian Collings asking about the *High in the Sky* (*HITS*) book. He had heard that there were to be no more editions of this book, and wanted to know if I had heard anything. For those of you who have never heard of this book, it is a listing of aircraft SELCAL codes which helps you to identify an aircraft when you hear a flight being controlled by an ATC station or LDOC station.

A few weeks after receiving this E-mail, I spoke with the book's publishers, and they basically confirmed this fact. It seems that the 6th edition is the last one to be produced.

However, for those of you who rely upon this book to provide additional information whilst listening to the aeronautical ATC stations, I recently came across an alternative book. The book in question is *Calling Shanwick* by B.A. Woch, published by SELDEC. This book does not entirely replace *High in the Sky*, as it is mainly aimed at traffic crossing the Atlantic, but it does contain a wealth of information concerning Shanwick Aeradio, their history and the way that they operate. In some respects, the SELCAL listing in Calling Shanwick is easier to use as it has a better lay-out. But, there is only one list (in SELCAL code sequence), whereas *HITS* contains the list in several different sequences. However, the author does point out in the introduction to Section 8 (which lists the SELCALS) that SELDEC's own Directory of Aircraft SELCALs contains a full list in four different sort sequences.

The SELCAL information is presented in two columns on each page, and is in quite large print, making it easy to read. Each column contains the SELCAL code, aircraft registration, carrier (airline operator, or whoever), the aircraft type, and finally the aircraft construction number. Each entry is in a small box, which makes it very hard to mix-up entries for different aircraft. Although this book is really about aircraft crossing the Atlantic, it includes SELCAL information for aircraft from all around the world - you're probably unlikely to hear an Australian Boeing 737 calling Shanwick! The listing of SELCALs is not perfect, and there are a number of inconsistencies, however, this is a very good listing of SELCALs and also a very good book.

One aspect of the book which I am particularly impressed with is that the covers are laminated. The *Calling Shanwick* is spiral-bound, which means that the pages do not fall out one-by-one as the book is used. Price £10.95, and I got my copy from **The Aviation Hobby Shop, Horton Road, West Drayton, Middlesex, Tel: (01895) 442123**. *Calling Shanwick* is also available from **SELDEC , The Gables, Trimpley, Bewdley, Worcestershire DY12 1NY**.

GHFS

Back in the Summer I mentioned the closure of the USAF GHFS station at MacDill Air Force Base in Florida. A recent copy of the US DoD *Flight Information Handbook* - effective from 16th July 1998 to 25th February 1999 - confirms that MacDill h.f. station is inactive, as of 1st July 1998. However, a new h.f. station has been activated in its place. This new h.f. station is 'SALINAS', located in Puerto Rico in the Caribbean. It was activated sometime around about 15th July.

Take a look at **Fig. 1** to see their operating schedule and frequency list, which I have copied from the *FIH*. As yet, I have not personally heard this station, nor have I seen any reports from anybody claiming to have heard it. This particular site is no stranger to USAF communications, as Salinas is (or was) a 'Mystic Star' site and thought to be one of the sites under 'Scope Command'. This means that it was to be a 'lights out' or unmanned location, with the operators sitting at a desk thousands of miles away and operating the equipment remotely.

Fig. 1: Salinas GHFS, Puerto Rico - Operating Schedule (MHz u.s.b., times UTC)

Frequency	Summer Time	Winter Time
4.724	0100-1000	02.00-1100
6.712	-	-
6.739	0100-1000	2400-1100
8.968	-	-
8.992	24h	24h
11.175	24h	24h
13.200	1000-0300	1100-0200
15.016	1000-0100	1100-2400
17.976	-	-

Fig. 2: Brisbane and Perth ACC/FIC

Brisbane ACC/FIC	
Brisbane FIS	3.452, 6.610, 6.616, 8.831 (North Eastern HF)
Brisbane FIS (SP-6)	3.467, 5.643, 8.867, 13.261, 17.904
Perth ACC/FIC	
South Western HF	3.461, 4,684, 6.565, 8.822
North Western HF	3.452, 6.604, 8.843
Perth FIS (INO-1)	3.476, 5.634, 8.879, 13.306, 17.961
Perth FIS (SEA-3)	3.470, 6.556, 11.396, 13.318, 17.907

Frequencies in MHz u.s.b.

Beacons

In the August *SWM* there was a question from **Martin Powell** who asked about h.f. communications frequencies used by aircraft in the Pacific. This prompted an excellent letter from **M R McLellan** from Australia, who sent along some copies from the *En-Route Supplement Australia* (*ERSA*). This includes a list of h.f. frequencies used by Brisbane ATC and similar for Perth ATC. In **Fig. 2** I have included the frequencies from the copies of the *ERSA*. Perth and Brisbane handle most of the international flights entering Australian airspace, so if you are going to hear any signals, it will almost certainly be on these frequencies. The *ERSA* is produced and sold by: **Airservices Australia, Publications Centre, PO Box 1986, Carlton South, Victoria 3053, Australia**. If you have access to the Internet, they have a web-site **http://www.airservices.gov.au** where you can purchase copies of the *ERSA*, air navigation charts and the like.

In the same issue, **Paul Churchill** asked about a list of aero navigation beacons around the world, and I explained that although I was not aware of such a list, it would be a massive document (and soon out-of-date, too!). Well, the *ERSA* contains a list of IFR waypoints within the Australian FIR, which will go some way to locating aircraft when you do hear them on Australian h.f. aero frequencies. Although I have only got a copy of the first page from the *ERSA*, the listing does show the name and lat./long of each beacon. Similar listings in European books also list the beacon type and operating frequency, but this information is strangely missing from the Australian book.

ATC

A few weekends back I was listening to the Air Training Corps on their regular Sunday morning Net. The usual stations were active, as well as a few others making rare appearances. During the morning, one station broadcast a message to all the others. The gist of the message was that all the channel designators used for ATC frequencies would be changing from 1st January onwards, and that from that date all ATC stations must cease using the old designators. The old designators were Alpha1 to Alpha7, Bravo1 to Bravo7 and Charlie1 to Charlie7.

So, the big question is, what are the new designators, and will there be any new frequencies allocated to them. At the moment, most listeners use the frequency and designator list given in *Eavesdropping on the British Military*, but I would like to know if this is now completely out-of-date, or just partially true.

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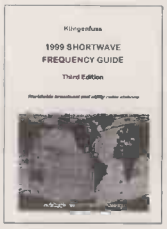

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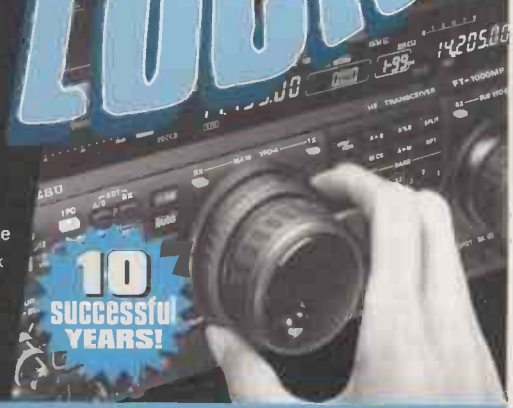

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Decode

Continuing the recent tutorial theme for the winter months, the next subject for scrutiny is multiplexing systems. Yes I know this sounds like a multi-screen cinema but it is also an important communications tool that's been in use for many years. The *Concise Oxford Dictionary* defines multiplex as "involving simultaneous transmission of several messages along a single channel of communication". This is a good description and a good clue as to the way in which this technique applies to data communications.

As with most technological innovations the main driving force for the development of multiplex techniques has been the need to send even more information over the available communications channels. In this case, the communications channel is divided up so that a number of traffic streams can be sent over a single link. This is a great way to make full use of an otherwise under utilised system. So just how can you divide up a communications channel? I'll start with a look at frequency division multiplexing. This is where the available spectrum is divided up to make room for lots of different users.

Although this might sound a bit complicated it is in fact all around us, and we use it all the time. A simple example is the way in which the short wave marine bands are divided up into separate channels so that lots of ships can communicate at the same time. In this case a band that is, say, 200kHz wide is frequently divided into lots of smaller channels just a few kHz wide. In that way everyone can communicate freely at the same time without causing interference. This basic principle of sharing the available spectrum to create lots of smaller channels can be found throughout the communications business, though it has generally fallen out of favour with the development of more sophisticated digital techniques. However, one of the most common applications of this system for data systems is what's known as Multiple Channel Voice Frequency Telegraph of MCVFT. This was used extensively to build teleprinter networks using both land lines and radio links. In fact, you can still find this system on the short wave bands. The easiest way to hear an MCVFT signal is to visit the WUN digital Sounds page at

http://www.gem.net/~berri/wun/files/sounds/br6028.wav

The main purpose of MCVFT is to get as many teleprinter lines as possible to run over a standard speech communications channel. That means the only spectrum that's available is the standard commercial speech range from approximately 300Hz to 3.4kHz. This gives just 3.1kHz of bandwidth to play with.

There are basically two current standards for MCVFT signals which provide for either 24 channels running at 50 baud or 12 channels running at 100 baud. Now to fit 24 channels into 3.1kHz, some simple maths shows that each channel can be no more than 129Hz wide. In practical systems this has to be taken back even further to allow some spacing between channels to minimise the risk of interference.

