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SEPTEMBER 1985 £1.10

934MHz equipment: some recommendations

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G30SS tests: Icom IC735
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* SEE THE REVIEWS * or SAE LEAFLETS

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RWC CREDITCARD
6 Straight and Level I
All the latest news, comment and developments on the amateur radio scene

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Your opinions on topics of interest

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IC-735, The Complete HF Radio

This new HF transceiver from ICOM is compact enough to make mobile or portable use a possibility. The IC-735 covers all Amateur frequencies from 1.8MHz to 30MHz including the three new bands 10, 18 and 24MHz. Modes include SSB, CW, AM and FM, all circuits are solid-state and output is approximately 100 watts.

Tuning ranges from 100kHz to 30MHz, made continuous by using a high-side IF and a CPU control system. RTTY operation is also possible. Dynamic range is 105dB with a 70.451 MHz first IF circuit. The direct feed mixer rejects spurious response and gives higher sensitivity and wider dynamic range. Pass-band tuning and a sharp IF notch filter provide clear reception even under duress. Preamp is 10dB and attenuator 20dB.

The new IC-735 from ICOM is easy to operate and versatile. It has various scanning functions, comprehensive LCD and 12 memories. Computer remote control is possible via the RS-232C jack. Options include: the AT-150 automatic antenna tuner and shown here the PS-55 AC power supply and SM-8 desk mic.

Please contact Thanet Electronics or your local ICOM dealer for even more information on this latest HF transceiver – the IC-735.

IC-290D/290E Mobile

290D is the state of the art 2 meter mobile, it has 5 memories and VFO's to store your favourite repeaters and a priority channel to check your most important frequency automatically. Programmable offsets are included for odd repeater splits, tuning is 5KHz or 1KHz.

The squelch on SSB silently scans for signals, while 2 VFO's with equalising capability mark your signal frequency with the touch of a button. Other features include: RIT, 1 KHz or 100Hz tuning/CW sidetone. AGC slow or fast in SSB and CW. Noise blanker to suppress pulse type noises on SSB/CW.

You can scan the whole band between VFO's/scan memories and VFO's. Adjustable scan rate 144 to 146 MHz, remote tuning with IC-HM10 and HM11 microphones. Digital frequency display, Hi/Low power switch. Optional Nicad battery system allows retention of memory.
IC-02E, IC-04E
Handheld

The direct entry microprocessor controlled IC-02E is a 2 meter handheld, features include:
- scanning, 10 memories, duplex offset storage in memory and odd offsets also stored in memory.
- Internal Lithium battery backup and repeater tone are included. Keyboard entry is made through the 16 button pad allowing easy access to frequencies, duplex, memories, memory scan and priority.

The IC-02E has an LCD readout indicating frequency, memory channel, signal strength, transmitter output and scanning functions.

HS-10 Headset also available with earphone and boom microphone, which operates with either of the following: HS 10-SB Switch box with pre-amplifier giving biased toggle on, off and continuous transmit. HS 10-SA Voice operated switch box with pre-amplifier, mic gain, vox gain and delay. The IC-2E and 4E continue to be available.

IC-27E
Mobile

You can get what you want just by picking up the telephone. Our mail-order dept. offers you:
- free, same-day despatch whenever possible, instant credit, interest-free H.P., telephone Barclaycard and Access facility, and a 24 hour answering service.
Please note that we have a retail branch at 95, Mortimer Street, Herne Bay, Kent. Tel. 369464. Give it a visit. BCNU

Authorised Icom dealers in the UK

Alytronics, Newcastle. 0632-761012
Amateur Radio Exchange, London (Ealing). 01-992 5765
Amcomm, London (S. Harrow). 01-422 9585
Amrow Electronics Ltd., Chelmsford Essex. 0245-581673 26
Beematte, Cardiff. 0222-486484
Booth Holding (Bath) Ltd. Bristol. 0221-2410
Bredhau Electronics Ltd., W. Sussex. 0444-401766
Drestry (UK) Ltd., London (Levisham). 01-558 9454
D.W. Electronics, Widnes Cheshire. 051-420 2559
Hobbytronics, Knutsford Cheshire. 0565-4040 Untill 10pm daily.
Photo Acoustics Ltd., Buckinghamshire. 0908-610625
Radcomm Electronics, Co. Cork, Ireland. 01035-321 632725
Radio Shack Ltd., London NW6. 01-624 7174
Scomms, Edinburgh. 031-612-2391
Tyrone Amateur Electronics, Co, Tyrone, N. Ireland. 0662-2043
Waters & Stanton Electronics, Hockley Essex. 0702-206835

Listed here are authorised dealers who can demonstrate ICOM equipment all year round. This list covers most areas of the U.K., but if you have difficulty finding a dealer near you, contact Thanet Electronics and we will be able to help you.

STOP PRESS» Contact us regarding 50MHz equipment for new issued!
ATTENUATORS
Tony Chapman Electronics Limited, of Epping, are the sole distributors in the United Kingdom of a comprehensive range of attenuators for use in HF through to the microwave communications industry, manufactured by JFW Industries Inc of Indiana in the United States.
JFW manufacture what is one of the largest ranges of attenuators and accessories available in the UK today. All products are designed and engineered to the most exacting standards and provide dependable, quality performance over a wide range of applications.
The 50FH series offers power levels of up to 100 watts, with standard attenuation values of between 3-30dB operation, in most models to 2,000MHz, which makes these suitable for VHF/UHF and microwave applications where high power levels need to be attenuated for measurement purposes. An accuracy of ±0.3dB and a choice of N-BNC or TNC connectors make these attenuators ideal for extending the range of thermistor type power meters.
Designed for IF signal processing and general instrumentation, model 50P-076 provides up to 127dB in 1dB steps controlled via 12V dc with attenuation steps 1,2,4,8,16,32, and 64 sections. Type specifications are 10MHz through to 1500MHz. There is 50 or 75 ohm impedance, VSWR 1.5:1.
Other models in the 5DP series can provide alternative ranges of attenuation with and without full solid-state TTL control.
For further information contact: Tony Chapman Electronics Ltd, Electron House, Hemnall Street, Epping, Essex CM16 4LS. Tel: (0378) 76138/9.

ELECTROMAGNETIC SHIELDING
Inco Selective Surfaces Limited, through research and testing, have created an electromagnetic shielding coating (EMS360) which will effectively screen components against electromagnetic radiation.
EMS360 is a multi-layer metallic coating, deposited by a high rate vacuum sputter process on to plastics used in the manufacture of enclosures for the electrical and electronics industry.
The intermediary high conductivity copper gives a cost effective electromagnetic shield, and a hard top coat achieves maximum resistance to corrosion and abrasion. To ensure the integrity of the coating, all layers are deposited in one vacuum cycle.
The advantages of EMS360 coating are the uniformity of film thickness due to the vacuum deposition process, however complex the component size and shape, and the low temperature of the components during application, which prevents distortion and minimises thermal stresses in the coating.
For further information please contact: Inco Selective Surfaces Ltd, Wiggin Street, Birmingham B16 0AJ. Tel: (021) 454 4871.

INTERFACE KIT
The Centronics parallel interface for dot matrix and daisy wheel printers can be used with the ZX Spectrum, using an easy-to-assemble interface kit available from Electronics and Computer Workshop Ltd.
The Centronics interface kit – K2614 – is just one of a series of I/O expansions that enable Spectrum owners to expand their machines to communicate with the outside world, plugging into a standard interface mother-board, the K2615. With the Centronics kit the printer can be plugged directly into a standard 2 x 18 way socket, and non-standard parallel printers can also be controlled provided that they have a Ready or Busy TTL-level output.
The construction and operation manual supplied with the kit explains in a clear, step-by-step way how to construct the unit, and this should cause no problems to most home constructors.
The manual also includes a USR routine for simple program listing and a BASIC HEX loader program to simplify the entering of the machine code.
The Centronics interface card kit costs £31.98 and the ZX Spectrum motherboard costs £26.84.
For further details contact: Electronics and Computer Workshop Ltd, 171 Broomfield Road, Chelmsford, Essex CM1 1RY. Tel: (0245) 262149.
All the latest news, views, comment and developments on the amateur radio scene

**ASTRID**

MM Microwave Ltd, the Yorkshire based radar and communications sub-systems specialists, have entered the consumer satellite market with ASTRID (Automatic Satellite Telemetry Receiver and Information Decoder). ASTRID is a complete and ready to use satellite receiving system with built in decoder, enabling signals to be received and data displayed on home computers.

In operation, ASTRID receives all the data transmitted by the UoSAT satellites and automatically records it on a standard cassette tape recorder.

Information being transmitted by the satellites includes: news bulletins; satellite status; experimental data; messages on the electronic mailbox; digitalker speech telemetry; experimental CCD television camera signals.

Assessment of this data enables a deeper understanding of the rapid developments in space technology and encourages active participation in real experiments. ASTRID extends the range and scope of a home computer, bringing space technology within everyone’s reach.

Software available from AMSAT-UK allows graphic display of satellite ‘tracks’ over maps, error correction of received data, disc storage of data for computer analysis and data presentation of particular telemetry channels. ASTRID is priced at £144 complete.

For more details contact: MM Microwave Ltd, Satellite Group, Thornton Road Industrial Estate, Pickering, North Yorkshire. Tel: (0751) 75455.

**TECHNICAL SURPLUS**

A new shop, Technical Surplus, has recently opened in Birmingham, just down the road from Ray Withers Communications, in fact.

Technical Surplus stocks a wide range of surplus radio, electronics, CB and military equipment – all very good for the constructor.

The shop is open from 9.00am to 5.00pm Monday to Saturday at: 576 Hagley Road West, Oldbury, Warley, Birmingham B68 OBS.

**SATELLITE TERMINAL**

Wave Devices Ltd, of Covent Garden, London have announced the introduction of the ASAT-1214 small aperture satellite communications terminal for use in business and industrial applications. The terminal is manufactured by Avantek, the microwave specialist from California, USA.

The two-way terminal is designed primarily for voice and data transmission and is easily installable. It can transmit and receive at rates from 9.6kbits to 1.544Mbps, and features an antenna as small as 1.2 metres in diameter and less than 5 feet in height. With integrated electronics, it transmits up to 10 watts in the Ku frequency band, between 14.0 and 14.5GHz, and receives between 11.7 and 12.2GHz.

The ASAT-1214 suggests many applications where data is distributed or collected over significant distances. These would include financial data transfer, inventory and shipment control, oil well and pipeline monitoring, point-of-sale systems, electronic mail, video conferencing and voice communications.

For further information contact: Wave Devices Ltd, 9 Betterton Street, London WC2H 9BF. Tel: 01-240 7052.

**dc/dc CONVERTERS**

Burr-Brown have just introduced a new 400 model line of low-cost dc to dc converters which are claimed to offer more complete dc/dc circuit functions and to withstand more environmental stress than many other dc/dc converters.

Known as the PWRxxx series, these dc/dc converters are available with single/multi-channels, regulated/unregulated outputs and single/dual outputs. Features include UL544, VDE 750 and CSA C22.2 dielectric, input and output filtering and six-sided shielding.

Across the range the PWRxxx family offers input voltages of 5V dc to 48V dc, output voltages of 5V dc to ±15V dc, power rating of 450mW to 5W and a minimum isolation voltage of 1000V peak.

Each of the PWRxxx devices is housed in a rugged non-conductive package.

For further details contact: Burr-Brown International Ltd, Cassiobury House, 11-19 Station Road, Watford, Herts WD1 1EA. Tel: (0923) 33837.
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Pre-amp Gain: 12dB Typical
RX Noise Factor: Better than 1.5dB
LPM70-10-100 £172.50

2M
Frequency Range: 50 to 54 MHz
Output Power: 100W +/- 0.5dB
Power Requirements: 13.8V DC, 14A +/- 15%
Pre-amp Gain: 12dB Typical
RX Noise Factor: Better than 1.5dB
LP144-3-50 £108
LP144-10-50 £108

6M
Frequency Range: 70 to 72 MHz
Output Power: 100W +/- 0.5dB
Power Requirements: 13.8V DC, 14A +/- 15%
Pre-amp Gain: 12dB Typical
RX Noise Factor: Better than 1.5dB
LPM50-10-100 £172.50

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"NOTE: MICROBOX II WILL BOOT 'FLEX' FROM ANY STANDARD SYSTEM DISC.

MICRO Concepts
8 SKILLICORNE MEWS - QUEENS ROAD - CHELTENHAM - GLOUCESTERSHIRE GL50 2NJ
BNOS Electronics Ltd have announced the introduction of 100 watt linear amplifiers for the amateur 4 and 6 metre bands. In their LPM Series format, these models join their 2m and 70cm cousins as the LPM70-10-100 and the LPM50-10-100. The usual BNOS bargraph power meter, low noise pre-amplifier and RF PVOX/PTT switching facilities are built in, as is the BNOS overdrive protection feature. The mobile mount is supplied as standard.

The specifications are as follows: The frequency band supplied as standard.

- **Output power**: 100W rms ±0.5dB. Power requirements are 13.8V dc, 14A ±15% and insertion loss is 1.5dB ±0.5dB. There is an Rx pre-amp gain of typically 12dB and the Rx noise factor is better than 1.5dB. The amps sell at £172.50 each.

For further details contact: BNOS Electronics Ltd, Bigods Hall, Great Dunmow, Essex CM6 3BE. Tel: (0371) 4677.

### Radioteletype Press Broadcasts

Press transmissions are undoubtedly the most popular RTTY stations among short wave enthusiasts, and the availability of sophisticated decoding units linked to home computers has made them readily available to all. Watching the news bulletins of the foreign press agencies, the amateur finds himself in the front row of international affairs.

In order to find the frequencies and times of transmissions, the new second edition of Michel Schaab's book, Radioteletype press broadcasts, will prove to be of great help.

Not only are hundreds of transmissions listed, but a chapter is devoted to each of the forty-five most interesting press agencies, giving a detailed insight to how they operate. This provides a much better understanding of the bulletins being received. A total of sixty-three agencies are covered, among them Associated Press, Pressa Latina, TASS, Press Trust of India, AFP, ANSA, and some more unusual ones such as Bakhtar News Agency from Afghanistan, Service de Presse Kampuchea and a clandestine station, Kwacha Unita Press from Angola.

The second part of the book has a comprehensive listing of transmissions for each hour and half hour, plus cross references.

As the book was written in Europe Interbooks believe that it will be of particular interest to British short wave enthusiasts. The first edition was a best seller.

This book is available for £11.85 from: Interbooks, Lynton, Stanley, Perth PH1 4QQ. Tel: (0738) 828575.

### Combline Filters

Time Microwave, based in Santa Clara, California, has introduced a new series of combline bandpass filters. The passband frequency ranges from 4.0 to 8.0GHz, 5.0 to 8.0GHz, 5.0 to 12.0GHz, and 12.0 to 18.0GHz.