If you cast your mind back to my earlier descriptions of RTTY you will recall that the data is broken down into two tones to represent the mark/space parts of the signal. To make this MCVFT system come to life we just need to allocate mark and space tones for each channel that fit within the available overall bandwidth. So a real 24 channel MCVFT system operates with mark and space tones that are spaced 70Hz apart (much the same as the shift we talk of in a conventional signal). To guard against interference there is a gap of 50Hz in between each channel. Decoding an MCVFT signal is relatively straight-forward but does require a receiver with very fine tuning steps and ideally some pretty narrow filtering. The only problem you may have is that many of the current links are only used as standby circuits so you may find there's very little traffic around. With the development of more and more sophisticated digital systems, time division multiplex has really come into its own.

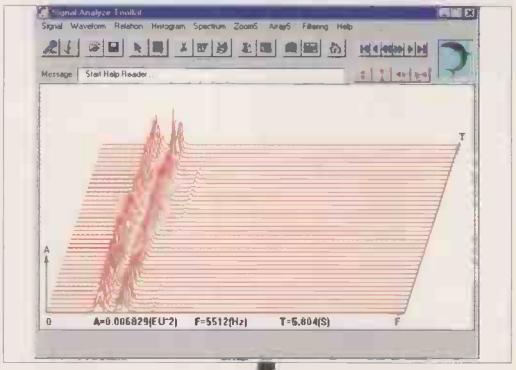

Fig. 1: SAT32 three dimensional display of ARQ-E signal.

This system can best be described as sharing by taking turns! It's something people often do at Christmas when you 'phone a distant relative and several family members take turns to have their say. What's happening is the time available for the call is being divided between the family members - hence time division. So how can we do this with data communications?

One very common example is good old NAVTEX. This has all the stations operating on the same frequency, 518kHz, but each station has a predefined slot in which it can send its message. Another is to be found in the packet radio systems where many stations communicate on the same frequency. However, this latter example is rather different because the stations don't have pre-arranged transmission slots. With the packet system stations just send whenever they're ready! The problem, of course, is that sometimes the transmissions will clash leaving a gap in at least one transmission. The answer to this is to use what's known as collision avoidance software. All this does is put in a random delay before the transmission is repeated. The theory being that the two colliding transmitters will have different delays, so won't collide when they re-transmit their message.

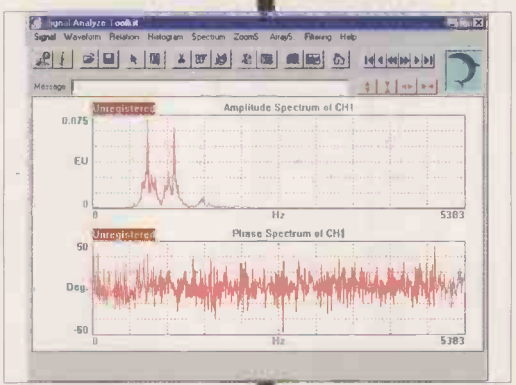

Fig. 2: Amplitude & Phase Spectrum of ARQ-E Signal.

The time division multiplex system is also used in a number of complex data modes that can be found throughout the h.f. bands. In these systems, the characters from two or four messages are interleaved so that they can be sent over a common radio link. They are then separated out at the distant

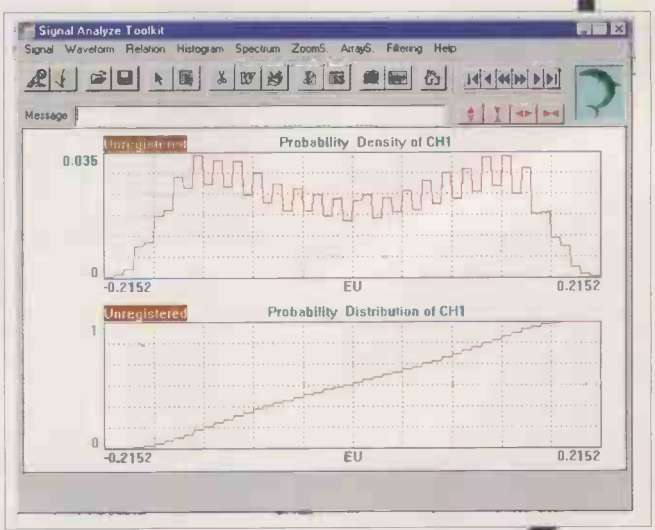

Fig. 3: Density & Distrubution plots of ARQ-E.

end to go their merry way! A common system that uses this approach is ARQ-M which can be found in two and four channel guises used by the French military, mainly as standby circuits. However, the most extensive use of this approach is to be found in land-line based telecommunications systems where t.d.m. forms the basis of just about all digital communications systems.

One of the problems associated with both the TDM and FDM systems is their lack of flexibility. If, in a two channel system, one channel is idling, there is no way the other channel can take advantage of the spare capacity and send its data faster. For an answer to this we need to move on to the very latest in multiplexing systems which is known as Code Division Multiple Access (CDMA). This is a type of spread spectrum system that may be a little tricky to get your mind around! The idea is that each channel of data is mixed with a special unique code and effectively spread across all the spectrum that's available. This can be done for lots of different signals providing they each have their own unique code. At the receiving end this same code is used to unscramble the signal and resolve the original data.

If you were to tune-in to one of these signals all you would hear is some hissing with no discernible pattern, in fact you probably wouldn't even know you were receiving a signal at all! Needless to say these are very difficult to resolve as even finding a signal in the first place is hard enough. If you were fortunate enough to locate a signal it could only be resolved if you knew the code that had been used to create the signal. Even if you managed all this, I bet you'd find that the message is in cipher! Hopefully, I've given you an insight into the world of multiplexing. Please drop me a line or E-mail if you would like me to cover any other specific areas.

Get Recording!

Yes I've been prodding about on the Internet again and come across some more audio software that could prove very useful to all you data analysts out there! The first news is that the very latest version of the excellent *RecAll* (v2.3) is now available from **http://www.sagebrush.com/~sells/** This wonderful little program provides an excellent digital audio recording system that starts as soon as the signal rises above a pre-set threshold. This is excellent for utility fans as you can leave it hooked-up to your receiver when you're trying to catch that rare DX signal. The thresholds are now fully adjustable, the program features variable record quality and works a treat.

Next is an alternative recording package that can be set to start recording at a particular time of day or night. As with *RecAll*, the recording quality can be pre-set to suit the type of signal you're monitoring. This one really comes into it's own if you want to monitor a channel that tends to be rather noisy. Whereas *RecAll* will fill your hard disk with noise *AirCheck* will just turn on at the prescribed time.

Both programs offer tremendous assistance to the data enthusiast. *AirCheck* can be found at **ftp://sunsite.org.uk/Mirrors/ftp.cdrom.com/pub/simtelnet/win95/sound/airchk1.zip**

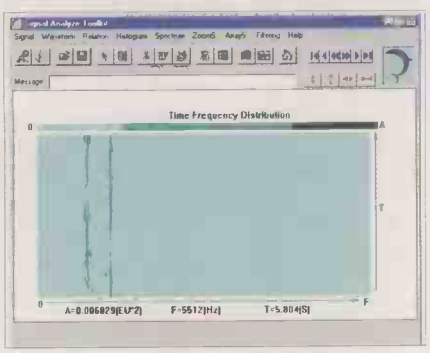

Fig. 7: Time-Frequency distribution of ARQ-E.

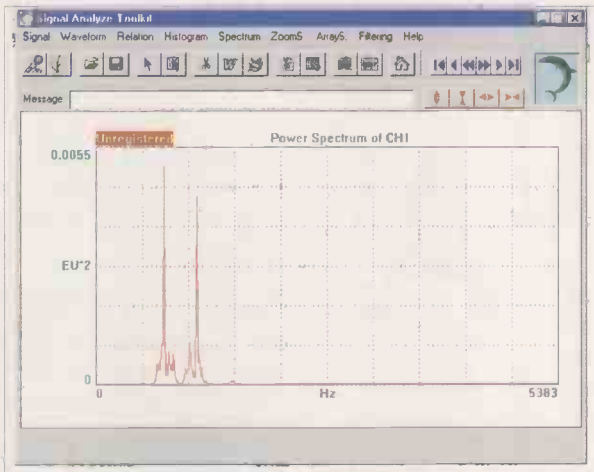

Fig. 4: Power spectrum of ARQ-E.

Once you've captured your valuable data signal you can then take it apart with one of the following spectrum analyser tools!

Signal Analysis

Getting inside new data signals can be great fun, but you do need a few basic tools to make life a little easier. A while back (two to three years ago!) the only way to do this was to use the specialist tools that were built into the more advanced decoding systems. The spread of computing and rapid growth of the Internet has changed this and made available a huge number of ingenious software packages.

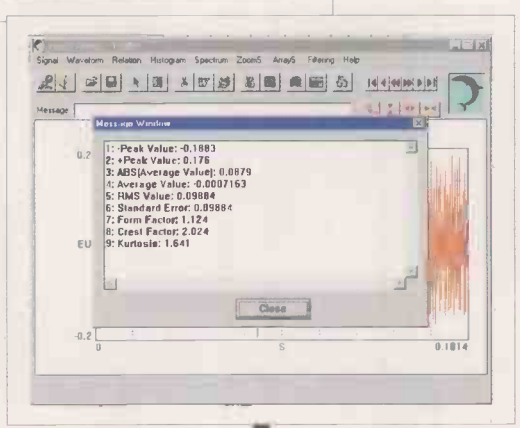

Fig. 5: Signal analysis output from ARQ-E.