The model BPF176 features a VSWR of 2.0:1 maximum, insertion loss of 1.0dB maximum, and a size of 2.50 inches x 0.70 inches excluding connectors. Filter models BPF176, 177 and 178 feature a VSWR of 1.5:1 maximum and all SMA female connectors.

The stop-band rejection for the model BPF176 is 50dB minimum at dc to 4.0GHz and at 16.0 to 18.5GHz. Model BPF177 has a stop-band rejection of 50dB minimum at dc to 6.0GHz and at 24.0 to 26.5GHz. The model BPF178's rejection is 50dB minimum at dc to 3.0GHz and at 10.0 to 15.0GHz.

The BPF175 and BPF126 models have also been introduced. The passband frequency range for these units is 10.46 to 10.59GHz and 13.2 to 13.4GHz. The VSWR for both filters is 1.5:1 maximum with an insertion loss of 1.0dB maximum.

The BPF157 features removable SMA female connectors, and a size of 1.45 inches x 0.63 inches x 0.05 inches. The stop-band rejection of this unit is 20dB minimum at dc to 10.22GHz and 20dB minimum at 10.825 to 22.0GHz.

Model BPF126 measures 1.24 inches x 0.60 inches x 0.55 inches, excluding the SMA connectors. Stop-band rejection is 20dB minimum at dc to 12.8GHz and 20dB minimum at 13.8 to 23.5GHz.

For further information, please contact: Time Microwave, 398 Martin Avenue, Santa Clara, CA 95050. Tel: 408/970-8463.

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**Electronics Book**

STC Electronic Services' stock catalogue, The Electronics Book - Summer Issue, is now available.

The catalogue contains almost 700 pages and covers more than 40,000 products from more than 250 manufacturers. In excess of 12,000 new products have been introduced this year from Commodore business computers to capacitors from Vitramon.

The Electronics Book is available free-of-charge from: Publicity Department, STC Electronic Services, Edinburgh Way, Harlow, Essex. Tel: (0279) 26777.
Datacom

The British Amateur Radio Telegrapher Group (BARTG) has published the summer 1985 issue of its magazine, Datacom. It consists of 120 pages of news, views and technical articles, on all aspects of RTTY, Amtor, Packet Radio and FAX.

Special features include full technical and constructional details of the STC terminal unit and of a unit to convert from a parallel Centronics interface to serial RS232.

There are suggestions for circuits and ideas for audio notch filters, sidetone monitoring of RTTY transmissions, driving teleprinters on low voltage, improving efficiency in RTTY transmitters, etc.

In this issue the results of BARTG’s survey on the use of RTTY on 45.45 and 50 bauds is published. BARTG believes that this will be of particular interest to RTTY repeater builders, emergency network planners and DX operators.

Datacom gives details of how Amtor can be used through the Oscar 10 satellite, as well as Packet Radio news, and information on the new TNC2 Terminal Node Controller.

Datacom is published quarterly and supplied free to members. Send an SAE for details to: Mrs P Beedie, 822286.

SPRAT

We recently received the latest issue of SPRAT, the journal of the G-QRP Club, which, incidentally, is edited by our very own Rev George Dobbs G3RJV, who is a regular contributor to Amateur Radio with his Beginner’s Workshop feature.

The club is now going strong in its tenth year. Readers interested in low power communication will find it worthwhile joining the club, if only to receive this very useful little journal. This edition contains an account of this year’s RSGB Convention, which was held at the NEC in Birmingham, an article on the construction of a QSK transceiver for 80m CW, a review of the Micron 6 band QRP transceiver kit, and lots more.

For more information contact: Alan Lake G4DVW, 5 Middleton Close, Nuthall, Nottingham NG16 1BX.

Clever Trevor

Trevor Morgan GW4OXB, who readers will know from his regular Short Wave Listener column in this publication and as the organiser of the Amateur Radio Prefix Award scheme, is at it again!

He has recently proposed the idea of organising a listener’s award with the aim of raising money for Bob Geldof’s Ethiopian appeal.

The White Fang Fellowship’s JOTA SWL Contest, intended to encourage SWL activity during the organisation’s annual jam boree, will charge an entry fee of two IRCs in the UK and 4 IRCs overseas. All IRCs in excess of those used to send contest certificates to the contest will be donated to the Live Aid appeal.

Any clubs or individuals who can offer assistance of any kind with the running of this scheme should contact Trevor at the address below.

Full details of the contest rules are available from: Trevor Morgan, 1 Jersey Street, Hafod, Swansea SA1 2HF.

Welsh convention

This year’s Welsh Amateur Radio Convention will be held at the usual venue — Oakdale Community College, Blackwood, Penmaen, Blackwood, Gwent NP2 OUO. Tel: (0495) 225825.

The programme will include lectures entitled, ‘The 5th Generation of Transverters’ by Chris Bartram G4DGu of muTek, ‘Oscar 10 Video’ by Werner Hass DJ5KG, and an all day DX feature and a display for newcomers. Morse test facilities will also be available.

Applicants should contact Mr G Williams, BTI Radio Station, Worston Lane, Highbridge, Somerset TA9 3JY.

There will be £300 in cash prize offers, the usual trade stands, a bring-and-buy and a lecture on aerials is to take place on 27 September.

Civil Service special

The Civil Service Amateur Radio Society (CSARS) intends to operate five special event stations this month, under the callsign GB0CSR.

The first, on 7 September from 9.00am to 8.00pm, will take place on the occasion of the Civil Service regional annual sports day. The venue will be the Central Ordnance Depot, 38 Base Workshops REME, Chilwell, Notts.

The second special event station will operate on 8 September from 9.00am to 8.00pm, at the Civil Service Sports Ground, Witford Lane, Notts.

Operation in both instances will be on HF 80-10m and possibly 2m.

More information is available from: K R Hawkins G40FL, 37 Darley Avenue, Totton, Notts.

Insurance shock

We recently had a letter from Mr R Robinson, of West Yorkshire, who has spotted an item in his local paper, The Yorkshire Post, which he thinks might be of interest to readers of Amateur Radio.

The item recounts how a motorist’s insurance policy became invalid after he installed a CB radio in his car, due to a clause in his policy specifically excluding the use of a vehicle with a two-way radio. This led to the motorist being prosecuted and fined £80 for driving without insurance.

According to the man’s solicitor, he believed he was adequately insured, having been advised by the insurance broker that the exclusion clause referred only to taxi radios.

This unfortunate incident has brought to light a situation which mobile operators should be wary of. Check that your insurance policy has no similar exclusion clauses.

New computer club

A new Amateur Radio and Computer Club (AMRAC) has recently been formed in South Hampshire. The club aims to promote the use of computers in amateur radio and to encourage the use of digital communication techniques.

The members are active on the data frequency 144.675 MHz using ASCII and both the AX25 and Cambridge Packet systems.

Meetings are held every fourth Friday at 8pm in the Crown Public House in Bishop’s Waltham. The next meetings are scheduled for 6 September and 4 October.

Further details are available from: The Secretary, Trevor Tugwell, 50 Mayridge, Fareham, Hants. Tel: (0485) 81032.

Radio lectures

The Maidstone Amateur Radio Society recently held its AGM and the new committee has arranged two special events for September.

On 13 September there will be a lecture entitled “Fault Diagnosis of 27-30MHz Rigs’ and a lecture on aero is to take place on 27 September.

The lectures start at 6.30pm at the YMCA Sportcentre in Melksham, near Mids tone, and the club meets every Friday at the same location at 7.30pm.

North Devon Radio Rally

The fifth North Devon Radio Rally is to be held in Bradworthy Memorial Hall, near Holsworthy on 2 November at 10.30am until 5.00pm. There will be a bring-and-buy stand and talk-in on 2 metres (522).

Raleigh celebration

Exmouth Amateur Radio Club will be operating a special event station from Hayes Barton, Teignmouth, Devon using the callsign GB4HB during the 28 days from 5 September until 2 October on the HF bands, 144 MHz, 432 MHz, Oscar 10 and RS satellites.

Hayes Barton is the birthplace of Sir Walter Raleigh, who was born in 1554. He later went on to establish a colony in North Carolina in 1585 and it is hoped to contact the Raleigh Amateur Radio Society in the City of Raleigh as part of their 400 year celebrations. It is also hoped to contact the Operation Raleigh ship, the ‘Sir Walter Raleigh’, GB0SWR/MM, on her round the world mission. A special QSL card featuring the Elizabethan farm house where Raleigh was born will be issued to all contacts.

New clubrooms

The members of the West of Scotland Amateur Radio
Society have been very busy lately converting a former curtain factory in the centre of Glasgow into new clubrooms.

The curtain goes up on this project (groan! – E6) on 20 September at 8pm, when the new club will be formally opened by the President of the RSGB, Mrs Joan Heathershaw G4CHH.

The new clubrooms have a sizeable meeting hall, a shack equipped for HF and VHF operation, a lounge, kitchen and cloakrooms, and a room for Morse classes and construction work.

The club meets at 7.30pm every Friday and has a fortnightly lecture programme starting in September.

Further information can be obtained from: Ian McGarvie GM4JDU, 3 Kelso Avenue, Paisley PA2 9JE. Tel: (050) 581 2708.

South Manchester RC

The South Manchester Radio Club has sent us details of events planned for September. On 13 September an HF activity night will take place followed on the 20th by a junk sale.

On the 27th the club will have a visit by the RSGB General Manager, John Nelson G4FRX.

For further details contact the club secretary, Dave Holland, on (061) 973 1837.

Edgware news

The Edgware and District Radio Society has announced a lecture on 12 September, entitled 'Pre-War Transmitters'. It will be given by Eric Godfrey G3GC.

The club will meet at 8pm in the Watling Community Centre in Orange Hill Road, Edgware.

For further information on the club and their other activities contact: John Cobley G4RMD, 4 Briars Close, Hatfield, Herts.

WACRAL news

The World Association of Christian Radio Amateurs and Listeners (WACRAL) has sent us information regarding its 1985 conference weekend. The venue for the conference is Cliff College, Calver, Sheffield on 4-6 October. The cost per member is £22.50.

The conference programme is partially planned and talks have been arranged. The WACRAL HQ would like to hear from volunteers to give talks and help with the organisation of the conference.

Cliff College can accommodate 68 people and there is also a caravan and camp site nearby.

For further information contact: WACRAL HQ, Micasa, 13 Ferry Road, Wawne, Hull HU7 5XU. Tel: (0482) 822276.

Radio rummage

The South Bristol Amateur Radio Club (G4WAW) are holding their first 'radio rummage' on Sunday 27 October. As the name suggests, the emphasis will be on bring and buy, surplus user equipment, surplus equipment and parts.

There will also be radio displays (SBARC radio shack), a Raynet stand, film shows, a Wild West 'shoot-out' and various refreshments. Talk-in will be on S22 and SU8 and the entrance fee will be 50p.

Enquiries for this event should be made to: Mike Ward G1LJO (Organiser). Tel: (0272) 687179.

The club meets at 7.30pm every Wednesday at: The Whitchurch Folk House, East Dundry, Whitchurch, Bristol, Avon BS14 0LN.

<table>
<thead>
<tr>
<th>Course title</th>
<th>Enrolment date</th>
<th>Additional Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAE</td>
<td>9/10 Sept</td>
<td>Derby CFE. Weekly 2 hr session for 30 wks. Tutor = G4MLL. College also runs an Advanced RAE course. Tel: Derby 73012</td>
</tr>
<tr>
<td>RAE + CW courses</td>
<td>10 Sept</td>
<td>Bradford and Ilkley Community College, Gt Horton Rd, W Yorks BD7 1AY</td>
</tr>
<tr>
<td>Construction for the Radio Amateur</td>
<td>10 Sept</td>
<td>As above</td>
</tr>
<tr>
<td>RAE + CW practice</td>
<td>17 Sept</td>
<td>The Nautical College, Fleetwood, Lancs. Thursday evenings for 25 wks. Tel: (0591) 79123</td>
</tr>
<tr>
<td>Microelectronics + RAE course</td>
<td>Sept</td>
<td>Hendon College, N London. Head of Technology = Chris Holford. Tel: 01-202 3811</td>
</tr>
<tr>
<td>RAE + CW courses</td>
<td>Sept</td>
<td>Wigan College of Technology. Tel: (0942) 494911</td>
</tr>
<tr>
<td>Hobby Electronics</td>
<td>Sept</td>
<td>As above</td>
</tr>
<tr>
<td>RAE</td>
<td>10/9 Sept</td>
<td>De Havilland College, Borehamwood, Herts. Every Tuesday. Tutor = G L Benbow G3HB (Editor of How to Pass the Radio Amateurs' Examination). Tel: (963) 8024. The college also runs this course on Thursdays at its Applecraft Centre in Welwyn Garden City. Tel: WGC 26318</td>
</tr>
<tr>
<td>RAE + CW courses</td>
<td>16/17/19 Sept</td>
<td>Reddish Vale Evening Centre, Stockport, Cheshire. The RAE course is on Monday evenings and the CW course on Thursday evenings. Tel: (061) 477 3544</td>
</tr>
<tr>
<td>RAE</td>
<td>10/11 Sept</td>
<td>Paddington College, London. Tutors = G4KXM and G6FMF. Use of Electrical Engineering Dept's facilities to conduct practical experiments. College operates club station, G4WU. Special rates for students, pensioners, unemployed. Pass rate nearly 90%</td>
</tr>
<tr>
<td>RAE</td>
<td>Sept</td>
<td>Adult Education Centre, Tonbridge, Kent. Practical demonstrations + theory. Tutor = G6PWG. 86% pass rate. Tel: Tonbridge 254313</td>
</tr>
<tr>
<td>RAE</td>
<td>14 Sept</td>
<td>Islington Institute, 86 Ager Ave, Camden Town, London NW1. Tutor = G3ZKE. Tel: 01-485 7065</td>
</tr>
<tr>
<td>Morse + Theory and Regulations</td>
<td>Sept</td>
<td>Dept of Elect Engineering, Loughborough Technical College, Leica. Tuesday evenings. Pass rate 80% for Morse, 70% for Theory. Tel: Loughborough 254313</td>
</tr>
<tr>
<td>RAE</td>
<td>9 Sept onwards</td>
<td>Fareham Adult Education Centre, Wickham Rd, PO18 7DA. Tutor = G3CCB. Tel: (0239) 288139</td>
</tr>
<tr>
<td>Theory + Morse + Practical RAE</td>
<td>9/10 Sept</td>
<td>Brunel Technical College, Bristol. Dept Aerospace and Radiocommunications. Tutor = G3ZJH. Last year 94% pass rate for theory, 100% for CW. Tel: (0272) 4142, ext 64</td>
</tr>
</tbody>
</table>
SWR DEBATE
May I be permitted to make one or two points regarding Bill Mantovani's 'Back to Basics' feature in the May issue of Amateur Radio. However, before doing so let me admit that it is easier to criticise than to produce the original article!

Regarding the statement that 'the SWR is constant along the whole length of the feeder'—top right-hand corner, page 47—this is untrue. Consider the case where the line is sufficiently lossy for only 50% of the feed voltage to appear at the antenna end; also that the latter produces a total mismatch.

In this case the whole of the voltage is reflected and is again halved during its journey back to the feed end. Thus, whilst the SWR at the end is infinite, at the feed end it will be circa 1.5:1.

In reality the losses are far less and the differences in SWR as measured at the two ends of the feeders are similarly less. This brings me to my second point: feeder losses and the effect of SWR. These are far less significant, certainly at HF, than are generally imagined. One hundred feet of decent co-ax will have a 'level line' loss of circa 1dB at 28MHz; to double the loss would require an SWR of circa 6:1. For the more typical feeder, say 50ft with a 3:1 maximum SWR, the loss may be ignored.

Certainly high powers and SWR can produce flash-over, it's a case of horses for courses. However, Bill has avoided the usual excuses of blaming high SWRs on feeders for blown output stages, the latter being almost solely due to incorrect operating conditions or component ratings.

Finally, it was gratifying to read on page 35 that my speculations regarding the Hatesey Diploma of Delight (Letters, Amateur Radio, February) were not far off. JW Barker G3WAL, Rugby

The topic of SWR is a very thorny one because of a number of misunderstandings that have spread through our hobby in recent years, primarily due to the now accepted use of the SWR meter for checking the match between transmitter and antenna system. It is rarely possible to mention the word SWR without invoking a contradiction of opinions, which is totally uncalled for and would not occur if people understood SWR in the first place. I have personally spent many an hour both on and off the air discussing SWR related facts (and in some cases fallacies), but I don't think that a feature aimed at someone just starting in amateur radio is a good place to launch into such discussion—there is plenty of time for that when the newly licensed amateur gets down to looking at the performance of his antenna system for himself!

In reply to the first of Mr. Barker's comments, the answer is quite simply that we are both right. In his letter, Mr Barker considers the situation where a lossy transmission line is being used, but this is really going outside the scope of the RAE syllabus and the objective of my 'Back to Basics' feature, which is to cover only elementary principles. Therefore, it is sufficient for the RAE to consider only the behaviour of standing waves on a loss-free transmission line, in which case it is indeed true that the SWR is constant along the whole length of the feeder because there is no power loss.

Mr Barker is quite correct on his second point, that too great a significance is placed on feeder losses and low SWR than need be, which brings me back to my opening statement of misunderstandings over SWR. The SWR and any line losses need to be pretty high when operating at HF frequencies before there is a pronounced effect on the transmitted signal, especially as the ionosphere, under favourable propagation conditions, does a great job of ensuring that even the poorest signal travels long distances. However, using a lossy transmission line or operating with a high SWR could lead to TVI problems, amongst others, so a certain amount of common sense is obviously called for, especially when you bear in mind that a high SWR could lead to the SWR on a co-ax line down to below about 2:1 can be regarded as wasted effort from the point of increasing the radiation from the antenna.

As Mr Barker states, at frequencies below about 30MHz, losses incurred by typical feeder lengths may be ignored and a high SWR is not always a bad thing to be avoided at all costs. This is not the prime cause of a blown PA stage, as is often believed. Not everyone will agree with my or Mr Barker's comments, but these are the facts—it's the fallacies which cause the arguments, but it does make the airwaves interesting!

Bill Mantovani G4ZVB

WAS GOD A RADIO AMATEUR?
As a long time SWL and also a CB operator I would like to reply to certain people who write to your magazine under the guise of being 'radio amateurs', namely G4X1V, G4KCC, G4GJN (AR, July).

Erich Von Daniken wrote a book called Was God an Astronaut?, I think it should have been called Was God a Radio Amateur? I get sick and tired of amateurs knocking hell out of everyone who has anything to do with CB. We are not all Idiots, just as amateurs are not all gods, excluding you three of course.

My wife and I are both disabled and we have CB in our car in case of emergencies. We certainly do not contribute to the 'chatter' on 27MHz, just as you three are not part of the 'undisciplined rabble' on 2 metres. We are members of the RAIBC and they have kindly loaned us a receiver which gives us a lot of enjoyment. We would also like to study for the RAE, but because of health reasons my wife is unable to attend classes to gain the necessary knowledge, and offers of home tuition do not seem readily available. So we will carry on in our own way, and in due course we will pass the RAE despite people like you.

You are entitled to your opinions, but do us all a favour before you carry on slamming CB operators. Try to get to know some of us; you never know, you might even realise there are some CBers who really do want to become amateurs.

By the way, our transceiver and aerial conform to the legal requirements, and we do have a licence. With people around with your attitude, it's a wonder that anyone bothers to become a radio amateur. Still, I suppose there must be some of them who are interested in helping others to learn rather than in just putting them down.

J B Hackett, Cornwall

SNOBS
After reading the letters of G4JGN, G4XIV and G4KCC, I feel that I must reply. Why do these people, who I can only describe as 'snobs', perpetually 'slag off' CBers? Just because we cannot afford the money to buy HF, VHF or UHF equipment are we inferior?

True, on 27MHz FM there are a few who do abuse the band, but many others use it seriously and properly. True radio amateurs are those who struggle to make do with what they can afford, not those who can walk into a shop and pay cash for a black box that can get them around the world without any skill needed. I myself am studying for the RAE and hope to sit at Christmas, and any attempts to take the Morse test so that I may obtain a class A licence. If and when I pass the exam I will depend upon other radio users to lend me some equipment—those users, that is, who are not so stuck up and still use CB regularly. However, even not a drastic change in my financial status will see me discard my rig and refuse to speak to that 'undisciplined rabble'.
RAE CONFUSION

The letters penned by LG Slater and BJ Marsh in the May and July issues respectively caused me some confusion. On the one hand Mr Slater seems to be raising a relevant point about the status of the RAE when he describes his repeated failures to pass it, despite having a technical background and many previous exam successes in presumably related subjects. Mr Marsh, on the other hand, makes another quite justifiable point; studying for and sitting an examination carries no in-built guarantee that one will pass. Try again, he advises.

My confusion arises through agreeing with what I believe lies behind Mr Slater’s lack of confidence with the RAE, agreeing with Mr Marsh’s comments, and learning today that I have scored a double credit pass in it. Why not take the certificate and run, I ask myself!

Never having been a good runner I propose to ignore my own advice and take a closer look at the RAE.

Paper 1 seems generally to be a free gift, and it shouldn’t be. Assuming, and it is only an assumption, a 40% pass level then 14 correct answers scores a pass.

Since 23 questions deal with licence conditions it is possible to gain a pass in Paper 1 without knowing anything about transmitter interference (12 questions).

I should have thought more emphasis on this extremely important branch of our hobby would go far to silence the perennial complaints in the amateur media about interference, not all of which comes from the whipping boys of the CB fraternity and radio pirates.

More central to Mr Slater’s complaint is the state of Paper 2. At the same pass rate correct answers required are 24 out of its total of 60. It is this paper which is responsible, I believe, for the bulk of the failure rate. Because the examining board calls in the question papers immediately after the exam it is not easy to analyse their content over a period of time. From my own experience, however, I am quite certain that at least ten of the questions put to me had no obvious relation to the syllabus.

I have marked papers at university level and have been an internal examiner for CSE, setting and marking papers for a number of years. In consequence I feel I can recognise a question on a subject I know next to nothing about, and I recognised ten such in the RAE.

Trevor MacDiarmid, Essex

LEARNER’S POINT OF VIEW

In the July ‘85 issue of Amateur Radio under the headings of ‘Progressive Licence’ and ‘No Novice Licence’, Mr Holmden and Mr Skafe both express views which, as a newcomer to the subject, I heartily endorse.

At present I am awaiting the results of the RAE, which I attempted in May (and if I’ve failed I intend to persevere), however for a while I was a CBER.

The rig was used for my convenience (savings on local ‘phone calls, road reports and directions etc) rather than the ‘enjoyment’ of talking to some ‘one-nine-for-a-copy’ wally who was proud of his Silver Rod, 100 watt boots etc...

I enrolled with the local school’s evening classes in September ’84 rather lightheartedly, originally only to accompany one of my husband’s friends who wanted some moral support.

At that time I wasn’t bothered if I learned anything or not, but with a few classes the amateur radio bug bit me really hard. If I have failed the RAE, it won’t be for the lack of first class expert tuition as our class was taught by none other than Ray Petri G8CCJ (why not plug the author as well as his book) who really gave far more than the Kent County Council could expect for the meagre pitance that is paid to their tutors. When I get my ticket I intend to use CB only to talk to my parents, who have neither the inclination nor (possibly) the ability to pass the RAE.

As regards the letter from Mr Shannon headed ‘Drive’, I’m afraid I believe that he’s talking drive off himself. As far as I’m concerned, any ex-CBER who has the determination to study for and pass the RAE is probably genuinely interested to discover if the callsign she/he is working known to her/him under an alias or ‘handle’.

As for compulsory CW, why? Surely the system proposed by Mr Holmden is by far the better. Also, my level of technical knowledge is probably sadly lacking according to Mr Shannon’s standards, but with 13 ‘O’ levels (I was studying for 5 ‘A’ levels but got fed up with the lack of cash) and the fact that I am a member of MENSIA, I am sure that even Mr Shannon will agree that I am far from ignorant. Yet I do not wish to venture into CW and his precious HF bands, at least not for a while.

Any comments appreciated - I’m used to criticism, if only because I’m not male.

Rosemary Pearce, Kent

PRACTICAL KNOW-HOW


It occurs to me, an ancient G3, that part of the problem of how to make or even acquire an antenna matching unit (an AMU, not ATU; nothing ‘tunes’ an antenna except when it is reworked mechanically) is the lack of practical training prior to the technical examination for our licences.

In the days prior to circa 1965, the transmitting amateur, were also the teachers of our hobby. When the local G2 or G3 stood up in front of the RAE class and explained what an AMU was he would naturally bring with him his own piece of ‘home-brew’ to illustrate the beast. No doubt it cost him £2-10-0 to build, but it did the job. Pupil found items mostly at the local DIY shop or ‘Fred’s emporium’ and went home with their own ideas on how to construct their home-brew.

Anyway, to put my money where my mouth is, and having 35 years of professional experience trying to match Tx and Rx to odd lengths of wire and long lengths of coaxial, I am willing to make a date and time this year for an AMU constructional evening and teach-in where there is the greatest response to the suggestion. The idea would be a practical demonstration of all types of AMU using all items out of the local stores or junk box in a flash case or on a piece of plywood. I would not only invite newcomers to the hobby, but ask some old timers to show up with prime examples of their own work.

Anybody interested in this idea should contact: Ron Broadbent G3AAJ, 94 Herongate Road, Wanstead Park, London E12 5EO.

ONLY A HOBBY

I took the RAE in May 1984 and went straight on to the hard task of learning CW. During that period I held a class B licence and found local amateurs very helpful.

In January 1985 I took the Morse test and am now the proud holder of the callsign G8AOJ.

I was (dare I say it) a CBer for about 2 years and have been a listener on the amateur bands for 3 years. It seems to me that many people take amateur radio too seriously and hold very strong views on such matters. Take Mr Shannon G4GJN, for example. He says that black box operating should be stamped out; if we all thought like that people would still be going to work on a horse and cart.

Come along fellow amateurs, let’s get rid of all this back biting. After all, it’s only a hobby, so let’s enjoy it.

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The force is with us

Having said all this, we can be in no doubt that the
sunspot minimum is now well
and truly with us, and many
amateurs will be looking for
something other than distant
DX to keep them amused.
Many years ago my daytime
recognition on the LF bands
used to be chasing squares
for the Worked All Britain
Award, and I am delighted
that this award programme is
still going strong, despite the
death some years ago of its
founder G3ABG.

Worked All Britain

WAB started in April 1969
under the sponsorship of the
Cannock Chase Amateur
Radio Society. The initial
award was available in Basic,
Bronze, Silver and Gold clas-
ses, the Gold Award requiring
the applicant to have worked
(or heard, in the case of an
SWL) 1500 out of a possible
total of 3980 Ordnance Survey
squares.

These squares derive from the
grid pattern of squares
(100 kilometres per side) into
which Great Britain is divided
by the Ordnance Survey. Each
square has a two letter refer-
ence (TL, TM, etc) and is

further sub-divided on a
north/south and east/west
basis into 100 smaller squares
(with 10km sides). These
squares are numbered 0 to 9
both vertically and hori-
zontally from the bottom left-
hand corner (thus going from
00 to 99). The WAB awards
are based on these squares, plus
a distinction by county. Thus
some squares only count
once, but others, if divided by
a county boundary, will count
more than once.

A WAB record book, listing
all areas, counties and offshore islands (a specified
number of each are required
for the Gold Award) became
available for seven shillings
and sixpence. By July 1969 six
hundred books had been sold
and a further award (the WAB
Century Award) was intro-
duced for working 100 book-
holders.

WAB contests

The WAB contests were
introduced in 1970. There
were six twelve-hour events
for LF, HF and VHF (both
phone and CW in each case).
Originally, all contacts from
1/1/69 counted for WAB
awards and QSL cards had to
be submitted with claims.
However, this placed an
undue burden on the QSL
bureau and on mobile oper-
ators travelling from square
to square for the benefit of
others.

For contacts made after
1/177, therefore, QSLs were
only required where reports
were not exchanged at the
time of the contact. In Janu-
ary 1972 a new series of
(updated) books was issued,
at a cost of 6s5.

Diamond Award

It was at this time that the
Diamond Award was intro-
duced. By now the num-
ber of possible areas had
grown to 4200, and Diamond
Award claimants had to have
worked 3000 of them, together
with a specified number of
book-holders, islands, and
numbers of areas on particu-
lar bands.

It was around 1971/73 that
WAB became independent of
the Cannock Chase ARS and
the first AGM and election of
officers took place on 15 April
1973. This, and each succeed-
ing AGM, was held at Drayton
Manor Park.

The first committee con-
sisted of G3VIT (President),
G3ULH (Manager/Treasurer),
G3ABG, GW3UXS, G3VLL,
GM3OGJ, G3RDC and Bob
Treacher. Later that year
the new committee intro-
duced the Large Squares
Award.

New counties

It was in 1972 that Parlia-
ment intervened, by way of
the Local Government Act,
which made considerable
changes to county bound-
daries, much to the chagrin of
those who were close to
qualifying for various awards.
However, the opportunity was
taken to have a thorough re-
organisation of the books and
the existing awards, as well as
introducing two new awards
(the WAB Counties and WAB
Districts awards).

Since that time (1 April
1974, when the act came into
effect) WAB has continued
with over 5000 books now
having been sold. In 1979 the
Decade Award was intro-
duced to celebrate 10 years of
WAB.

At the 1982 AGM a formal
constitution was adopted,
ensuring voting rights to
book-holders and paving the
way for affiliation to the
RSGB.

The future

WAB continues to grow and
is by no means confined to
HF, with an increasing
number of class B devotees. In his
report to the 1985 AGM on 12
May, the awards manager
reported that no less than 670
awards had been issued in the
previous year, and the
treasurer reported donations of
£250 to RAIBC and £100 to
QTI.