An old favourite in this column is *Spectrogram* which has now been upgraded to version 4.2.7 in it's *Windows95* format. This magic program provides real-time spectrum analysis with extensive analysis and measurement facilities that really lets you take signals apart.

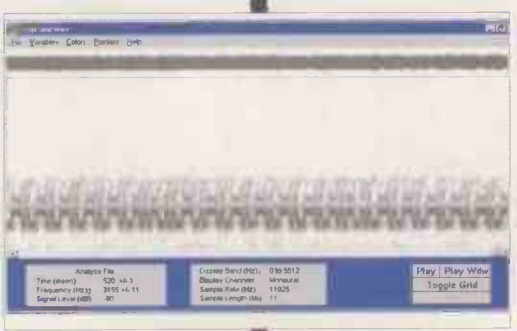

Fig. 6: Spectrogrm ARQ-E Analysis.

In addition to working in real-time from your sound card, *Spectrogram* can also operate on stored .WAV files from programs such as *RecAll*. It's this that gives *Spectrogram* its real power as you can choose an appropriate section of the signal and systematically analyse it to work out how it functions. The latest version includes improved audio quality, spectrum averaging for better noise reduction and weak signal detection. There's also improved audio quality and a new print window facility. If you want to try a copy it's freeware and can be found at: **ftp://sunsite.org.uk/Mirrors/ftp.cdrom.com/pub/simtelnet/win95/sound/gram42.zip**

Hot on the heels of *Spectrogram* is *SAT32* (Signal Analysis Toolkit) which boasts an even wider range of analysis modes, including; spectrum, correlation, histogram, waterfall, transfer function and digital filter. The *SAT32* interface is slightly less user friendly than *Spectrogram* but provides some very sophisticated measurement tools.

To tempt you I've included a number of screen shots, see **Figs. 1** to **7** . You really can take just about any signal apart with this tool. To get a copy visit their home page at: **http://homepages.infoseek.com/~heliso/fft.htm**

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Satellite TV News

As we near the departure of the 20th century, we're also experiencing the arrival of the new digital technology that will carry us into the new millennium. Several established analogue satellite 'zappers' have now opted into the new technology, bought MPEG-2 digital receivers and are slowly coming to terms with 'strange' tuning techniques - all are experiencing a very steep learning curve as they grapple with bit and FEC rates! After my inconclusive excursion into the digital fields a few months ago, the new RSD ODM-300 receiver is working well and finding numerous digital signals that are carried on most satellites.

Associated Press TV contact numbers seen 13°E digital (Dean Rogers).

Italian football digital via Eutelsat 16°E (Dean Rogers).

Reuters TV, a live digital satellite news Gathering (DSNG) feed for Sky TV via 16°E (Dean Rogers).

My own thoughts on digital are that signal hunting is more time consuming, if at times bordering on the tedious. Fortunately there are frequency listings in *What Satellite TV* that detail the digital programme offerings across the satellite arc - there are hundreds both encrypted and free to air (FTA) - for those with internet access, up to date listings can be located on **http://www.satcodx.com**, which is generally the most accurate listing available for use in Europe and world-wide. We'll be pleased to feature other internet info access points if you send in the details.

In discussion with several active sat-zappers, the accepted method for digital signal hunting is to use a conventional analogue receiver that has a scan feature. I use the cheapie (analogue) Manhattan LT-6300 + Mk2 (*SWM* December), though there are many others that will scan through the band. Swing your dish onto a known satellite and switch on your analogue receiver set-up, including your TV set. Enter the lowest frequency of your analogue receiver that it can tune down to, e.g. 900, set the polarity to either vertical or horizontal. Now push to 'scan' and 'up', away the tuning races and stops on any signal carrier it finds - both analogue (which will be obvious from looking at the TV screen) and possible digital carriers - the screen on the TV will display absolutely nothing other than a snowstorm.

If the receiver stops on an otherwise empty shash screen then this could well be a digital signal, there is little obvious visual indication on the TV screen of a digital TV signal present. On my ODM-300 receiver I now tap the frequency onto the receiver via the remote control hand unit, the bit and FEC rates are merely entered as 'auto' and then 'search'. The TV screen displays a signal strength barograph marked 'poor' to 'strong' which will suddenly move towards 'strong' if a signal is present. Hopefully the 'FEC' and 'QSPK' squares will flick up 'lock' and a scrolled message will advise "found 6 new video channels, found 3 new audio channels", they enter themselves into memory from which you can then select and view your find.

You progressively work your way up the band in, say, vertical polarity and then back down again in horizontal. Receiver advances will, I'm sure, improve on this rather crude form of signal hunting as there are now 2nd and 3rd generation receivers entering the market place; almost, it seems, every month.

November 21st, a few days after my digital receiver returned, I was checking across a favourite bird - *Intelsat K* - and I hit upon digital activity - 11.566GHz horizontal, bits @ 5632, FEC @ 3/4 and up came the Starbird SNG truck feeding into the BBC's *Noel's Houseparty* Saturday night offering! It was interesting to note that the previous Saturday Noel was taking an analogue feed from a 'lonely Scottish Island' as seen by Roy Carman, this time on *Telecom 2D*, 11.619GHz vertical 5°W.

I had a five page listing from **Jim Scofield** (Lake IN), who has now opted into digital exclusively, using his Pace analogue receiver as a search device only for the mainstream digital Nokia 9600. 'Strange goings on at *PAS-3R*' he comments, with EBU feeds on 12.726V and 12.732V as listed, audio but no pictures; he suspects this is MPEG 4:2:2 used exclusively by the EBU for news feeds and cannot be resolved by the standard MPEG-2 DVB receiver. *Intelsat 801* @ 31°W has proved very useful for monitoring football and other sporting feeds into the UK, a favourite for UK ITV/Ch5, French and Italian football. During the Hurricane Mitch disaster across Central America, news feeds out of Honduras were often monitored on *PAS-3R/6* @ 43°W (12.726V, bit 7028, FEC 3/4). It was interesting when I tapped in a known AFRTS frequency on *Orion*, 37°W, after perhaps 30 seconds of receiver hunting with a full scale signal strength deflection, up scrolled about eight new video channels and nearly 30 audio channels. All were encrypted, but exotic names were present, such as AFN- Korea, AFN-Pacific, and the lesser exotic AFN-Bosnia!

Dean Rogers (SE2), our flat dwelling sat searcher, is also into digital, using a Humax F1C1 with twin CAMs (conditional access modules). Using just his 800mm dish with IRTE Multi-Sat motor he's sent in several excellent pictures - being a sports enthusiast he has spent more time on *Eutelsat II* F3/W2 @ 16°E. Check out 11.137H bit 611, FEC 3/4; 11.148H 5632, 3/4 and 11.190H, 5632, 3/4. The first carries live links for Channel 4's Italian football, the others carry top league games for Italian PAY-TV network TELE+. This bird also carries live Sky News feeds in the Telecom band segment. With the mass of capacity on digital, a few exotics are appearing; Omani-TV and Sudanese TV have appeared on 13°E, check out 12.654GHz horizontal.

Analogue still lives on: a major marketing corporate November 15th, 1800 onwards, concerning the merger between Daimler and Chrysler motor groups, was rehearsed and transmitted via *Intelsat K* 11.676V. The 'Day One' section included live inserts from Wall Street and market reaction to the news. English was carried at 6.60 and German 7.20MHz. Ciba Speciality Chemicals carried a staff global meeting on *Intelsat K* a few days earlier, 11.620V mid afternoon - they too had been involved in merger activity though this was to advise staff on developments and job losses! Live Q and A sessions followed - staff were not happy!

Cyril Willis (Kings Lynn) comments that the 'RAI Corp. New York' seems to be carried now on *K*, 12.582V often through the

Reuters news flash upcoming via *Intelsat K* digital.

***Noel's Houseparty* down the mine, in digital via *Intelsat K*.**

***Intelsat K* test card for the corporate CIBA staff presentation.**

Countdown to the CIBA staff meeting (analogue).

***Telecom 2D* @ 5°W test card - analogue.**

A press day and music presentation seen *Intelsat K* evening of November 5th - Whitney Houston's new album.

White balance for GMTV.

24 hours with test card and a few news feeds plus 2-way interview inserts in the RAI's national news programmes.

Eutelsat 16°E and **Roy Carman** (Dorking) watched and heard a vocal rendition from Ginger Spice, Ms. Halliwell, singing 'Happy Birthday' to Prince Charles on his birthday. This offering was produced by Millbank Studios and was being fed into Italian TV, apparently a report on the life of UK royals. Early November and what Roy thought to be analogue activity from *Kopernikus* 3 @ 23°W was in fact test transmissions from *Eutelsat* repositioning II F1 at 25°W a little short of the correct slot! The caption read "Voraussicktuhe Abschaltung des Satelliter ES II f1 am/ 10,11,98 um 0200 MEZ".

As we suffer the UK Winter into early Spring, this is the time for seeking out those skiing and sledging OB feeds from the snowy slopes of the European Alps - and of course the annual and impressive Islamic religious ceremony of Ramadan in Mecca. This will be carried on many of the Arabic satellite channels available on 13/16°E, not forgetting *NileSat* 7°W in digital. Let me know what you see...