It is worth noting that no
individual receives payment for
services to WAB and profit from
the sale of books and
fees for awards is donated to
organisations catering for the
less fortunate amateur.

So there you have it, an
interesting awards pro-
grame which at the same
time puts something back
into our hobby. My thanks to
Adrian Keeble G4HPU for the
above background to WAB. If
you want to take part why not
send £5 for a book to Brian
Morris G4KSQ at 22 Burdell
Ave, Sandhills Estate,
Headington, Oxford OX3 8ED,
or send him a stamped, self-
addressed envelope for more
information. Alternatively,
see the WAB stand at the HF
Convention.

Lundy Island

As part of their tenth birth-
day celebrations, members of
the Newport Amateur Radio
Society (GW4EZW) will oper-
DX DIARY

ate from Lundy Island from 21 to 28 September. This may be the last major DXpedition to Lundy as the helicopter service to the island will be discontinued on 30 September. Operation will be on all HF bands (160-10) as well as VHF. Although not counting towards the Islands on the Air programme, Lundy does count towards the WAB Awards (see above) and five of the operators will be WAB members.

The callsign to be used is G84LIE and a considerable array of gear will be taken in addition to a 60ft tower (which, needless to say, is not going by helicopter!) for the HF beams. Skeds can be arranged before leave for ing to PO Box 33, Newport, Gwent, or phoning (02912) 6867. Special QSLs will be available through the bureau or via the above box number.

Cyprus

Now that the British Sovereign bases count as separate countries, there is interest in which ZC4 amateurs are active on the bands. There are currently some twenty-five ZC4 licences in force, including the two club stations, ZC4E1PI in the Western Base and ZC4E5ES in the Eastern Base. Of the remainder, only about ten are active and only about half of these could be described as very active. CW operation from ZC4 is particularly scarce. ZC4CZ offers skeds (especially CW) to anyone interested and can be contacted via JSB, BFPO 53. His QSL manager is G4MGQ/G8MWS.

Rodrigues Island

For much of last winter 3B9CD was regularly to be heard on the low frequency bands operating from Rodrigues Island, a dependency of Mauritius. Rodrigues, which is linked to Mauritius by a regular boat service, is a lush volcanic tropical island, about forty square miles in area with a population of about 33,000.

The island was first sighted by the Portuguese in 1507 and at that time was uninhabited. Later, however, it was colonised by the French who used slaves to cultivate sugar plantations. Britain acquired the island and the slaves from the French at the end of the Napoleonic wars and most of the present islanders are direct descendants of those slaves, although there have been some Chinese and Indo- Mauritians. The main export is labour to work in Mauritius itself.

In amateur radio terms, Rodrigues acquired the 3B9 prefix on independence in 1968, having previously used the VQ9 prefix (assigned to several British islands in the Indian Ocean and still used from the Chagos Archipelago). Many Mauritain amateurs have operated from there over the years and several visiting amateurs from elsewhere (Mauritius has a major international airport, and Rodrigues can be reached by boat or light aircraft). My own collection of QSLs includes cards from 3B8AE/3B9, K1BJ/3B9, 3B8FK/3B9 and DL9EAE/3B9 as well as 3B9CD mentioned earlier.

Somewhat more inaccessible are the other Mauritian dependencies of Agalega Island (3B6) and the St Brandon Rocks (3B7, also known as the Cargados Carajos Shoals). These two count as a single country for DXCC but separately for the Islands on the Air awards.

Agalega Island actually consists of two islands (North and South islands), twenty-seven square miles in total, lying about 600 miles north of Mauritius. With a population of only 350 life is very much at the subsistence level, although there is a small export of copra and coconut oil.

The St Brandon Rocks lie 250 miles NE of Mauritius and consist of twenty-two islets, uninhabited except for a fishing station on the largest.

I have two QSL cards from Anand 3B6CD (the same operator as 3B9CD) dating from 1979/80 and a further card for a contact in 1981 when he operated briefly as 3B8CD/3B7.

However, in recent years there has been little or no amateur operation from Agalega or St Brandon. Readers will recall the saga of SM0AGD's attempt to travel there earlier this year (see June DX Diary), which was thwarted by officialdom. In any case these islands are sufficiently remote to discourage the would-be tourist.

All in all, then, we may have to wait some time for another operation unless the Mauritain operators themselves can put something together.

News

Despite what I said last month about Mount Athos, a short operation by G4VG0 (ex-KF10 and SW0BV) was announced in late July, and there are rumours of a possible operation in September. Sometimes it is hard to know just what to believe. One thing is for sure, an unauthorised operation in late June by DL7FT, supposedly from Mount Athos, did nothing to help the amateur radio cause in that part of the world.

New Zealand amateurs will be allowed to use the ZM prefix in place of the more usual ZL from 1 October until the end of the year. This is to mark the 6th conference of IARU (International Amateur Radio Union) Region III which will be held in Auckland from 13-17 November.

A very special station to look out for during this period will be ZL20Y, scheduled to arrive on Kermadec Island in late September. Chris is currently active as ZL70Y from Chatham Island, and will be very popular with the masses if his new posting comes about as planned (from Chatham, and previously from Auckland Island, Chris was mainly to be found on 40, 20 and 15 metres SSB).

The Guernsey Amateur Radio Society are planning a training course for young (under 18) RSGB members, to coincide with the CQWW SSB contest in late October. The aim is to train newly licensed (class A or B) amateurs in DX and contest techniques, focussed around a major international contest.

Further information can be obtained from Andrew Haymon GU4WTN, c/o GARS, PO Box 100, Guernsey (or 'phone (0481) 65633). Andrew himself is probably the youngest ever (at 16) UK recipient of the DXCC award.

Contests

On the contest scene, September brings the German organised Work all Europe SSB event on 14/15th and the Scandinavian Activity Contests (CW event for 27 hours starting at 1500GMT on 21st and SSB event, similar, but a week later).

And there we have it for another month. I always welcome comments on, and contributions to, this column. Ideally these should reach me about one month before publication date. See you at the HF Convention?

G4LJF's 100ft tower with KT34XA and KLM yagi for 40m
The IC735 is Icom's latest addition to their range of HF transceivers which can all be run off 13V for mobile operation, and some of which can be provided with an internal mains power supply. This rig is smaller than the other Icoms and is thus very compact indeed. It is primarily intended for mobile operation, although it could be very suitable for use as a base station using an external 13V PSU. It has general coverage reception from 0.1MHz to 30MHz, and transmits on all amateur bands from 160 to 10m.

SSB, CW, AM and FM modes are included and interconnections allow the use of AFSK for RTTY purposes. The front panel tuning knob runs very freely but there is a small access hole underneath the front panel to allow for increased tuning tension if required. Frequency is indicated digitally with 100Hz resolution, the display also giving very comprehensive status indications including VFO A or B, memory channel, mode, Tx/Rx, etc. The LCD has a green background with black lettering, which is very easy to read from all angles.

Front panel
The main controls on the front panel include push-buttons for supply on/off, MOX Tx/Rx, four mode buttons (SSB button cycles between normal and reverse SSB modes), noise blanker on/off, 20dB antenna attenuator, 10dB gain pre-amp on/off, AGC fast/slow and processor on/off.

To the left of the tuning knob is a bug hatch cover which pulls forward and down revealing some miniature up/down faders with a very short throw for adjusting noise blanker level, RF gain, RF output power, VOX gain and delay and mic gain.

Below these are more push-buttons selecting normal AM or narrow AM (ie, SSB filter!), CW normal or narrow, meter ALC or power output, VOX on/off, semi or full break-in keying, and electronic or manual keying.

I am slightly concerned about this hinged cover as it is rather flimsy and, I feel, could be easily broken in a mobile installation. Furthermore, I wonder just how long the miniature faders will last before rot sets in!

To the right of the tuning knob are four large buttons to control the VFO mode, the first of these giving 10Hz/1kHz synthesiser steps, and in the 10Hz position the tuning rate is approximately 2kHz per revolution, rising to 8kHz per revolution when tuned fairly fast. If it is tuned very fast the synthesiser loses lock, so you don't QSY as far as you think you ought to! In the 1kHz step position the tuning rate is approximately 100kHz per revolution.

The second button selects MHz steps and the third button, when pressed in, allows the VFO to tune from one amateur band to the next in jumps. By the side of this button is a memory button associated with which are push-buttons for going up and down the twelve memories which store mode and frequency.

A scan button has two functions. When the rig is in the VFO mode and the scan button is pressed, the rig searches slowly between the frequencies stored in memories 11 and 12. The normal searching rate is just under two minutes per 100kHz, with 10Hz steps selected, and eleven seconds per 100kHz, with 1kHz step rates chosen. The searching speed can be made faster by removing an internal jumper connector.

Squelch control
If the squelch control is used searching stops when a signal breaks the squelch, searching continuing ten seconds after the signal disappears. An internal switch can select a fixed stop when a signal has been found.

When in the memory mode the scan button scans over all the memories in rotation, the same scan stop and continue functions being applicable.

Two VFOs are incorporated, and one can switch between them, equalise them or split between Tx or Rx. Rotary controls include passband tuning, which is centre indented, and tunable notch (switched). An RIT control can be switched in to offset Rx by ±800Hz. Two more buttons select memory write and memory to VFO functions. To the left of the tuning knob is a dial lock button, to prevent accidental QSY, which is very useful if you are mobile.

Good sound quality
Finally, a dual concentric rotary control includes Rx audio gain and behind this is a squelch control, which is active on all modes. On the front panel is a 1/4in mono headphone jack and an 8-pin standard Icom mic socket, the mic supplied being an ICHM12 which is a electret fitted with up/down buttons and a PTT lever and gives quite good sound quality.
A ball stand is provided under the front which can lift the rig around 2.5cm. The loudspeaker is built into the top panel. On the left side cheek is an adjustment hole to allow the LCD brightness to be varied, other holes under the bottom panel providing access to CW side-tone volume and Rx audio tonal balance adjustment.

On the rear panel are very many interfacing sockets. The antenna connection is an SO239, and two phone sockets are provided to give breakpoints with a jumper immediately after the Tx/Rx antenna relay in the receive path. A transverter Tx drive socket gives around 30mV at 28MHz which is a ridiculously low level, although most modern transverters should just about be sensitive enough. I suggest that it is about time that Japanese manufacturers standardised on a much higher level than this at say +10dBm, which would make life easier for everybody.

Sockets

The 13V dc input socket allows the connector to lock onto it and the heavy duty lead supplied is fused in positive and negative lines, its length being just over 3m!

A spring-loaded earth tag is fitted immediately after the IC745 for example. The FM sensitivity measured on a rig with a good sensitivity!

The 13V dc input socket allows the connection using serial data. Two multi-pin sockets are standardised, including the PA shuts off and transverter control and 13.8V. When AF/RF Tx response 10W PEP

Although this socket is not the normal Icom oblong type previously used, the importers inform me that the interconnections are standardised, including the band data for interfacing with external Icom equipment, although no lead is available at present.

Two additional switches are provided internally, a 25kHz marker and a power reduction switch to 50W max. Options include a narrow CW filter and an electronic keyer board.

Laboratory tests

We checked the RF sensitivity on SSB at 28.55MHz and it proved to be very good for a mobile rig, although it fell short by just 1dB or 2 from the best Icom alternatives.

It should certainly be sensitive enough, even on the 10m band, for normal QSOs, even when the band is quiet, although there is not too much sensitivity to spare. The reciprocal mixing performance measured superbly well for spacings beyond 20kHz, the measurements for spacings above 100kHz being fantastic.

At a few spot frequencies the off-channel input signal gave a beat with off-channel local oscillator spurious to degrade the odd measurement, but these oscillator 'birdies' were all very weak indeed. The 5kHz measurement sat right on top of one of these, the ratio here being —74dB, but it improved to —86dB when the rig was moved just 1kHz further away, this figure being up to the average good Icom synthesiser performance.

John Thorpe method

The intermodulation performance was checked in several ways and the figures quoted are from the John Thorpe method. These measurements show that the IC735 has a spectacularly good dynamic range, and who can possibly quibble about a +20dBm intercept point on a rig with a good sensitivity!

We checked the blocking performance, which has been rather poor on some earlier Icom rigs, and found that this one shows a very marked improvement over the IC745 for example. The intercept point at 5/10kHz spacing was around —25.5dBm rather than the horrendous figures noted on the 745. This results in a much cleaner reception on the LF bands, which will allow you to wink out weak DX stations much more easily. The FM sensitivity measured fairly well but I would have liked to have seen it a few dB better.

The SSB selectivity shows the top of the curve to be a little bit on the narrow side with the —60dB points showing 3.8kHz bandwidth, which is just about right. The skirt opened out a bit below this, though, particularly as the generator hit a small sprog at around 5kHz off-channel. The FM selectivity was, as usual, rather on the wide side and it was not possible to reject 10kHz off-channel stations adequately for 10m FM.

We noted just 24dB difference between S1 and S9 on SSB, but readings above S9 were surprisingly realistic. We checked the FM received response inserting 750µS pre-emphasis in the signal generator and noted an amazingly flat response from just below 500Hz to 4kHz, the bass end rolling off sharply beyond 200Hz.

Insufficient attenuation

At 5kHz the response was still only 5dB down and this is in my opinion showed insufficient attenuation of frequencies above 3kHz, thus contributing to the slightly poorer than average FM sensitivity reading. Although the SSB response was slightly on the narrow side this was virtually entirely due to the filter, for the response after the product detector was quite flat to 2.5kHz.

Product detector distortion measured fairly well, up to Icom's normal standard which is quite acceptable.

The FM discriminator distortion was also quite reasonable at 1.7% for 2.5kHz deviation. The maximum audio output power was 2.8W for 10% THD, but this increased to a healthy 4.6W into a 4 ohm load, which should be ample for mobile use and a lot better than much of its competition.

Received audio response (750µS pre-emphasis)
FM limiting action was excellent but we did note that the quieting at very low input levels measured far better than the sinad sensitivity, thus showing increased distortion on low level signals, which is a little curious. This could again have been caused by the over wide response.

**Excellent**

We checked the frequency stability and tuning accuracy and these were both excellent. The digital read-out was well within 100Hz of the true received carrier frequency on SSB, although we noticed an offset of around 1kHz on CW. This particular point is highly debatable but one very useful improvement by Icom is that they have at last changed their philosophy concerning sideband switching. On the IC735 the carrier point remains the same, as does the digital read-out when switching sidebands. We checked this by tuning in a strong AM station on AM and then switching to SSB. When the carrier beat was 0 and the speech pitch was correct, there was hardly any detectable pitch or quality change when changing sidebands, thus allowing you to check on another station's sideband rejection.

If you look at the two-tone plots taken on 28.55MHz you will see that at 100W PEP output (into ALC) the lower order products are quite acceptable, but higher orders do not decrease fast enough. An example of this is that the products do not reach —60dB until the 15th order. At the 50W PEP level you can see that the third order products are actually lower than 5th order, and this shows slight distortion cancellation in the PA and its driver. However, note also that 9th order is no better than it was at 100W.