Orbital News

Hot bird 5 @ 13°E entered service morning of November 10th, but soon problems arose with low power transmissions on the BBC transponder which included both the BBC World/Prime outputs. BBC World in analogue was providing a weak signal, and the Prime digital signal was falling out completely. *Eutelsat* changed frequencies onto another wide beam transponder (11.031V/11.048V) to maintain the service (which is picked up and retransmitted by other broadcasters across Europe/Middle East) whilst they sorted the problem.

Eutelsat also put into service their new W2 bird at 16°E on November 19th replacing their II F3 bird, several enthusiasts reporting increased signal levels. The 24 Ku-band transponders cover all of Europe and into the Middle East, a steerable beam is spotted into the Indian Ocean (Mauritius/Reunion Is) for digital TV broadcasts. Internet folk wanting access to the Eutelsat Web site tap in **www.eutelsat.com/transfer** where more info on the *Hot Bird 5*/W2 can be extracted. The old TV-SAT 2, a German DBS satellite, has been bought by Eutelsat for 1 DM and has been moved to 12°E for data/internet use targetting Moscow, though Deutsche Telekom will make more DMs from the control/uplinking of TV-SAT 2 out of Usingen (Frankfurt). The old *Eutelsat I* F5 bird has also been shunted to 12°W and the middle aged II F1 that serviced 13 East (until replaced by *Hot Bird 5*) has been moved slightly to 12°E.

The new company created as a spin-off from Intelsat - 'New Skies Satellites N.V., the Hague, Holland' opened for business December 1st and has currently five birds in slot and a sixth on order, all transferred from Intelsat. These are :- *Intelsat 703* @ 57°E; *513* @ 183°E; *803* and *K* @ 21°W; *806* @ 40°W. K-TV, an all Ku-band bird destined for 95°E is still at the factory.

USA digital TV operator Echostar (DST) has bought out the American Sky Broadcasting (ASkyB) uplinking centre, two satellites, goodwill and licensing and digital box manufacture. As part of the deal DST must broadcast the various Fox Network programme and news channels for three years. ASkyB received many millions of shares, totalling 37% of the DST's equity, and increased expansion of DST will lead to 500 channels becoming available over the next year.

Astra 2A digital viewers have now received four additional channels, that of Welsh S4C, QVC, Travel Channel and the Littlewoods 'Shop!' channel. Eventually the same digital multiplex will carry Turner programming (TNT, Cartoon Network and CNNI). Also, a new kid's channel for 2001 will be a French TF1/Murdoch creation, 'TFX' via the Television par Satellite (TPS) platform. The French channel M6 have however threatened to pull out of the multiplex if TF1 continues with the Murdoch channel...

The *Leonids* Meteor Shower, feared by several main satellite operators, passed without any reported incidents, and all birds are still in a 'go' situation. Fears had been expressed that damage would be caused by the largest meteor storm for 33 years, expected to peak November 17th either in '98 or '99.

BT Broadcast Services have established a dedicated uplink terminal in Moscow for the BBC to feed out recorded or live material back to the TV Centre in London. New bird on the block is *PanAmSat*'s PAS-8 that launched November 4th ex Baikonur, slotting at 166°E over the Pacific carrying 24 each of Ku and C-band transponders. This will further expand PanAm's Pacific capacity along with the existing PAS-2 neighbour at 169°E. Coverage will extend from the Western USA across to Bangladesh. Internet fans can check out PanAm at **http://www.panamsat.com** for more info on their activities and their new PAS-6B baby just launched.

Other launches upcoming will be *Arabsat 3A* from Kourou, early 1999 into 26°E with 20 Ku-band transponders alongside their existing *2A* bird. This central European position is a financial hot spot adjacent to the 28°E Astra slot and transponders at the right price could bring in much business. *Asiasat-3S* launches March '99 to replace the ageing *Asiasat-1* and will offer 16 x 54MHz Ku-band transponders - the *Asiasat-4* satellite launch has now been delayed pending the financial slow down in the Far East. *NileSat-102* should launch end '99 into the 7°W slot with 12 Ku-band transponders covering from Europe across to the Middle East. There is an interesting situation in Saudi, with a major expansion of a local terrestrial MMDS system that will transmit microwave programming, including many satellite programmes, which could in turn lead to a ban on the use of satellite dishes in the kingdom.

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Info in Orbit

Another overhaul is about to take place at *chez nous*. Just as the winter rains were setting in, my second WXSAT antenna - used daily for monitoring various satellites - failed. Maybe a connector has broken, or maybe water has got inside the cable. Either way, it is coming down for a thorough check. Also ready for winter treatment is the main (1.8m) dish that I recently put into operation for receiving high resolution (Primary) data from *METEOSAT-7*.

Getting the system operational is one thing; giving it winter protection against our westerlies means cleaning off a year of grime and rust, and treating it with suitable paint. This is an instance of ignoring the maxim "If it ain't broke, don't fix it!". Also planned for the New Year is a significant expansion of my receiving equipment to hopefully monitor transmissions from the *International Space Station*.

NOAA-15 Promoted

Since launch last summer, the WXSAT *NOAA-15* has passed its operational tests with flying colours. Effective 1st December 1998, *NOAA-15* replaced *NOAA-12* as one of the two primary operational Polar Orbiting Environmental Satellites (POES) maintained by the National Environmental Satellite, Data, and Information Service (NESDIS). The second primary operational POES is *NOAA-14*. *NOAA-12* is now a secondary (or back-up) satellite, but according to **Steve Arnett** of the Satellite Analysis Branch (of NOAA/NESDIS/SSD), *NOAA - 12* will continue to transmit both high resolution (h.r.p.t.) and normal resolution (a.p.t.) images, and to support search and rescue operations.

The Other WXSATs

All three *NOAA*s (12, 14 and 15) have continued nominal operations. Seasonally low solar illumination means that *NOAA-14* visible-light passes appear very dark. *METEOR 3-5*'s orbit took it out of daylight transmitting range during late December, but it will be back in range by late January. *METEOR-2-21* might be switched back on during early January, though northern solar illumination is very low, so the WXSAT would not be providing much imagery of Britain. I logged one transmission from *SICH-1* on 10 December, but nothing recently from *OKEAN-4*. These two oceanographic satellites are rarely heard.

Those Leonids & WXSATs

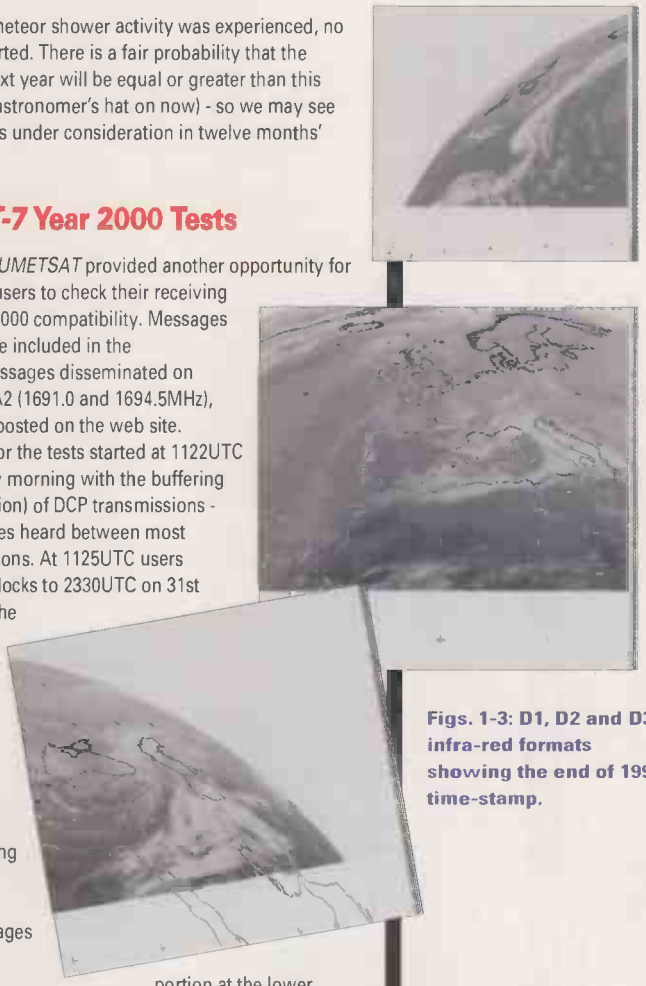
A few days before the earth passed through the thickest part of the *Leonid* meteor debris (left by comet *Tempel-Tuttle* that passed near the sun last February) several weather satellite operators announced plans for special monitoring during that time. **Yuzo Yotsuya**, of the Office of Meteorological Satellite Planning in Japan, announced that although the observation schedule of GMS-5 would not be changed through the period of the expected Leonid meteor storm (November 16 to 19), extra monitoring of the conditions of GMS-5 and GMS-4 would occur.

GOES operations were more precautionary. On 17th November, the *GOES-8* imager scan mirror was positioned to avoid the peak activity of the meteor storm, so there was no imaging for a few hours. *GOES-10* continued to provide full disc scan operations. In the event, although a significant enhancement of meteor shower activity was experienced, no damage was reported. There is a fair probability that the meteor shower next year will be equal or greater than this year's (I have my astronomer's hat on now) - so we may see further precautions under consideration in twelve months' time.

METEOSAT-7 Year 2000 Tests

On 2 December, *EUMETSAT* provided another opportunity for PDUS and SDUS users to check their receiving systems for Year 2000 compatibility. Messages about the test were included in the administration messages disseminated on channels A1 and A2 (1691.0 and 1694.5MHz), and notices were posted on the web site.

The timeline for the tests started at 1122UTC on the Wednesday morning with the buffering (temporary cessation) of DCP transmissions - those peculiar tones heard between most WEFAX transmissions. At 1125UTC users changed system clocks to 2330UTC on 31st December 1999. The transmission schedule started with the D2 format carrying the appropriate timestamp to simulate that slot. Transmissions continued, following the timeline of 2330UTC. The first three D format images carried an empty portion at the lower section of each image - see **Figs. 1** to **3**. The date and time changed smoothly on my system, with *PROsatII* showing 01/01/00 and time 00:00:00 as the year 'changed'. The tests also included Primary Data. *EUMETSAT* plan to run further tests during 1999 for the benefit of *METEOSAT* data users.



Figs. 1-3: D1, D2 and D3 infra-red formats showing the end of 1999 time-stamp.

PDUS - Getting A Key!

All the geostationary WXSATs transmit high resolution data; the European *METEOSAT-7* WXSAT transmits Primary Data on 1691.00MHz, and a receiving system for this is called a Primary Data User Station (PDUS). With a very limited number of exceptions, all *METEOSAT-7* (self-produced) images are encrypted - the exceptions being *METEOSAT-7* synoptic images (those at 6-hourly intervals). The cost of a decryption unit is 700ECUs (about £500). Since commencing image encryption, the amateur market for PDUS systems has virtually collapsed. I believe this is a great pity; encryption has probably prevented the commercial development of new (and therefore probably more advanced) systems because it is no longer a thriving market, particularly for the amateur user.

For the benefit of those possibly contemplating the purchase of a decryption unit, I asked **Brian Dudman** of Harrow to tell me of his experiences following his decision early last year to buy one. Fortunately, as Brian recounts, the

Fig. 4: METEOSAT-7 visible-light image 11th December 1210UTC.

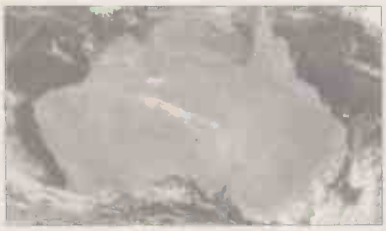


Fig. 5: Australia - GMS-5 image (*METEOSAT-7* re-transmission) from 15th November.

process ran smoothly. He ordered the PDUS key and interface unit from Timestep Weather Systems (from where he had bought his PDUS system), and a few weeks later the product was delivered, together with *EUMETSAT*'s paperwork for completion. The documentation requests information on the location of the user, hardware details, data required and its proposed application - usually educational. The form was returned to *EUMETSAT* a few days later, with the request for a user's key. Brian received a call from the Met Office advising him that they would be responding to his request shortly. A few days later he received the paperwork - a licence requiring witnessing, signing and returning. Later in April, his *EUMETSAT* key was delivered by courier, with the request for £490, together with a note that following receipt of the money, his key would be activated.

His cheque was despatched and a call from *EUMETSAT* at 0830 one morning advised him that it had arrived, and that his key would be activated within three hours! The process of local activation involved running a program to store the 'keys'. All ran smoothly. When Brian returned from shopping at 1630 he was receiving clear images. Some 18 months later Brian reports that the system continues to run trouble-free. Many thanks to Brian for providing a full description of the process.

Fig. 6: *GOES-8* image on 26th October 1998 0945UTC from Tim Healey.

METEOSAT-7 Mid-Day Unencrypted PD Image

EUMETSAT's policy on Primary Data transmissions calls for all but a few *METEOSAT-7* images to remain encrypted. The formats in the main synoptic hours are not encrypted: 0000, 0600, 1200 and 1800UTC. This relates to the following slots: 12, 24, 36, 48. Formats disseminated between 0000:00 - 0029:59, 0600:00 - 0629:59, 1200:00 - 1229:59 and 1800:00 - 1829:59 are not encrypted. The two mid-day visible-light (and associated infra-red and water-vapour) images are therefore transmitted in the clear. I plan to include at least one PDUS image in the column, to illustrate the type of images available. I could not resist including this image of sunny Australia, a small section of a full-disc image originating from GMS-5, and re-transmitted as a J-format visible-light image from *METEOSAT-7* during the night.

Fig. 7: *NOAA-14* 29th August from George Newport.

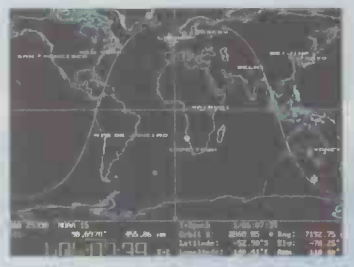


Fig. 8: Screen shot of *Footprint*.

Correspondence

Tim Healey lives just a few miles away, and has been experimenting with *GOES-E* reception. Here in Plymouth, *GOES-E* is about three degrees above the western horizon, so under favourable conditions we can just hear its WEFAX signal on 1691.00MHz. Yagis seem better than dishes when trying to receive signals from low elevation satellites, as Tim has noted. I have used a little processing on the original image to enhance its presentation.

George Newport (Canterbury) regularly sends a selection of high quality colour printouts obtained from his WXSAT equipment, and **Fig. 7** was amongst a recent batch.

Tracking Programs

During the 1980s, **James Miller G3RUH** produced a number of satellite tracking programs for the BBC microcomputer, most notably *Satfoot*. James released the coding for his programs, and **Les Hamilton**, the software distributor for the Remote Imaging Group, has added his own talents and produced a new *Windows* based tracking program based on the original *Satfoot*; he calls it *Footprint*; see **Fig. 8**.

The program requires a low specification computer; Les suggested that it might even run on a '286 (but I do not have one to test). There are many more sophisticated satellite tracking programs around today, but the purpose of *FootPrint* is to provide a program that produces as near as possible instantaneous results, and which does not take an age performing calculations, or drawing map details. It simultaneously displays the positions of up to five orbiting satellites, showing footprints on a Mercator map of the Earth, updating positions and footprints at frequent intervals. The program also provides reference tables of a.o.s. times, and can be updated using Keplerian elements.

To obtain the optimum display, you use a recent Kepler element file and ensure that no more than 25 element sets are included (because only the first 25 are read); many more can be held in the database for possible display. Using the 'File' and 'Load' option the new data is input, and will appear on the satellite option listing. Clicking here will display the relevant

Fig. 9: *STSPlus* screen display.

footprint, and clicking one of the satellite name boxes shown in the lower part of the screen renames that box.

Subsequently, the chosen satellites are instantly selected via the boxes. The program can be configured for your own location and will provide accurate data as long as the element file is updated regularly. The software can be obtained from the Internet at **http://www.riglib.demon.co.uk** as **footxxxx.exe**, or from me at the address at the head of this column.

STS Plus - 9838

David Ransom's program *STSORBIT* was originally written as an "attempt to duplicate the wall map in NASA's Mission Control Centre in Houston, Texas". Intelsat used *STSPLUS* operationally at their Launch Control Centre in Washington DC, and at five tracking stations around the world during the STS-49 mission. Numerous other official and semi-official installations use *STSPLUS* as the primary satellite tracking software or to supplement other software, see **Fig. 9**.

David has issued several upgrades during the years, the latest enhancement being 9838, issued a few weeks ago to implement GPS capability, as well as providing a number of bug fixes. An additional help file has been provided for the setting up of STS-Plus under *Windows 95*. Copies can be obtained on the Internet from **http://users.sedona.net/~dransom/stsplus.html**, or from me - see Readers' Offer.

Shuttle Launches

Peter Wade (Sevenoaks) spent two weeks with his family in Florida, and, from the vantage point of Melbourne Bridge - some 48km from Kennedy - was able to see STS-95 (the John Glenn flight) launched. Peter visited Kennedy Space Centre, seeing three sites by bus, at $20 to $30 a ticket (depending on how many of the four Imax films you wanted to see). Peter heard the double sonic boom during the return flight of the *Shuttle*, and described it as "incredibly loud", even from within the killer whale stadium in 'Seaworld', 48km distance. On a different topic, Peter built the quadrifilar helix antenna and sent me a picture showing it mounted adjacent to his chimney, where it performs well, see **Fig. 11**.

Fig. 10: Launch pad 39A with STS-88 being prepared for 3 December lift-off.

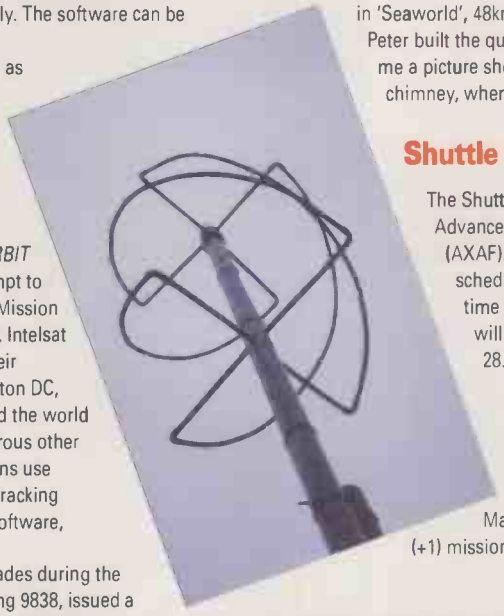


Fig. 11: QFH antenna from Peter Wade.