Plots taken at 14.15MHz show a very similar story at 50 to 100W PEP levels. The AF/RF plot taken from mic input to RF output at a maximum output power of around 10W, using my newly developed technique, shows the transmitted pass-band to be rather on the narrow side. Not only are the skirts extremely steep below 500Hz and above 2.5kHz, but there is some added LF roll off below 700Hz which would make transmissions a little bit on the thin side.

**Superb**

Carrier rejection is superb, however, being better than —60dB rev full carrier, and sideband rejection is also excellent. Returning to the two-tone plots you will also be able to see that some audio distortion developed, eg F1-F2 being —28dB.

The average for all the plots here shows around 3% second order audio intermodulation distortion. This seems to be a characteristic of many Icom rigs and, whilst it is not bad, I would like to see it cleaner.

Power output on CW, SSB and FM is generally at 100W or slightly higher on all amateur bands. Transmitted frequency accuracy was within 50Hz and maximum FM deviation was set at 5kHz; rather high for 10m FM. We had a look for harmonic and spurious outputs from all bands and in general harmonics were between —63dB and —75dB or even lower, whilst the odd spuri were always below —60dB.

Only on one band did we note harmonics just a slightly significant level, 10.125MHz at full power producing a second harmonic of —54dB and a third of —55dB. The rig draws up to 18A at full power output.

**Subjective Trials**

I tried the rig on all modes for reception from medium wave up to 29.6MHz. CW reception was excellent even though the review sample was not fitted with a narrow CW filter. SSB was always received cleanly and tuning across LF and HF bands showed up less crackly rubbish in between stations than usual, thus verifying the excellence of the synthesiser and of the front end performance. The passband tuning was spectacularly useful, for a very high frequency interfering carrier could be removed so easily with a slight adjustment of PBT.

I was not impressed with the notch filter, however, as it did not seem to give a good enough notch and was over wide. There seemed to be plenty of sensitivity on all bands and I did not need to use the pre-amp (which gives around 10dB gain) below 21MHz under normal conditions. The 20dB antenna attenuator was useful for LF but was not as necessary as usual, again because of the superb front end performance. On 10m, the receiver seemed very lively in a sporadic-E opening and there seemed to be plenty of IF gain.
Fast AGC was just about fast enough, whilst slow AGC was a compromise between being fast enough to cope with a net and slow enough to retain a moderate dynamic range on a strong SSB signal. However, I would personally have preferred it to be slightly slower. The filter bandwidth was rather narrow, which is excellent for DX reception, but too narrow in my opinion for a long relaxed QSO with a strong station.

Fewer problems
I noted fewer problems than usual when receiving 160m from my trapped half-wave dipole, although there was slight intermodulation from medium wave signals until I switched in the ATU. AM reception was quite good, distortion seeming better than usual although still not good enough, peak modulation sounding just slightly rough. Incidentally, measurements showed that when the rig was tuned right onto an AM station centrally, the distortion was slightly higher than when tuned slightly off it, which is a bit odd. AM selectivity was not particularly good but the quality of stronger stations was above average. FM reception on 10m confirmed the usual high Icom standard and gives helpful explanations of all the facilities, although it was just a little vague about transverter interfacing.

Conclusions
This rig is clearly in direct competition to the Yaesu FT757 and the Trio TS430S. I feel that this rig has been better designed both technically and ergonomically than earlier Icom rigs. The instrument panel is well up to the usual high Icom standard and gives helpful explanations of all the facilities, although it was just a little vague about transverter interfacing.

Virtually identical
The facilities are virtually identical to those of the 209R, which were discussed in great detail in the previous review of the 209R. As a short recap the following basic facilities are mentioned. In the centre of the front panel there is a 5x4 push-button matrix which gives access to frequency from 430-440MHz. Stepping buttons can be selected to give 25 or 50kHz channelling. There is immediate access to plus or minus repeater shifts, reverse repeater and any of ten memories which can hold frequency and repeater offset information. Various types of scanning are provided, and both priority channel scanning and direct access to a predetermined calling channel are available, the latter being stored in memory. You can scan up and down the memories by selecting any memory and using the up and down stepping buttons.

In the November 1984 edition of this magazine I gave a very warm recommendation for the Yaesu FT209R and its higher power version, the RH model. A few months ago the Yaesu FT709R arrived and I have been assessing it for a while, both with its own supplied 5/8 wave flexy whip and with a Walters & Stanton double 5/8 collinear, made for them by Diamond. Let me say here and now that FT709R is easily the best portable 70cm FM rig that I have yet tried as it offers excellent performance with superb ergonomics and facilities which far outclass those of the Icom IC04E.

Flag waver
I would not be surprised to see Icom discontinue the IC745, for I much prefer this new model. It seems to be an excellent flag waver for Icom and it is fascinating that not only is the intercept point dramatically better, but Icom have also improved the IF blocking performance which was so poor in the IC745. Modulation quality was regarded as being quite adequate from a communication standpoint, and the considerable LF cut on SSB would actually be an asset when the rig is used as a mobile. I have no doubt that this rig will sell extremely well and I highly recommend purchase.

Less problems
I noted fewer problems than usual when receiving 160m from my trapped half-wave dipole, although there was slight intermodulation from medium wave signals until I switched in the ATU. AM reception was quite good, distortion seeming better than usual although still not good enough, peak modulation sounding just slightly rough. Incidentally, measurements showed that when the rig was tuned right onto an AM station centrally, the distortion was slightly higher than when tuned slightly off it, which is a bit odd. AM selectivity was not particularly good but the quality of stronger stations was above average. FM reception on 10m confirmed the usual high Icom standard and gives helpful explanations of all the facilities, although it was just a little vague about transverter interfacing.

Conclusions
This rig is clearly in direct competition to the Yaesu FT757 and the Trio TS430S. Whilst I appreciate that many readers will have their personal loyalties for one brand or another, I feel that the IC735 is a clear winner over its competition within a fairly similar price bracket. The Yaesu and Trio prices have just been reduced somewhat, making the Icom comparatively more expensive. Not only is the Icom's overall performance excellent in all areas, except for my criticism of the rather high two-tone intermodulation levels of high orders, but ergonomics are splendid and far superior to the competition.
attachment. The PTT lever and toneburst button are on the left cheek whilst the mic and loudspeaker are mounted on the top of the front panel. On the back of the rig is a substantial belt clip. On the top there is a BNC socket for antenna connection and sockets for external mic/speaker. An accessory speaker mic (type MH12 costing £18.80) is available which can be used with VOX controls on the top panel, one selecting VOX on/off and the other low or high sensitivity. The volume control incorporates the on/off switch and by the side is the squelch control, both of these being very easy to use. A low/high power switch is also provided here. Underneath the battery pack are the charging connections and a socket for driving the rig from an external dc voltage (6-15V).

Of the many important accessories available, mentioned in the FT209R review, I would like to remind readers about the fast charger, type NC15 costing £65.95. The charger for the FNB3 battery pack, type NC9C and the charger for the FNB4 battery pack, type NC18C both cost £9.60. The basic price for the FT709R is £289 including VAT, the FNB3 battery pack, whip, case, carrier strap and small earpiece. With the FNB4 pack the price becomes £299.

**Laboratory tests**

The input sensitivity varied from 0.18-0.2μV across the band and, whilst the sensitivity is quite good, I have measured somewhat better in one or two other rigs. The input intercept point is -16dBm, and this shows a significant improvement over much of the competition. The reciprocal mixing performance measured quite well at close spacings and very well further out, so there should be no trouble in this area. The IF selectivity measured extremely well at 25 and 50kHz spacings, but 12.5kHz off-channel signals showed the close in selectivity to be only fair. Although amateurs do not normally use this close spacing on the band, there are, unfortunately, some other band users who do use 12.5kHz offsets.

FM discriminator distortion is at quite an acceptable level, and a maximum Received audio response (750μS pre-emphasis)
The output power available from the Nicad pack (10.8V) was around 4W on high power and an average of 350mW on low power. Using an external 13.8V supply, maximum power rose to 5W. This is a lot of power for a UHF portable and thus makes it far easier to get contacts. Current drain on high power averaged at 940mA from an external 13.8V supply, reducing to 335mA on low power.

Subjective trials
The performance of this rig with just its own flexy whip was way above average, but what I found particularly astonishing was its potential with the double 5/8 whip.

From my garden it was possible to access at least five repeaters, lower powered rigs on their normal antennas managing only one with luck! I have used the rig at other locations and found it to be superb, both the transmitted and received quality being above average. The ergonomics really are superb, and Icom should have a look at these, for this rig is so much better than the IC04E.

The ease of access to repeaters and then back to simplex is particularly marked, and I have no grumbles at all! The battery saving circuit could allow you to leave the rig squelched all day long, and still leave you plenty in the battery, a facility which should not be underestimated in its importance.

Conclusions
I consider the most important competitor to be the Trio TH41E, which I reviewed very recently. The Trio rig is stunningly small and is also a good performer, but it has only a very low power output and its whip is so small that it provides only a very low ERP.

The FT709R, although much heavier, is for the amateur who wants to have the higher power and super facilities, which also make the rig suitable as a low power mobile rig. A BNOS linear with an appropriate power sensitivity when combined with this rig could provide you with a very good mobile installation, but I do not see why you shouldn’t have a lot of fun with this rig as a base station.

Very satisfied
I most strongly recommend this new Yaesu product which may well greatly assist in further popularising the band. Some of my friends have already bought them and have been very satisfied. Very many thanks to Amcomm for the loan of the review sample which I finally decided to purchase, and to G1LMS and G4RCD for assisting me to prepare the review.
Home-built amateur radio projects vary from the rough and ready to the ultra sophisticated 'let's beat the manufacturers at their own game' approach. Amateur radio, in spite of what some think, is a hobby and just as much pleasure can be derived from a rat's nest of components that does the intended job as from a semi-professional 'joy to behold' piece of equipment.

Do your best
No one need be ashamed of what they build, after all most radio amateurs build little or none of their own equipment. Whatever the level of skill or the available facilities, the constructor likes to make the best job possible of each project.

Most commercial equipment uses printed circuit boards to form the basis of the actual electronic circuitry contained within the alluring box. Since the printed circuit form of construction came into popular use in the 1950s it has become the normal method of electronic construction. It is neat, the components are easy to mount into place, the method is durable and above all it is reproducible. The reproducability of the method makes it ideal for commercial use.

Professional finish
Amateur constructors like the neatness and the professional finish of the technique, but amateurs rarely wish to make more than one of any particular circuit board.

This calls into question the viability of using printed circuit techniques for making one-off circuit boards. Certainly they are neat and the finished job looks good, but there are a whole variety of techniques which give reliable and pleasing results, some of which were discussed in the last part of this series. Is it worth all the fuss of etching and drilling a board for a one-off project?

Well, noble constructor, the choice is yours. Over the years I have found that it takes little extra effort to make up an etched circuit board but I also use other techniques, a favourite being the 'cut board' method described in Part Four of this series to build my equipment. However, do not be put off by the thought that making a printed circuit board is difficult or hazardous.

The average amateur building equipment on his kitchen table can easily produce and use an etched board for any of his projects. This little article will attempt to show that the printed circuit board method of construction is just another option that the home constructor can take up and use when he feels it necessary.

The PCB VFO
The simplest way to describe the making of a printed circuit board is to show the building of an actual project. In the last part of this series the practical project was a little audio amplifier module which was built on circuit board using 'cut board' techniques. Although the amplifier could be a little project in its own right, I mentioned that it would form the audio stages of a simple amateur band receiver.

To illustrate the making of a printed circuit board, I will describe another section of that receiver, the variable frequency oscillator (VFO). The receiver is to be a direct conversion receiver for the 80 metre (3.5–3.8 MHz) amateur band, so the VFO is required to cover the actual frequency of the band.

A variable frequency oscillator at radio frequencies is not a project to be tackled lightly; of all the projects that a radio amateur may wish to build, making a stable VFO can be amongst the more difficult. Getting the circuit to oscillate should not be difficult but obtaining a stable variable signal source at radio frequencies can be a problem.

No problem
The circuit chosen for this VFO is simple and reliable but usually the actual choice of circuit is not the problem. Good stability seems to rely more upon how the circuit is built than the choice of circuit.

A radio frequency variable oscillator must be built like a battleship, as the usual problems of drift can often be related to poor physical mounting of components, overcrowding or poor layout and lack of good screening.

In this project, if the constructor follows both the method of making the
circuit board and the method of mounting the board there should be few problems. The circuit is shown in Figure 1 and most good RAE candidates or graduates should recognise it as a parallel tuned Clapp oscillator.

The feedback to maintain oscillation comes from the emitter of Tri via C3/C4. The oscillator is tuned by an inductor (L1) with C1 and VC1, the latter providing the tuning control. The output is taken from the emitter. A simple little circuit but capable of good results in this application, although in this form not suitable for driving a transmitter.

Making the board
The first task is to translate the circuit diagram to a drawing of the layout for the printed circuit board. I begin with a layout sketch viewed from the top of what will be the completed board. Figure 2 shows the sketch I made for this board. I like to work out the layout from the top, although this does mean that I have to transfer the interconnecting lines, which will be the printed circuit copper sections, onto the reverse side of the layout sketch.

There are those, more clever than I who can think 'in reverse image' and design the layout from what will be the copper side of the board. At least begin by doing it my way because it is simple to transfer the image through a bit of paper.

I begin with a sheet of 0.1 inch grid graph paper, not all that common in these metric days. Your friendly local stationery shop assistants may say, 'We don't stock that sir, it's all metric these days.' Just tell them that the whole American nation and the electronics industry worldwide all use inches and that the calculator and electronic till on the counter are all designed on a 0.1 inch grid spacing.

Because most stationery outlets seem to concentrate on the school market, which is hooked on metric units, it is not a bad idea to buy in a few sheets when you locate the stuff. I found some excellent 0.1 inch grid paper some years ago that is translucent, so I can see the design from both sides. Sadly my stocks are running low... any reader know where I can get some more?

The method of laying out the board follows the directions I gave in the last part of this series. Simply follow the circuit and have the actual components to be used at hand to measure the spaces required between the mounting holes. The audio amplifier described last time used a 'minimum etch technique' board where as much copper as possible is left on the board. The board is the reverse in that most of the copper is to be removed. All that is required is for the lines of copper to join the components and a groundplane around the edges of the board.

This is the better technique for a VFO because an excessive amount of copper connected to ground on the board can give rise to capacitive effects which influence the operation of the circuit.
The paper is now removed from the board, checking that the holes or dots are all there. The next stage is a careful cleaning of the copper side of the board. This is important because any dirt or grease on the board will resist the etchant and leave unwanted copper on the board. If the holes have already been drilled it pays to clean the board first with emery paper to ensure that there are no burrs around the edges of the holes.

**Cleansing agent**

The best simple cleansing agent I know is household scouring powder — Vim or any other similar product. Clean the whole board right into every corner. Then rinse the board in hot water and dry it well with a clean cloth.