Shuttle Launch Schedule

The Shuttle *STS-93* - Payload - has an Advanced X-ray Astrophysics Facility (AXAF). *Columbia*/OV-102, launch is scheduled no earlier than March 25, time to be determined. The mission will last five days, orbital inclination 28.45°.

The STS-96 is on its 2nd US International Space Station flight. Payload - Spacehab double module. *Discovery*, launch scheduled for 13th May 1999 at 1733UTC for an 11 day (+1) mission. Orbital inclination 51.6°.

Frequencies

NOAA-14 transmits a.p.t. on 137.62MHz
NOAA-12 and *NOAA-15* transmit a.p.t. on 137.50MHz
*NOAA*s transmit beacon data on 137.77 or 136.77MHz
*METEOR 3-5*s use 137.85MHz
OKEAN-4 and *SICH-1* use 137.40MHz
RESURS 01#4 may transmit a.p.t. on 137.30MHz
METEOSAT-7 (geostationary) uses 1691 and 1694.5MHz for WEFAX
GOES-8 (western horizon) uses 1691MHz for WEFAX
Mir (Russian space station) uses 143.625MHz for voice.

READERS' OFFER

Kepler Elements - WXSATs, *MIR* and *Shuttle*

If you want a computer disk file containing recent elements for the WXSATs, AMSATS and others of general interest, together with a large file holding elements for thousands of satellites, please enclose 50p with a PC-formatted disk and stamped envelope. A print-out is included that identifies NASA catalogue numbers for the WXSATs. The disk file is ideal for automatic updating of tracking software.

A comprehensive listing of all *Shuttle* flights and payloads, together with associated information, is available from me as the *Shuttle Pack*. Please include £1.50 and stamped s.a.e. for the A4 booklet.

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. Transmission frequencies are given for the operating satellites. This data originates from NASA.

■ JOHN HODGKINSON - ALRS, c/o *SWM* EDITORIAL OFFICES
■ E-MAIL: aas@pwpublishing.ltd.uk

All At Sea

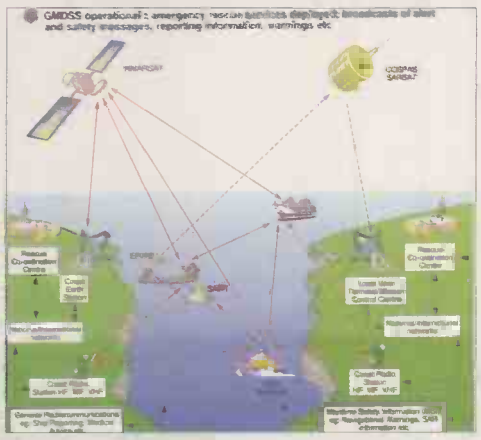
The Global Maritime Distress & Safety System – GMDSS

February 1st 1999 - this date heralds the most important revolution in maritime communications since Marconi invented radio and it was first introduced on ships in the early 1900s. What follows is a brief description of the basic concepts involved in GMDSS and how it will be implemented to improve Safety of Life at Sea (SOLAS).

Radio was first used to save lives at sea in 1899. Subsequently it has helped to rescue tens of thousands of people and become the key element of maritime Search and Rescue (SAR) systems. Since that date, numerous technological advances have been made.

However, until the introduction of the Global Maritime Distress & Safety System (GMDSS) in 1992, the way in which a message from a ship in distress was sent had changed very little from those early days, namely a Radio Officer sending a message by Morse code or radiotelephone and hoping that another ship (or shore station if within range) would hear the call and respond.

The GMDSS has introduced new technology completely dispensing with the need for a Radio Officer, and has completely transformed maritime radio communications. The new system is quicker, simpler, and, most importantly, more efficient and reliable. The major difference between the GMDSS and the previous 'steam driven' system is that the equipment to be carried by the ship is determined by its area of operation, rather than by the size of the ship.



Basic Concept Of GMDSS

The GMDSS uses modern technology, including satellite and digital selective calling techniques on m.f., h.f. and v.h.f. bands (known as 'terrestrial systems'), enabling a distress alert to be transmitted and received automatically over long as well as short distances. This allows SAR authorities ashore, as well as other shipping in the vicinity of the ship in distress, to be rapidly alerted to a distress incident so that they can assist in a co-ordinated SAR operation with the minimum of delay.

Additionally, the GMDSS provides for urgency and safety communications and the dissemination of Maritime Safety Information (MSI), navigational and meteorological information to ships. Commercial communications are also available through GMDSS services.

Areas Of Operation

Because the different radio systems incorporated into the GMDSS have individual limitations with respect to range and service provided, the equipment required to be carried by a ship is determined by the ship's area of operation. The GMDSS has divided the world's oceans into four distinct areas. All vessels are required to carry equipment appropriate to the sea area or areas in which they trade. **Table 1** defines the four areas together with minimum requirements for carriage of equipment.

Digital Selective Calling System

Digital Selective Calling (DSC) is an integral part of the GMDSS and is used for transmitting distress alerts from ships and for transmitting the associated acknowledgements from coastal radio stations. It is a very comprehensive system and caters for the setting up of all types of calls using internationally agreed codes.

DSC is basically a 'calling' system. Each call consists of a 'packet' of digitised information using one of four priorities: Distress, Urgency, Safety and Routine.

Messages can be routed to 'All Stations', an individual station or to a group of stations using a Maritime Mobile Selective identity code which consists of nine digits.

Distress messages are automatically routed to 'All Stations'. Once an 'Alert' call has been received by either a ship or a Coast Station, subsequent communications are then carried out on RadioTelephone or Telex (SITOR). Frequencies used in the GMDSS are shown in **Table 2**.

On-scene communications between Search and Rescue (SAR) aircraft and the casualty usually take place on 4.125MHz, but further frequencies of 3.023 and 5.680MHz can be used in some situations. SAR aircraft can also be fitted with 2.182MHz and v.h.f. Ch16.

There is much more to be explained about GMDSS, but unfortunately with limited space I cannot cover all aspects in full. The GMDSS alerting DSC signals can be received and decoded using any good quality decoder, such as a Hoka Code-3 Gold and an appropriate h.f. communications receiver as used by yours truly.

All seagoing vessels will have to be fitted with the necessary equipment to comply with International Law, so activity levels on the above frequencies should increase after the implementation date of 1st February 1999.

GMDSS is fully explained with colour diagrams and graphics in *Admiralty List of Radio Signals, Volume 5*. Anyone having specific enquiries about GMDSS, please do not hesitate to contact me via *SWM*, or via E-mail, and I will endeavour to answer your queries.

Table 2: Radio Distress Communications.

	Digital Selective Calling (DSC)	Radio telephone	Radio telex
v.h.f.	Channel 70 (156.525MHz)	Channel 16 (156.8MHz)	
m.f.	2.1875	2.182	2.1745
h.f. (4MHz)	4.2075	4.125	4.1775
h.f. (6MHz)	6.312	6.215	6.268
h.f. (8MHz)	8.4145	8.291	8.3765
h.f. (12MHz)	12.577	12.290	12.520
h.f. (16MHz)	16.8045	16.420	16.695

Table 1

Area Description	Distance	Radio	Frequencies	EPIRBs*	Survival Craft
A1 Within range of shore-based v.h.f. stations	Depends on antenna height at shore based v.h.f. station, about 20-50 nautical miles	v.h.f.	156.525MHz (Ch70) for DSC or 156MHz (Ch16) RT 518kHz NAVTEX	Either L-Band (1.6GHz) or 406MHz COSPAS-SARSAT or v.h.f. EPIRB	9GHz radar transponder (SART) v.h.f. portable radio (Ch16) and one other frequency
A2 Within range of shore-based m.f. stations	About 50-400 nautical miles	m.f. v.h.f.	As above plus 2.187MHz 2.182MHz RT 2.1745MHz Telex 5.18MHz NAVTEX	L-Band (1.6GHz) or 406MHz COSPAS-SARSAT	As above
A3 Within geo-stationary satellite range (ie. Inmarsat)	70°N-70°S	h.f. or Satellite m.f. v.h.f.	As above plus 1.5-1.6GHz alerting or as A1 and A2 plus all h.f. frequencies	As above	As above
A4 Other areas (i.e. beyond Inmarsat range)	North of 70°N or South of 70°S	h.f. m.f. v.h.f.		406MHz COSPAS-SARSAT	As above

* Emergency Position Indicating Radio Beacon.

■ GODFREY MANNING G4GLM , C/O THE GODFREY MANNING AIRCRAFT MUSEUM, 63 THE DRIVE, EDGWARE, MIDDLESEX HA8 8PS

Airband

The Navstar Global Positioning System (GPS) is run by the United States. Originally for military purposes, developed from the Transit system (used in the Vietnam conflict), it is frighteningly accurate. I say frightening, since the system could be used by an enemy to hit a target (in the USA?) with great precision.

GPS does have limitations. Having created a system of devastating accuracy, the authorities have deliberately introduced errors so as to prevent the enemy's use for precision attacks. This also rules out landing an aircraft by reference to basic GPS alone. However, commercial pressures might win the day over the military argument, but that's for the future. The other limitation is reliability, as satellites can fail. Then, so can ground-based beacons.

The airworthiness regulators are cautiously beginning to acknowledge the place of GPS. As described in *AIC* 113/1998 from the CAA, aircraft in certain European airspace must be equipped with Basic Area Navigation equipment. Currently the definition of this is not going to make existing aircraft redundant, but it is now permissible to meet the requirement by carrying GPS.

In fact, GPS is favoured over Omega (a v.l.f. system on around 10kHz), which has been taken out of service, and Decca Navigator (a more localised l.f. system) which might have a limited future. Even in North Atlantic airspace, GPS can now be approved to meet the Minimum Navigation Performance Specification. No UK approaches make use of it yet, though. For visual flying, GPS should be regarded as a cross-check and not relied on as the sole means of navigation.

GPS can check itself if six satellites are in view. If they're not then the self-check is lost. The system is accurate to 100m on 95% of occasions and 300m on 99.99% of occasions. What worries the regulators is how quickly the pilot becomes aware when accuracy is lost.

You've heard of the Millennium Bug. There are other date discontinuities, too. *AIC* 116/1998 points out an unexpected one. GPS counts its dates according to how many weeks have elapsed from the moment the whole system was first switched on. Only 10 bits of computer data were provided for this purpose and 2 raised to the power of 10 is 1024. So, GPS dates run from weeks 0 through to 1023 and then, on August 22, 1999, will roll back to zero at midnight. Some GPS equipment might then fail! Make sure your GPS-equipped carriage doesn't suddenly become a pumpkin!

On The Air

You are invited to listen to the Old Equipment Net by **John Coggins G3TFC** (Baginton). Meeting on 3.625MHz at 0930 UK local time each Saturday, some of the transmitters to be heard were once found in older aircraft (even a few wartime ones). If there's a whistle in the background, the transmission is a.m. (with carrier) and not s.s.b.!

Keith Seddon (Chapel en le Frith) is having difficulty identifying n.d.b.s. I reckon that LGS is Lagos, but on 364 not 418kHz, and I don't know if it's sky wave could reach the UK. In Finland there's JL at Kuopio on 387 rather than 435kHz. As for UZ, I can't identify it at all. If anyone has better suggestions, write to me!

On The Airfields

Do take care when driving on airfields. This may seem a boring subject, but if you are involved in an accident then it could prove expensive, possibly beyond your means. The problem is that most car insurance excludes any liability if your car is on part of an aerodrome where aircraft can also have access. This applies to third-party liability, even if no aircraft is anywhere near when the accident happens!

This reminder comes from **Ron Nicholas** (Hinckley). The general clause that damage by supersonic pressure waves is excluded is unlikely to cause problems in mainland UK where such flying doesn't take place. Anyway, read the small print before paying the premium - especially in the case of those direct-marketing telephone-sales companies.

Ron would like to see more about h.f. airbands. Yes, you can have that, but only if you give me ideas as to what topics you'd like covered! The trouble with much of the h.f. traffic is that it carries a vast amount of routine position reports that take little explanation from me. Write to let me know what questions you want answering about this area.

In The Air

Looking back to page 68 of the December issue, **Clive Allen** (Chesterfield) spotted a low-flying Skyvan. It was also seen by Keith Seddon estimated as 100ft above the brow of a hill. The boom, fixed to the tail, was confirmed. The clue about a survey was the regular pattern of parallel tracks being flown over an area known for its mineral deposits.

This has remained a mystery to all but **Noël Fairhurst** (Manchester) and **Gordon Heasman** (Cheadle). They tell me that it's VH-WGL of World Geoscience (UK) Ltd. and confirm that a magnetic survey is indeed being conducted, so my guess in the December issue was correct. The equipment is so sensitive that the pilot tries not to transmit during a measurement pass as the outgoing signal would affect the readings. Exemption from the Air Navigation Order allows flight within 300ft of the ground in rural areas (instead of 500ft) and 800ft (instead of 1500ft) over built-up places.

Thanks for the compliments, Noël; yes, Chris is superb and her photographs are good, too (!).

Receiver Hardware

The new AR8200 scanning receiver looks tempting (if not a bit expensive) from the adverts in this magazine, but I recommend that **John Weir** (Edinburgh) and any other potential purchaser should try one out first. Any reputable dealer would be happy to let you do this. Then, precise specification details (such as the number of signal meter segments) can be verified. I don't own such a prestigious set and so can't comment from personal experience, John. You could also try two rival sets together at a dealer's showroom. A good antenna is essential for conducting a meaningful test.

An important point is also raised by John concerning the law. You are permitted to receive broadcast and amateur (including amateur satellite) service transmissions without a licence. There was some debate but Citizens' Band is probably also included (*No, not without a CB licence!* - **Ed**). What about other services including the airband?

Theoretically there is no ground receiving station licence, but you need the permission of the signal's originator to listen in. At some airshows they tell you the operational frequencies and I hold the opinion that this constitutes permission to listen - but it hasn't been tested in court!

What actually happens is that

Abbreviations

AIC	*Aeronautical Information Circular*
a.m.	amplitude modulation
CAA	Civil Aviation Authority
ft	feet
h.f.	high frequency
kHz	kilohertz
l.f.	low frequency
m	metres
MHz	megahertz
n.d.b.	non-directional beacon
nm	nautical miles
s.s.b.	single sideband
u.h.f.	ultra high frequency
UIR	Upper Information Region
v.h.f.	very high frequency
v.l.f.	very low frequency

Godfrey in Cameron N120 Balloon. *Christine Mlynek*

L.29. *Christine Mlynek*

Airband

Continued

large numbers of enthusiasts harmlessly listen in to all kinds of transmissions with a genuine interest in self-education. This excludes cellular telephone frequencies which are specifically forbidden by the *Interception of Communications Act*. Apart from this legislation, the *Wireless Telegraphy Act* swears you to secrecy if you accidentally pick up something that you haven't got permission for.

So, in practice, the situation is that someone listening in privacy (even out-of-doors but with a headset), and keeping this activity a secret, will not be called to account in law. If someone was discovered breaking the law, a criminal prosecution would succeed if the illegal act could be proven. Frequencies stored in a receiver's memory might be cited in court as part of the evidence.

This is my layman's understanding of the present law, if anyone has a more intimate knowledge then please write in to enlighten us.

Frequency & Operational News

I have read the official *8.33 User Guide* that explains the proposed reduced channel spacing. From October 7, 1999, 8.33kHz radios must be carried when flying in certain parts of European airspace. Initially, Austria, Benelux, France, Germany and Switzerland will allocate these new channels to their air traffic control network. The UK will wait until 2000. By June 14, 2001, all exemptions from the requirement to carry 8.33kHz sets will cease.

Most 8.33kHz channels will be found between 132.000-134.800MHz, with existing '25kHz' stations being moved out of this sub-band. Remember that a conventional '25kHz' radio has a bandwidth wide enough to interfere with adjacent 8.33kHz channels, hence the incompatibility between the two - even though some new channels are on the same frequencies as old ones. Some military, search and rescue, or medical flights might continue to work existing u.h.f. channels instead of carrying '8.33kHz' v.h.f. sets.

At ground level, v.h.f. propagates just beyond line-of-sight but this 'radio horizon' is more distant when at altitude. So, no frequency may be re-allocated within 250nm of an existing user. The actual new frequencies, along with the names that controllers will refer to them by, appear in the table.

Information gratefully received, as always, from **Martin Sutton** (CAA). The Radnor n.d.b. (RNR, 374kHz) has been withdrawn, so that's one less for the students of propagation to hunt for. Likewise, reporting point RADNO (it was abeam the beacon on (U)A25 and (U)B39) is deleted.

A new airway, dedicated to Gatwick arrivals, is (U)Y76 from the ERING reporting point to the UIR international boundary.

To **Jim Woodrow** (Livingston): thanks for writing again. Your letter missed the December issue deadline and was dealt with in the January column. The A320, says Jim, was a new aircraft on delivery.

Next month I will have news of a flight to see the eclipse and information on air-sea rescue frequencies. All other letters received up to December 9 have been answered. The next three deadlines (for topical information) are February 8, March 8 and April 6. Replies always appear in this column and it is regretted that **no** direct correspondence is possible.

Table 1: 8.33kHz channels (all MHz).

Actual frequency	How a controller refers to it
132.0000	132.005
132.0083	132.010
132.0166	132.015
132.0250	132.030
132.0333	132.035
132.0416	132.040
132.0500	132.055
132.0583	132.060
132.0666	132.065
134.8000	134.805

DX Television

November was a considerably active month for long-distance TV reception, with a number of sustained Sporadic-E openings recorded on several days. There was only a slight tropospheric lift, late on the 7th, creating Dutch u.h.f. reception in the Bristol area. We also had a report of a possible F2-Layer opening on the 13th.

The Leonids - A Damp Squib!

Few readers will have escaped the much-hyped predictions about the Leonids Meteor-Shower event which occurred during mid-November. Supposedly the best event for over 30 years, in reality it fell short of expectation, particularly where DX reception was concerned. To top it all, cloudy skies over the United Kingdom put paid to the spectacular visual display which was forecast. Just to confuse the issue, the peak of the event occurred several hours earlier than anticipated by the so-called 'experts'!

So, how did the Leonids affect the TV bands? During the early hours of the 17th, **Tom Crane** (Essex) discovered multiple carriers present on several Band I channels - many more than would be expected even during a good summertime Sporadic-E opening. All the co-channelling f.m. sound carriers were producing a strange squealing effect, making the dialogue incomprehensible. Vision was very fluttery, unlike Sporadic-E or tropo reception. Between 0001 and 0330UTC, a deluge of signals had been observed throughout Band I, including the Icelandic or Norwegian PM5534 test card co-channelling with a chat show on Channel E3.