Next add the etchant resist, the stuff that will prevent some parts of the copper dissolving and leave the required connecting tracks. Amateurs use all sorts of etch resists: nail varnish; modelling paint; bits of PVC tape cut to shape and I know someone who swears by typewriter stencil correcting fluid. Most constructors however seem to opt for etch resist pens. These are small felt tipped pens which draw the pattern directly onto the copper. These pens are expensive and I think the tips are too fine for many of the applications in amateur radio etching. Very thin etch resist lines are prone to being lost in the etching process.

I use felt pens, but these are just the common types sold by most stationery chain stores. Most spirit felt pens act very well as etchant resist pens, often described as ‘marker pens’, and the range of tip size is useful in the choice they afford of thickness of line. Thin lines may look very neat but I usually opt to have my copper track quite thick, especially if no integrated circuit pins come into the circuit layout. My best PCB pen is a ‘Bullet Tipped’ Pentel marking pen. It produces reasonable lines and good ‘blobs’ at the points where the board is to be drilled.

I begin by making these ‘blobs’. When marking the holes (or the centre punch points), I make a reasonable sized blob at each of these locations. This gives the matrix from which I can identify the layout of the board and add the interconnecting lines. Two simple rules: push down on the pen to release plenty of fluid, remember it has to do battle against the etchant chemical, and try to keep your finger off the clean sections of the copper as much as possible. It can help to put a little triangle of masking tape across each corner of the board to provide holding points.

Just follow the layout sketch for the copper side and take care to hit the right holes with the right lines. A clumsy move or shaky hand might mean that adjacent lines or blobs may touch. This is not the end of the world, or that board. After etching, the lines can be separated by scratching away the copper.

**Etching the board**

‘Come in and see my etchings!’ is a classic joke. As a matter of fact, just as I had completed etching the board for this project my lady organist called to see me. I tried the phrase on her. I think she was amused … back to the process.

The usual etchant, and I believe the safest, used by amateurs is Ferric Chloride. It is not bad stuff but there are some warnings. The main problem is that it stains … my word. It can ruin towels, teacloths, clothes, nice sinks and can give fingers the appearance of a heavy smoker. Keep it away from children and all other things that your wife holds dear.

The best place to etch boards is in a garage or garden shed; I use a cellar room. Ferric chloride can be bought in crystal form or in concentrated solution; the crystals are cheapest, the solution is easiest to handle.

Make up the solution to the directions on the bottle. Likewise the crystals, but if there are no directions just make up a strong solution. Text books seem to advise about 1 part crystals to 2 parts water, but I just add it and stir until its good and strong.

I prefer a rather rapid etching action so that I can monitor the process and pull out the board when the etching is just complete. Slow, overnight etching is prone to one of the common faults in amateur production of printed circuit boards: over etching. Once the etchant has removed the copper to the edges of the resist lines, it begins to etch under the etch resistant material and can produce ragged lines at best and broken lines at worst.

**Vessels**

The vessels used for the etching process should be of plastic or glass. Some people use the plastic trays designed for photographic darkroom work, some use plastic containers which once contained margarine or ice-cream but I almost always use jam jars or coffee jars. My reason for this is that I like to etch vertically. Most people seem to etch with the board lying flat, copper side up, in the solution. The problem here is that the waste from the process lies on the top of the board and hinders the etching process, requiring constant agitation to get a good result.

I hang my boards vertically into a jar with a neck wide enough to take the board width, and hold the board in place with a washing peg and wire rod. The photograph shows how its done. I usually put a bit of PVC tape around the edge of the board, naturally over a section along the edge where copper is to remain, and this gives better grip.

The board is suspended in the solution and from time to time during the process I give the board a quick twist around to clear waste. Held in this manner, it is very easy to lift the board from time to time to check the progress of the etching. It beats poking about in a tray with plastic tweezers to find the board and lift it out.

**Checking**

By checking the process at regular intervals (my usual etch time is about an hour) I can remove the board at exactly the time when the last unwanted copper disappears. This leaves a circuit board with nice clean edges around the tracks. Lift out the board, allowing the etchant to drain away over the solution before waving it about. Then rinse the surplus chemical off the board. This really wary can do this in the garden with a watering can. Give it a good wash in soapy water and then clean off the etch resist with household scouring powder and water. With any luck you should have a fine piece of etched circuit board.

![Component layout](image-url)
Building the VFO

The layout for the completed VFO printed circuit board is shown in Figure 4. The components are simply placed into the board as shown and soldered into place. Some of the components are horizontally mounted, for example R1, 2, 3, 4, and others are vertically mounted, such as C2, 3, 4. The most critical components are those associated with the tuned circuit. The frequency determining capacitors should be of a type suitable for RF applications. I prefer the use of polystyrene capacitors in such circuits although others prefer silver mica capacitors. The capacitors in question are C1, C2, C3 and C4. The inductor (coil) L1 is wound onto a 3/4 inch diameter former with a core. These are common items and can be obtained from a variety of sources, including many surplus items of equipment. I chose to mount the inductor horizontally along the board with stiff copper wire, forming binding posts at either end for the ends of the windings. The whole coil is smothered in polystyrene cement of the sort used in model making, to give extra rigidity.

The actual coil is wound using 32swg enamelled copper wire, laying down the turns side by side to give a close wound coil. Begin at the ground end by securing the end of the coil wire, removing the enamelling by scraping with a knife and tinning the revealed copper to the ground wire. Solder it onto that wire which is twisted once around the former and then twist the two ends together for a tight fit. Count out the number of turns and then secure the other end to a piece of wire in the same way. The polystyrene cement acts to hold the turns in place as well as helping to secure the coil to the board.

The VFO requires a screened box and a slow motion drive to add the tuning rate. The box is an aluminium box type A10 from Minfford Engineering. The tuning capacitor, VC1, should be a good quality airspaced 50pF tuning capacitor. These can cost a small fortune and are items to be sought at radio rallies. A Jackson type C804 variable capacitor can be obtained from Cirkit but these are rather expensive.

The slow motion drive is a 6:1 epicyclic in-line drive of the type often used in home-made amateur radio equipment. The drive is mounted on to the front of the box shown in Figure 5. The variable capacitor is mounted on an aluminium plate set behind the front of the box. The photograph shows the method of mounting.

Take care to drill the hole for the drive and the mounting plate hole for the capacitor in line, to ensure a smooth action when rotating the knob.

The board is mounted into the box with four holes in each corner. These holes take 6 BA nuts and bolts. A stand-off pillar is required under each bolt to hold the board off the bottom of the box. If stand-off pillars are not available extra nuts can be used to space the underside of the board away from the box. The output can be taken out of the box by passing a wire through a hole but I used a feedthrough connector. However, this must not be a capacitor type feedthrough. A feedthrough capacitor is, however, used to take the supply line into the box.

If a feedthrough capacitor is not available then just feed an insulated wire into the box through a small hole, in which case it might be a good idea to add a small 1,000pF mica capacitor between the input lead and ground on the underside of the board.

Testing the VFO

If the constructor has a frequency counter the testing is easy. Connect the counter to the output and power up the VFO. Even without a counter the testing is not difficult. It is a matter of using a receiver tuned to the 3.5 to 3.8MHz amateur band to listen for the signal. Some adjustment of the core will be necessary to bring the VFO into the correct frequency range. Set the core so that when the capacitor VC1 is fully meshed the output is on 3.5kHz.

As an item on its own the VFO is not very useful. I suppose you could swish it up and down the band and listen to it on a receiver. The next part of this series will take the VFO and the audio amplifier described last time and use them to make up a simple receiver for the 80 metre band.

Suppliers

Aluminium box type A10: Minfford Engineering, Sun Street, Ffestiniog LL41 4NE. Tel: (076676) 2572.
VC1 Jackson C804 type: Cirkit Holdings PLC, Park Lane, Brixbourne, Herts EN10 7NQ. Tel: (0992) 444111.

Components

| R1 | 10K           |
| R2 | 10K           |
| R3 | 470           |
| R4 | 470           |
| C1 | 100pF (silver mica) |
| C2 | 470pF (polystyrene) |
| C3 | 1000pF (polystyrene) |
| C4 | 1000pF (polystyrene) |
| C5/6| 0.01µF (min plate ceramic) |
| C7 | 1nF (min plate ceramic) |
| TR1| BC109         |
| L1 | 25 turns 32 swg enamelled copper wire on 3/16 inch former + core |
| VC1| 50pF variable capacitor airs-

pass.
Some recommended equipment

When CB was first opened up in the UK some years ago there was not only an allocation on 27MHz but also 20 channels between 934 and 935MHz, although no sets were available for some months after the band was released.

I looked at a couple of early Revtek sets and carried out a few home-base to sets were available for some months some years ago there was not only an disaster area as the range was so short and the modulation quality so bad as to preclude any serious use. The original allocation was 934.025MHz for channel 1, the other 19 channels being at 50kHz spacings above this frequency.

About a year ago the DTI changed the frequency allocations down by 12.5kHz, channel 1 becoming 934.0125MHz, again with 50kHz channeling. This meant that all the sets in use at the time had to be modified to these new channels. Various other sets were introduced but most of them were also rather unsatisfactory. Unfortunately, for the first two years only a relatively small group of keen enthusiasts used the band, putting up with rather inferior quality.

Then, in early 1985, a company based in Portsmouth, Telecommunications Ltd, introduced a Japanese made transceiver known as the Cybernet Delta 1. Many accessories were included, and the performance was so much better that the potential of the band became almost completely realised in performance terms, and these units have already nearly doubled the band occupancy in four months.

The band and its users

Let me say here and now that the users of 934MHz are largely a group of enthusiasts who bear no resemblance at all to 27MHz operators. They are all very keen indeed for the band to be kept clean and for everyone to be very helpful and polite. I have been quite active on the band since March and have never heard any rudeness whatsoever, let alone vulgarities.

There is much talk about equipment, aerials and who has talked to whom, in much the same way as 433MHz FM users discuss equipment, but the average 934MHz user is not all technical, although he or she likes to learn a lot about those technicalities which are important for improved band operation. The dreaded 27MHz-style echo mics are somewhat rare on 934MHz, thank goodness. If one does pop up, the reverberant user is soon very politely told that his interference is excessive and that echo mics are not particularly welcome.

At the moment there are about 2,000 band users spread around the UK, but somewhat surprisingly there are fewer of them around the London area than I might have expected. Even so, a call on channel 20, the calling channel, will almost always produce a contact, after which it is generally appreciated that the contact should continue on another channel (in the same way as we QSY from 2m and 70cm calling channels). Quite a few radio amateurs are on 934MHz, often using the band for talk-back purposes whilst carrying out experiments on amateur bands. This has encouraged quite a few 934MHz band users to investigate amateur radio and many have passed the RAE as a result.

A typical station would be a Delta 1 with 13V PSU interconnected with a high gain collinear antenna, such as the Nevada with Pope H100 cable, and usually a masthead pre-amp which dramatically improves Rx performance. The average user will probably have his antenna at 10m above ground level and will enjoy contacts of up to 30km distance under normal conditions and up to 80km in their best directions, provided the station at the other end also has a good take-off.

Working mobile

Many people also like to work mobile, and again a mobile external Rx pre-amp gives a very useful improvement to sensitivity. My wife and I have enjoyed many mobile contacts, and I can remember one particular example which shows the band up in a good light. We wanted to travel from my home in Finchley to Harrowfield in Middlesex. Unfortunately, on this particular day there was a very important football match at Wembley, so we decided to divert around Watford in the hope of taking a long loop to avoid the immense traffic near Wembley.

I have to admit that we got hopelessly lost because of diversions, but 934MHz enthusiasts came on channel to help us out of our problem. We were in a very hilly area and some stations on the other side of a hill were often difficult to copy, whereas several more distant ones came in very clearly, including one in South London. It is thus difficult to give a typical range, but I suppose the minimum would be around 5km and the maximum perhaps 100km if you are at a very high spot.

Considerable increase

My findings are that average activity on the band is somewhat higher than on 433MHz simplex in the Greater London area, and the band's occupancy is now beginning to increase quite considerably. When tropospheric ducting occurs contacts are very long, and contacts have been noted by me, and at weekends very many stations around the south of England have been going to high points to increase their range.

There are quite a few retailers stocking 934MHz equipment. Whilst some of them seriously lack technical knowledge, many take a lot of trouble to satisfy their customers and have quite good test equipment.

If you spend an evening with a 934MHz band user who has a good system, I think you will be impressed with the standards of operating and you will most certainly find everyone very friendly. You will notice some very bad quality transmissions, many of them being off-channel, but I think you will find that those stations using the Delta 1 stand out as having extremely good modulation quality.

Unimpressed

I have heard many Revteks on the band, and I continue to be very unimpressed with their sound quality, noting drifting, distortion and sometimes a very high and bubbly background noise. Although I am being critical of Revtek here, it has to be said that it was this company that was responsible for getting the band going in the first place, thus establishing a significant group of enthusiasts. Unfortunately Revtek ceased trading late in 1984, but a new company has now been set up to service Revtek equipment, Crestbyte, their agents being Selectronics of Canvey Island.

The cost of equipment is appreciably higher than that of amateur radio FM gear, for the simple reason that it sells in much smaller quantities. You can easily spend £600 establishing a new station from scratch if you include a rig, antenna and cable, and masthead pre-amp. It is the relatively high cost of equipment that has kept a lot of 27MHz operators off the band, but I leave you to draw your own conclusions concerning what would happen if equipment became very much cheaper.

Band usage

Although in the London area I have only very rarely heard the band used for private and semi-business contacts, there are quite a few serious users in rural areas, where farmers want to keep in contact with each other, and when shops want to contact their delivery vans. By far the highest percentage of users just like to chat to one another, enjoying the companionship. Quite a few users have abandoned 27MHz, as they have found that band to be fairly putrid in built-up areas. It seems that once someone has come onto 934MHz he or she is likely to stay on the band with enthusiasm. There is a 934MHz club at present with just under 1,000 members, which holds regular meetings around the country and which produces a very useful magazine for a membership fee of only £5 per annum. The club address is:
The 934MHz Club UK, PO Box 323, Althorne, Chelmsford, Essex CM3 6UR.

Many readers would obviously want to consider the money aspect of 934MHz for business purposes as against cellular radio. A single mobile installation on cellular radio would cost about the same as a base station with two mobile installations; allowing local contacts in a family or business situation which would be very effective for a very small annual licence fee.

On the other hand, cellular radio is very effective indeed for mobiles, but the cost of calls rules it totally out of court for the majority of potential users. I have a feeling that a saturation point might well be reached rather sooner than many people think, unless the cost of calls can be significantly reduced when more people use cellular radio. Obviously I am not comparing the chatty aspect of the two modes, but I do see that there are tremendous potentials for 934MHz in business use.

The potential could be significantly increased if cellular quality 934MHz handy-talky became available. Many have tried to use 27MHz for local use, but bad manners, continual break-ins and foul language have wrecked that band, except in some rural areas.