Tim Bucknall (Congleton) adds Spain and Portugal to the list. To round off the day, **Stephen Michie** (Bristol) identified Slovenian TV on E3 at 2231. Using a half-wave Band I loop antenna, **Simon Hockenhull** (Bristol) observed many strong bursts of signals from the north-east during the early hours of the 17th. Using a scanner and its whip antenna, Simon detected pings on the lower Band III TV channels (E5, R6, E6 and E7). Several European f.m. stations were heard on 87.6, 87.8, 87.9 and 88.0MHz. Even local f.m. stations suffered Meteor-Shower zaps.

Other major Meteor-Shower events throughout the year include the Quadrantids (January 3rd and 4th), the Perseids (August 10th-12th) and the Geminids (14th-15th December). These are the ones which provide the best DX spectaculars, although some years the effects are more impressive than others.

Meteor-Shower reception in Band I occurs on a daily basis, provided you have the time and patience to watch. Stephen Michie (Bristol) watches at around 0700 and has had considerable success with Scandinavian catches on Channel E3.

Sporadic-E Reports

November started off well, with Italian transmissions present during the afternoon of the 1st. The following afternoon, signals from Italy, Germany and Slovenia were flooding in. On the 5th, a major Sporadic-E opening brought in transmissions from Romania, Moldova, Belarus and Lithuania, according to the log submitted by **Peter Barber** (Coventry).

All stations were logged on Channel R2 between 1100 and 2000UTC. A further opening occurred on the 17th when Peter spotted the 'YTH' news graphics from the Ukrainian second-network on Channel R2.

Fig. 2: Start of the News programme 'heute' on ZDF.

Fig. 1: The new Clock caption used by ZDF in Germany.

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

November DXTV Log

The collective log features reception reports supplied by Peter Barber, Tom Crane, Tim Bucknall and Stephen Michie. Times shown are in UTC.

Day	Log
1	Sporadic-E between 1650 and 1800 with reception from Italy (RAI UNO) A and B; Italy (VIDEO) E2; Italy (TVA) A; France (Canal plus) L2.
2	Sporadic-E between 1200 and 1900 with Slovenia (SLO-1) E3; Germany (ARD-1) E2; Italy (RAI UNO) A; Italy (VIDEO) E2; Portugal (RTP-1) E2; Serbia (RTS-1) E3 with subtitled film; Spain (TVE-1) E3; Denmark (DR) E3.
5	Sporadic-E between 1100 and 2000 with Romania (TVR-2) R2;Moldova (TVM) R2; Lithuania (LTV) R2; Belarus (BT) R2.
7	Italy (RAI UNO) A; Tropospheric reception from the Netherlands at 2300.
13	Unidentified E2 discussion programme with Arabic titles.
15	Sweden (SVT-1) E2 from 1020; Italy (RAI UNO) A from 1215 until 1530.
16	Meteor-Shower 'pings' on all Band I channels; Spain E3.
17	MS 'pings' on all Band I channels. Identified signals include Spain E3, Portugal (RTP-1), Italy (RAI UNO) A and B, Sweden E3, Norway E3, Denmark E3, Iceland E3 and Slovenia (SLO-1) E3 at 2231. Some f.m. signals were heard.
19	Sweden E3.
21	Sweden E3.
22	Unidentified Sporadic-E on E2 at 1030.
25	Denmark E3 with the PM5534 test card.

We incorrectly printed Nigel Evans' E-Mail address in the January issue. His correct address should have read: Nigel.Evans@eventail.freeserve.co.uk

Fig. 3: Weather forecast graphics used by Bayerisches Rundfunks (BR), Germany.

Fig. 4: Identification caption radiated by BR in Bavaria.

NTSC Mystery

Lt. Col. Rana Roy (Northern India) reports an increase in TEP (Trans-Equatorial Propagation) and F2-Layer activity with longer duration openings, usually between 1330 and 1630 local time. Channel E2 is the most commonly affected channel with signals mainly arriving from south-east Asia, probably Thailand. However, unidentified signals on Channel R2 have been encountered, but using the NTSC colour system! Rana suspects these originated in Vietnam, but are there any other possibilities?

A 'KIBCTV' logo in the top-left of the screen on Channel E2 also remains unidentified. This reception was in PAL colour and the language sounded like Thai.

Here in the UK, Simon Hockenhull (Bristol) reports possible F2 activity on Channel E2 at 1100UTC on the 13th, when a discussion programme with Arabic titling emerged.

Band I Closures

Depressing news has come from **Roger Bunney** (Romsey), advising that both Hungary's MTV-1 outlets on Channel R1 (Nagykanizsa and Budapest) closed at the end of December 1998. A replacement Budapest outlet on u.h.f. Channel R41 has been up and running for some time. Channel R4 services were transferred to u.h.f. a while ago. This leaves us with only one Hungarian TV transmitter in Band I. This is Pecs on R2, which relays the new RTL KLUB programmes.

Meanwhile, a new private station, 'VÁC', is using the Philip's PM5544 test card with a stylised 'VAC' logo at the top and 'ELECTRO-SZIGNAL' in the lower block. Channel R22 is used. Another private station (F6T) on R48 is operating, presumably with the identification 'FÓT' in the upper block.

Cable TV Interference

Several DXers have expressed concern at discovering cable leakage interference polluting v.h.f. frequencies. **Ian Moody** (Surrey) has noticed Granada Plus appearing just above Channel E6 in Band III, using System I (6.0MHz) sound, but with positive sync encoding.

Simon Hockenhull (Bristol) recently noticed excessive intermittent interference from his local Telewest cable system which drowned out E3 and E4, large parts of the f.m. band with signals appearing throughout Band III and into the u.h.f. bands. Fortunately a telephone call to report the problem resulted in swift action, which eventually resolved the matter. In this instance a fault on the system had developed, but some systems may be badly designed with inadequate screening in roadside cabinets or signal levels set excessively high.

Other operators may be unsympathetic if the complaint comes from a non-subscriber, but it is worth contacting them, especially if interference is affecting the f.m. band or u.h.f. TV in any way. Incidentally, Telewest have been experiencing interference from digital transmissions.

DXTV Receivers

Maplin can supply inexpensive small-screen receivers with multi-band capability. For £49.99 there is a Roadstar 12.7cm mono receiver (Model number TVM5002E), described in the Maplin catalogue as suitable for 'Systems CCIR + L'. Unfortunately, they could not confirm whether this actually covers the French system or whether the 'L' should be an 'I'.

For colour DXing there is a 17cm portable (catalogue reference number MY67X) listed at £199.99. The receiver functions on mains or 12V DC and resolves PAL B/G and I, SECAM B/G and D/K and French System L. Both receivers feature manual v.h.f./u.h.f. tuning, enabling each band to be perused rapidly.

Keep On Writing

Please send reception reports, information, off-screen photographs etc., by the first of the month to:-

Garry Smith, 17 Collingham Gardens, Derby DE22 4FS.

Fig. 5: Identification caption transmitted by the Dutch 2nd Network.

Fig. 6: A real brain-teasing trip 'Down Memory Lane' this month. Does anyone remember this identification logo used in the Fifties by Anglia TV?

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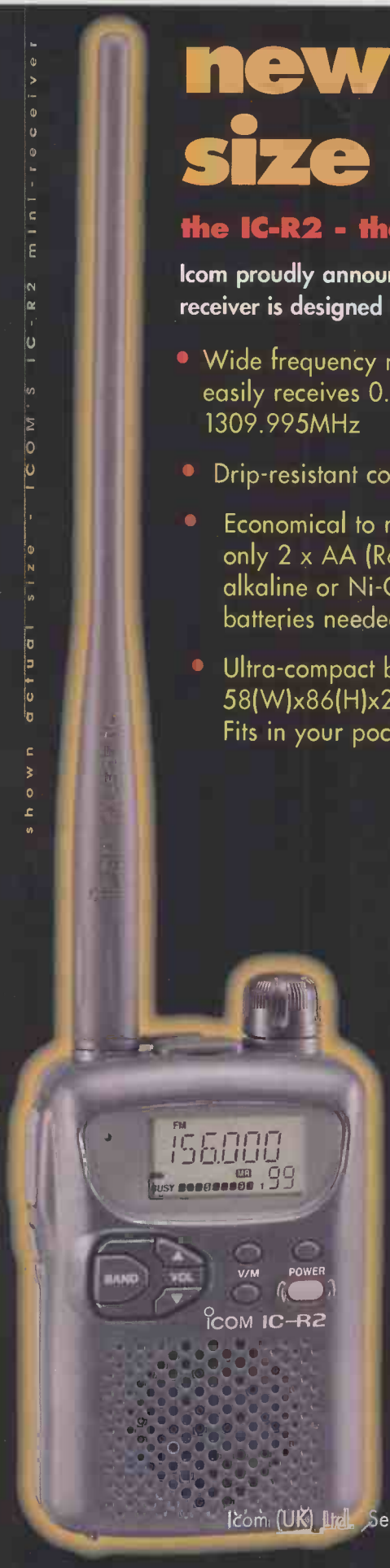

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***Extract of the review on the JRC-NRD 545 from the World Radio TV Handbook 1999**

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