I suggest that if you hear someone making business use of 934MHz, then leave them alone unless they obviously want to chat and do not mind break-ins. You may feel that business use should be discouraged, but there is a double-edged sword here, for prices of the 934MHz bands have dropped so much that if there was a large expansion of band use, the DTI have reserved an additional 20 channels which may be allocated one day when there is a higher demand.

Some problems with the band
In the last few months, since Racal Vodafone cellular radio became established using base station frequencies only just above 934MHz, there have been serious intermodulation problems produced in the poorer 934MHz installations, and even in some good ones if the station is extremely close to a cellular radio transmitting site. The primary reason for this is that the cellular radio channels are offset by the same amount as the new 934MHz frequencies, allowing intermodulation products developed within the receiver to fall onto 934MHz channels.

The problem is exaggerated if there is also a very strong 934MHz local transmission on the band, for the latter signal would cause the receiver front end to be far more susceptible to intermodulation from out of band signals. One transverter enabling 27MHz rigs to be used on 934MHz is particularly prone to the problem.

Whilst most users find the situation extremely annoying, it has been reported that a few rather enjoy it because they can contravene the Wireless Telegraphy Act by listening into 'phone calls! There are some strong rumours that the DTI have been requested by both the 934MHz users and by some cellular radio companies to allocate a new band of frequencies further away from the 934MHz band in order to clear the problem. The signal strength of the Racal and British Telecom installations is sometimes extremely high in order to provide saturation coverage, whilst the front end intermodulation performance of some of the 934MHz equipment can only be said to be abysmal.

I have investigated the problem at length, and I intentionally introduced a situation which made the problem very obvious at my own location. Pope H100 cable is not particularly easy to solder up with N plugs, and a poor joint can seriously degrade the system RFIM performance. Even with the masthead pre-amplifier switched off the band became almost unusable with a badly soldered plug connected to the antenna, but after making it up in the correct manner the problem virtually disappeared, even with the masthead pre-amp switched on.

The problem can also be significantly decreased by the use of a beam antenna, provided you avoid pointing it at your local cellular base station. The higher the gain of the antenna the greater will be the rejection of interference in most directions, but the DTI will also allow a maximum of 25W ERP, which unfortunately discourages the use of higher gain antennas.

Dramatic
Although one is allowed 8W at the antenna many of the rigs only give 5W output, and in an average installation perhaps only 2W would be getting to the antenna. An overall average system noise figure of 12dB or so is typical, and so the improvement to a system figure of 2dB when fitting a good masthead pre-amp is very dramatic indeed. I am surprised that as yet no manufacturer has been able to offer a masthead power amplifier which could give a fixed 8W output from 2W drive; this would obviously make an amazing difference to the transmitted signal strength. Bearing in mind cable losses, I suggest an external power amplifier would be more important than trying to design a rig to give the full 8W for base station use, although a true 8W rig would of course be most helpful in a mobile set-up.

In looking at some coaxial switches and masthead units I am a little concerned that prices are very high. The quality of relays used is in general not particularly good, thus introducing both transmitted and received power losses through the devices. Surely a good British manufacturer such as muTek Ltd could make a greatly superior masthead if they wanted to, and show up some of the Japanese imported products!

Appalling hum
I have heard a few signals on the band with appalling hum in the background, created by the use of very grotty 27MHz CB power supplies. It is worthwhile getting a better supply with a good ripple performance in order to avoid constant polite criticism every time you go on the air!

Some people have purchased second-hand Revtek products, only to find out that they have not been modified to the new channel spacing and that the audio modulator is faulty. They might end up paying quite a lot for maintenance costs, and would have been better off buying a new rig in the first place.

Some stations have used inappropriately co-ax, which is so lossy that they can hardly hear anybody! Even UR M67 is not really recommended for the band unless you only need a very short run. Some users have positioned their antennas much too close to TV aerials with their attendant steel supporting poles. Not only is the antenna mistuned, but the directivity pattern can be significantly affected.

I remember hearing a remarkable story on the band of one user who found that his collinear antenna was highly directional. He advised some of his pals to buy the same antenna and put it on a rotator! On investigation he eventually told me that his collinear was above a
beam antenna, and of course reflections from the directors and reflector of the beam were indeed making his collinear fairly directional!

Some enthusiasts have put up beams, only to find that many stations at an intermediate distance are no better on the beam than on the collinear. An omni-directional aerial picks up all the paths from another station, whereas a beam selects only the main direct path, so you might be disappointed with a beam's performance in some directions in which there are many nulls, etc. You will notice on the beam's superiority though in a tropoduct, but if you are to remain legal a collinear with plenty of gain should give a very good performance.

The Cybemet Delta 1

Although primarily intended and designed as a mobile rig, this unit is used by the majority of 934MHz users as a home-base station, requiring 13V dc powering. Two rotary controls adjust Rx audio volume and squelch whilst a row of microprocessor control buttons select up and down channeling, various memories, scanning, auto/manual searching, and clear.

The mic socket has four pins for audio with earth and PTT with earth. Unfortunately there is no provision for up and down stepping from the microphone. A push-button turns the rig on and off, and frequency stability is reached after a few seconds warm-up. 16 memories are available with scanning and another 20 channels could do a lot to get more users interested. Two samples were checked and these gave power outputs of 5.25-5.5W across the band. Rx sensitivity averaged 0.25µV (~119dBm) and the RF input intercept point was typically at ~4.5dBm, which is a lot better than almost all 70cm FM units! Selectivity was excellent and I never heard any interference from a strong adjacent channel signal. Received audio quality from another Delta 1 was excellent, with clean crisp HF, higher than average audio power available, and some 4.4W for 10% distortion being noted into an external 4 ohm load. The S-meter seemed to be reasonable, although there was not enough range between minimum and maximum indications.

I checked the frequency accuracy over a period of many months and after warm-up it was never more than 1kHz off-channel, which is a lot more than one can say about the Revteks! No frequency drift problems occurred and transmitted quality was considered very good indeed. The speech deviation normally peaked at ±5kHz, and even when extremely provoked it was only marginally above this.

A transmitted dynamic range of around 56dB was given if I was totally quiet, as compared with full modulation, and this is actually a lot better than many amateur FM mobile rigs. I am full of praise for this unit, which is very well made and supplied with a good technical back-up from the importers.

Mobile pre-amp type HRA 900M

This unit is fitted with a PL259 connector to screw onto a magmount and an SO239 onto which you can screw the mobile collinear aerial. The pre-amp had too much gain at 20dB and the system sensitivity became 0.14µV for 12dB sinad, the aerial cable loss being virtually eliminated. I noted a 1dB power loss on Tx, however, which is a pity. I feel this must be partly due to the inappropriate use of PL259s rather than N types. A masthead model type HRA900 is fitted with N type sockets and has a slightly lower through loss, the Rx pre-amp having slightly better performance, although it also has a very high gain. Both pre-amps are RF sensed and require only a 13V dc feed, the earth return being via the co-ax screen.

HAS-1 remote co-axial switch

This little unit has one N input socket and two outputs and is energised with 13V dc, then selecting a second antenna. It has about 0.5dB loss and switches very effectively, although it is not rated at more than 8W throughput on 934MHz. I do not recommend switching with the power on. It might well be of considerable use on lower frequencies, and it would probably take much more power on these. It is well weather-proofed and is recommended.

Antennas

Both the Nevada collinear antenna fitted with an N type socket and the mobile collinear fitted with a PL259 are recommended, the latter being available with a mag-mount. The length of cable supplied with the latter is far too long at around 5m and I suggest you cut it down as much as you can to reduce the loss. I would have preferred a higher quality co-ax used for it; its typical loss would be around 2.1dB plus the loss of any connectors. Both the aerials give a good SWR, incidently.

Conclusions

Not only am I delighted with the 934MHz band itself but, the performance of the equipment is surprisingly good for the frequency involved. My wife has enjoyed many mobile contacts when she has been on long journeys, and liked the informality and courtesy shown to her by all the band users.

If you want to get your XYL or OM interested in the hobby, you might try inveigling them with 934MHz first and they will soon become very good operators. The band is extremely useful for TV talk-back and many other purposes, but I have to be frank and suggest that there is far more potential than is being realised at the moment. An effective walky-talky with just a few channels could do a lot to get more people interested.

Don't confuse this band with 27MHz CB as it is utterly different, even the average age group being much higher, quite a few retired folk also being on the band.

Propagation is far more influenced by local terrain than is 433MHz, and the reliability of mobile to fixed station contacts is therefore rather variable. I highly recommend you to look at the band for yourself by contacting a band enthusiast. The 934MHz club will be pleased to put you in touch with one.

Incidently, I should mention that most users refer to the 934MHz band as 'personal radio' to discriminate it from CB. I would like to acknowledge the assistance of Telecomms Ltd and Selectronics, as well as that of many band users in assisting me with so much information for this article.
Join the growing number of people discovering this exciting radio band. Available to anyone for the cost of a current CB licence.

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24 Norwich Street, Dereham, Norfolk NR19 1DG
Tel: (0362) 2488

Green Electronics
6 Short Street, Lowestoft, Suffolk.
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Guilford Communications
34 Aldershot Road, Guildford, Surrey.
Tel: (0483) 574434

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Tel: (01-724) 0323

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Tel: (0274) 603209

H & R Watson
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Tel: (0906) 691481

Imagefree Limited
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Tel: (0932) 797874

Jameson CB
44 High Street, Fornes, Morayshire.
Tel: (0609) 727233

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Mitter Telecommunications
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Tel: (0525) 754379

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World Radio History
It doesn’t seem like two years since I started writing this section of our magazine, but time flies! Over that period I have received literally hundreds of letters. Some have made suggestions of items you, the readers, would like to see in the column, some have been praising or criticising articles and others have just been very interesting letters giving personal details or stories of your own experiences in the hobby.

One such letter forms part of this month’s column and I hope you find it as interesting as I did.

**To the mailbag**

Once again the mailbag has been full and we start off with a letter from Philip Davies in Shropshire who voices the plea that ‘special event’ stations should give the information about their stations more often. Although I can see your point, Philip, when you’ve got a pile-up going it’s very easy to skip the details and get the reports over to the callers. However, I can’t see any reason why the operator can’t give out the gen, say, after five or so contacts, unlike a few of the Russian stations recently who gave absolutely no details unless specifically asked for them!

Also mentioned by Philip was the ever changing Oblast list and the best way to keep up with this is to obtain the *Geoff Watts Oblast Update* available from: 82 Belmont Rd, Norwich NR7 0PU for the princely sum of 35p.

A newcomer to the mailbox this month is Colin Blunn in Leicestershire who uses a Trio R600 and a 60ft ended wire. Colin is on the prefix trail and obviously enjoys the hobby.

Another new member of our readership is Peter Hunter from Norwich who is reading hard for the RAE but getting his apprenticeship in listening meanwhile. His shack boasts a Drake 2B and a Realistic DX100 fed from a 40 metre dipole. Welcome to the bands, lads!

Michael Hudson in Kent includes a question on listening contests in his informative letter. Many of the national and international amateur contests have listener sections and details of these are regularly published by the RSGB in ‘Radiocom’. Often these are also included in ‘Listeners’ Club’ sections of broadcast stations such as Radio Sweden, Radio Finland, Radio Nederland and many others, including many of the Eastern bloc countries such as Radio Berlin International (DDR). DDR not only has a regular DX programme but issues a newsletter to regular listeners. This is where the general coverage receiver comes in handy.

Mike only lives 100 yards from the sea at Folkestone which is given him excellent ground wave reception of DX. His Trio 9R59DS and loft mounted wire do sterling service on all bands. He compliments *Amateur Radio* on the Prefix Awards and looks forward to gaining his Gold award in due course.

A nice letter from our friend in Caithness, namely Don Robertson, who informs me that he has already got hiscanvas tent up and is working his first Gold award for working all 1000 on CW. His latest count was over the 900 mark so I expect his list to pop up soon.

Contagious

Keith Forward in Sussex did his leg a mischief recently and had to be catching, *Keith* but it’s an ill wind, etc, and he’s using his spare time to dig into the pile-ups for some more prefixes. Keith mentions the dreaded ‘woodpecker’ and reminds me of a tale going the rounds of an amateur in QSO with a Soviet station who threatened that unless the woodpecker got off the frequency, he’d turn the transmitter worked too! By the way, many of them deserve reproach. From them bias was saved, save to remark that it works extremely well and I got a hell of a kick out of having put it together myself. By the way, the transmitter worked too!

As I mentioned earlier, I have had a lot of interesting letters from readers and think some of them deserve reproduction, so starting this month we are going to introduce some of the listening fraternity to you. If you would like to be one of our featured listeners, please write in to me with details of your station and, if possible, a picture of yourself or your shack.

**Feated Listener**

This month’s featured short wave listener is Elmer Liddicoat. Elmer lives near St Austell in Cornwall. Having spent some of his earlier years as a wireless operator in Lancaster bombers, he has many memories of the old 1154/55 equipment and similar receivers of the period. He is very influenced by those memories, Elmer’s shack still boasts a fine Edystone 1830/1 receiver.

The position of an old
be engraved plaques for the top two entries and all entrants will receive a commemorative certificate. Just to gild the lily, if you log GB2WFF you’ll get my card too!

**JOTA weekend**

The JOTA weekend is usually 19/20 October, but check the press for confirmation nearer the time.

I imagine most if not all of you have used long wires and dipoles in one shape or form and want to get a bit more adventurous with aerials without paying the earth for a beam and rotator.

Years ago it was the ‘in thing’ to cadge bamboo poles from a local carpet warehouse to use as supports for a variety of beams. These poles are not so common nowadays and cardboard rolls don’t stand up to the weather so well.

**Out of fashion**

Something that goes out of fashion in one hobby has the habit of becoming useful in another, and to this end the angling fraternity is being helpful to the amateur radio fans by casting off their old split cane fishing rods and roach poles in favour of more modern fibre glass or carbon fibre rods.

Split built cane rods are extremely strong and can withstand very strong winds, which makes them ideal for quad spiders or other wire formations. They can often be obtained from secondhand dealers or church bazaars at very reasonable prices. As these rods are available in sizes from 7 to 16 feet quite large beams can be constructed.

One of the many published plans I tried early on in my ‘serious’ listening days was the design by VK2ABQ for a tribander beam using bamboo poles and copper wire. This was an up-grade from the 20m ‘Bow tie Monobander’ which gave good results for about six months or so, a long time for any one aerial to be in place.

**Easier construction**

After I made my VK2, G3FRB (Phil Horwood) came up with modifications that made construction easier. Phil had excellent results using this design, but although I made plans to rebuild mine I never got round to doing so.

For those interested in experimenting, I’m reproducing the design here (see diagram) which could be neatly made using old fishing rods. The centre ‘spider’ can be made up from aluminium or galvanised steel tubing of the required size.

Simple dipoles are also a reasonable project if you wish to rotate them, and verticals become a viable proposition in awkward ‘visual’ areas as fishing rods are almost invisible if sprayed a dull grey.

One thing about being a listener is that you don’t have to worry about the SWR, and the use of a reasonable antenna tuner will give good results even if the measurements are a little bit astray.

**‘Kontest kormer’**

From time to time, as space permits, I’ll try reviewing a few awards and contests that are of interest to listeners. Although it’s a good thing, in my opinion, to be a member of the RSGB, some readers cannot afford the fees and don’t get to see the *Radcom* updates.

The People’s Republic of Bulgaria offers a number of awards for listeners including the following:

- PRBA, for valid reports for five LZ1 and five LZ2 stations on each of 3.5 and 7MHz;
- Five Bands LZ, for one LZ1 and one LZ2 on each of 3.5, 7, 14, 21 and 28MHz;
- W 100LZ Award, for 100 LZ contacts in one calendar year;
- W 28Z ITU Award, for reports from stations in zone 28, ie, DL, DL (West Berlin), FC/TK, HA, HB9, HB0, HV, I, IS, LZ, T7, OE, OK, SP, SV, SVS, SV, SY, YO, Y, ZA, 9H, 4U1ITU;
- Class one award, for 28 QSLs from stations in 20 countries;
- Class two award, for 28 QSLs in 16 countries;
- Class three award, for 28 QSLs in 10 countries;
- QSLs from five different LZ stations are obligatory in all cases.

Anyway, I hope the weather keeps clear for your experiments and wish you all the best of DX for another month.
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SEPTEMBER 1985
My first arrival in Papua New Guinea (PNG) was in early 1975 after a lengthy trip from the United Kingdom. It so happened that this year was particularly important, since on 17 September PNG became an independent country.

Until then, in terms of amateur radio and DXCC, two separate countries existed—Papua and New Guinea. No real distinction was ever made in design allocation, both areas being VK9. In addition, to confuse the issue further, this same prefix was used in several territories of Australia. It was always good fun working a VK9 and then keeping fingers crossed, hoping it was on one you needed. It is also true to say that long-term residents of these various areas needed no special calls. Ray Hoare VK9RH was Norfolk Island, Bob Sutherland VK9BS was Papua, and so on.

Prior to independence, the Post and Telegraph Department had been gradually taking over more and more of the radio licensing structure from Australia. As an indication of this the prefix P2 was introduced in order that identities be preserved. VK9BS became P29BS, VK9DJI became P29DJI, etc. These changes came into force on 1 January 1975.

Diverse country

To say that PNG is a diverse country would have to be the understatement of the year. A large island in itself (shared by West Irian to the north-west), it consists of hundreds of islands, many of them quite large. The country has many different cultures and ethnic groups. It is said that there are over 700 different languages in addition to Pidgin—a sort of common language.

A central rib of mountains divides the mainland mass. Peaks reach in excess of 15,000 feet and this forms the main division area was Papua New Guinea. As a result, one tribal group in one valley can be effectively cut off from another in a neighbouring valley. Each group is almost unaware of each other’s existence and has developed quite differently.

Some nine years later, as an independent country, PNG continues to move forward out of the stone age mentality, out of inter-tribal fighting, out of tribal control, towards the future. The transition has not been easy and problems exist, particularly in the movement of a reasonably simple and primitive people towards the bright lights of the cities. Hundreds of people in houses which do not exist, looking for work that isn’t there.

Radio licensing is vested in the Post and Telecommunications Corporation. Whilst PNG does not have reciprocal licensing with every country, it is nevertheless true to say that many licences are not recognised. Frequency allocations are excellent and in many cases quite different from Australia.

Probably the most significant event in recent years was the introduction of the Novice Licence. This licence has limited HF allocation, an easier theory paper, and a Morse code requirement of 5wpm. The first Novice Licence was issued to Ron Pain P29NRP, in March 1977. Ron has long since upgraded to a full call.

The result of the Novice Licence was that many people made a start in amateur radio, and this may not have been possible for them previously. Most take the novice status seriously and work towards full call privileges, battling with additional theory and Morse requirements.

In addition, ‘Z’ calls are also issued. These have full theory examination qualifications but lack the Morse code. Many remain as ‘Z’ calls from choice. They have no HF privileges, but prefer the challenge of VHF, UHF, etc. Content with 6 metre openings, satellite working and VHF/UHF studies, Rick Warnett P29ZFS is very well-known in these areas.

PNG has quite a large amateur radio population but, like amateurs everywhere else, many are not active. Three ‘nationals’ have full calls: P29SK, P29LL, P29KP, and many are studying for novice and full calls. The PNGARS is built on strong foundations. It has some problems, the main one being a reasonably migrant expatriate population which keeps the society in a state of flux. However, this is understood as people are on contracts, etc. An active QSL bureau and regular meetings help to keep things together. However, many never get to attend a monthly meeting in the ‘Big Smoke’, since many are ‘up country’.

In terms of radio locations, PNG has many variations. From coastal areas such as Lae, Madang, Port Moresby, Rabaul, etc to two major centres—Goroka and Mount Hagen, which are both in the temperate highlands at altitudes of over 4,000 feet. Some sites have to be seen to be believed, with their majestic scenery of breathtaking beauty.

Propagation from here can be quite unique—a near equatorial spot, a reasonable station, not forgetting a bit of decent sunspot activity, and one can be in business. Put a few dBs on for the P29 callsign and I suppose one could say we have it made. Most of the Asian countries are easily worked—AP, BY, V6, XU, YB, 9V, all within the proverbial ‘spitting distance’. Long-path openings round the equator have to be heard to be believed.

70,000 QSOs

As P29JS some years ago I was very active, in excess of 70,000 QSOs, and the 220 net kept me pretty busy. In addition, several exotic DXpeditions were undertaken, thus proving that PNG is not a remote backwater. Port Moresby has an excellent international airport and a long and memorable history, as Jacksons’ Airport was famous in WWII.

Regular daily flights to Australia and other areas can get one into the main traffic stream fairly easily. In fact, both Papua and New Guinea were deeply involved with pioneer flying in the early days. It is not a forgiving country for the flyer. Often, conditions can become marginal in minutes, especially for the smaller aircraft. Accidents happen and the edge can be very small between safety and disaster.

I am back in PNG (with Civil Aviation) for a short time and have been lucky to retain my PNG identity, so will be looking for a QSO with you—perhaps on the 14220 net. 73, Jim Smith, P29JS.
Bill Mantovani G4ZVB concentrates
on the knowledge of operating procedures
required for the RAE with a look at
LICENSING CONDITIONS

Licensing conditions

Knowing the terms and conditions of
the amateur radio licence is perhaps the
most important aspect of the whole RAE
syllabus. Of the 35 questions which make
up the first one hour paper of the RAE
exam about two thirds of those questions
will be on the licensing conditions. The
other third is on transmitter interference,
which we have already covered,
and it is quite surprising to note how
many examination candidates have
actually failed the first paper because
they did not pay sufficient attention to
fully learning the licensing conditions.
It’s like having to answer questions on
the Highway Code for a driving test; after
spending so much time learning to drive
the car the swatting up on the code is
then often left till the last minute, where
it is all crammed in at once.

The RAE exam is very different to
the driving test though in that it places far
more emphasis on the rules and regula-
tions than the latter. It is therefore in
your own interest to go into the exam
with a good sound knowledge of the
licence conditions.

RAE syllabus

Towards the back of the RAE Manual
you will find extracts from the Amateur
Licence A, and this chapter should be
very carefully read and understood along
with the notes to be given here covering
the more popular question areas. If there
have been any recent relevant changes
then these will be pointed out as we go
along.

By now you really should have your
copy of How to become a radio amateur
as this gives you all that you need to know
about obtaining a licence, details of the
amateur Morse test, the conditions of the
licence itself, together with any relevant
notes, plus a schedule of the frequency
bands, classes of emission, power etc:
This publication is available free of
charge from the Radio Amateur Licen-
sing Unit at the address given at the end
of this month’s article.

Table 1 shows a list of books which are
recommended reading for the prospecti-
ve amateur.

Types of licence

There are two types of amateur
transmitting licence currently available
in this country, referred to as the A and B
licences. The Amateur Licence B does
not, at the time of preparing this article,
authorise the use of frequencies below
144MHz but otherwise its conditions are
broadly the same as those of the Amateur
Licence A. You do not, however, need to
have passed the amateur Morse test, only
the RAE exam, in order to be
authorised to classify for an A licence.

The Amateur Licence A is the principal
type of amateur transmitting licence and
to apply for this one you must first have
passed both the RAE examination and
the amateur Morse test, the latter having
been taken no later than 12 months
immediately preceding the date of the
licence application, otherwise you will
have to resit and pass the Morse test
again. The two licence types are more
commonly known as the class A and the
class B licence, and to be granted either
type the applicant must be over 14 years
of age.

There is sometimes confusion over the
terms Amateur Radio Licence and
Amateur Radio Certificate, so let me
explain the difference. The former refers
to the A and B licences we have just been
looking at, and the latter is a certificate
issued by the Post Office Amateur Radio
Licensing Unit, without charge, to any-
one who has successfully passed both
the RAE exam and the Morse test. You
are usually sent this certificate by the
licensing unit when they receive your A
licence application, but you can also
apply for it if you, for some reason, do not
wish to take out a class A licence
immediately.

This may be the case, for example, if
you already had a class B licence, then
passed the Morse test but decided to
wait until the class B expired before
applying for the class A. As before,
provided the holder of the certificate
made his application for the class A
licence before the end of one year from
the date on which the Morse test was
passed, then no further retaking of any
exam is necessary, but if the 12 months
are allowed to lapse then the Morse
test must be sat again.

The Amateur Radio Certificate does
actually permit the holder, under certain
conditions, to operate an amateur radio
station but only in the presence of, and
under the direct supervision of, the
licensee of that station. It does not allow
the holder to set up and operate his own
station but it does mean that he or she
could possibly operate, say, a club
station.

The minimum age for holding an
Amateur Radio Certificate has just been
lowered by the Department of Trade and
Industry to 10 years of age, a move which
could entice some very young members
into our ranks.

Callsigns

Every amateur station is identified by
its callsign, and in the United Kingdom
the prefix G is used. The full prefixes for
England, Scotland, Wales etc are given in
Table 2 and you are strongly advised to
learn these (they are after all very easy to
remember) as there is nearly always a
question on prefixes in the exam. It
would read something like: The callsign
for the Isle of Man is a) GM, b) GD, c) Gl or
d) GW. The suffix of the callsign usually
consists of a number plus three letters
(unless it is for a special events station or
the like), and for class A the latest series
is G0--- or GW0--- etc, whilst for the class
B licences, the series is currently G1---,
GW1--- etc.

The fee for both types of licence is at
present £12.00 and the renewal fee.

<table>
<thead>
<tr>
<th>recommended reading</th>
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<tbody>
<tr>
<td>How to become a radio amateur — DTI (Radio Amateur Licensing Unit)</td>
</tr>
<tr>
<td>The Radio Amateurs' Examination Manual — G L Benbow G3HB (RSGB)</td>
</tr>
<tr>
<td>How to Pass the Radio Amateurs' Examination — G L Benbow G3HB (RSGB)</td>
</tr>
<tr>
<td>Amateur Radio Operating Manual — R J Eckersley G4FTJ (RSGB)</td>
</tr>
<tr>
<td>A Guide to Amateur Radio — P Hawker G3VA (RSGB)</td>
</tr>
<tr>
<td>Radio Communication Handbook — RSGB</td>
</tr>
<tr>
<td>Amateur Radio magazine</td>
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</tbody>
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It's easy if you remember that temporary is for separate periods, one of which precedes four consecutive weeks, and alternative is where prior notice is made to the controller of the Radio Communication Board of the appropriate Bailiwick in the case of the Channel Islands. So, if you are going on holiday, say, for a period of less than a month or just wish to set up the station at the local school to demonstrate amateur radio, then that is called temporary.

Are you with me so far? For periods that exceed four consecutive weeks it would then be termed as alternative premises or written notice, as explained, would be required plus further notification to the appropriate manager or controller of when the station is no longer established, the latter again in writing. A couple of things make the above sound a little more confusing though. The first is that the suffix, which must be added to the end of the callsign when operating from temporary premises, is '/A', the 'A' standing for the word 'alternative'. At first all of this does indeed sound very confusing, but if you read it through carefully then it isn't too difficult to grasp.

Callsign and notification of location

Dwelling on a moment on the subject of location, you can see from the above that the callsign is used to indicate if the station is being operated from somewhere other than the main address. Whenever the station is used the callsign given on the licence must be transmitted, but the prefix and/or suffix can alter depending on where the station is being operated from. If it is from a vehicle or vessel the suffix '/M' is added to the end of the callsign, while if as a pedestrian or portable from the top of a hill, say, then the suffix '/P' is used. Operation from temporary premises, as we have just seen, is '/A'.

The prefix of the callsign alters if the station is operated from another country within the United Kingdom in accordance with the prefixes in Table 2, ie G0ZZZ gives his calls as GM0ZZZ/M if he (or she) goes to Scotland for a holiday and decides to do some operating from the car whilst he is there. This is possible because the Licensing Unit issues callsigns on a suffix basis so that there will only ever be one -G0ZZZ issued in the UK, be it prefixed by G, GM, GW or whatever.

Sending a callsign

There is a limit to how fast (in Morse) and how often the call is sent during a transmission. It must be sent for identification purposes at the beginning and at the end of each period of sending, be it in telephony or Morse telegraphy, and also whenever the frequency of transmission is changed. If the period of use exceeds 15 minutes then the callsign has to be repeated at the beginning of each subsequent 15 minute period. Where the transmission is in Morse, the callsign must not be sent at a speed in excess of 20 words per minute, and when the station is used from the temporary premises or location then the address of those premises or location also has to be sent at the beginning and end of establishing contact with each separate amateur station, again at intervals no longer than 15 minutes.

On to another favourite question now. The licence states: when telephony is used, the letters of the callsign may be confirmed by the pronunciation of well-known words of which the initial letters are the same as those in the callsign; but words used in this manner shall not be of a facetious or objectionable character.' This means for instance that the word 'Mike' could be used to indicate the letter 'M' in conditions where the person you are talking to might think you said 'N'. Any suitable words can be used provided that they comply with the licence condition, but to maintain some degree of uniformity it is recommended that the phonetic alphabet given in Table 3 be used. This is not a difficult thing to memorise and it is certainly recommended that you do so.

Another often referred to condition is that the licensee becomes licensed to use the station for the purpose of sending to, and receiving from, other licensed amateur stations as part of the self-training of the licensee. This is done in communication by wireless by means which include visual images, facsimile

| Table 2 | which is also £12.00, is payable in advance each year on or before the anniversary of the issue of the licence. That may seem like a longwinded way of saying that the amateur licence costs £12.00 per year but my advice to you is to learn it the way the book says it.

It is unfortunate, but sometimes there are questions on the RAE paper when of ticking off the wrong answer. Some of them will be the correct one as per the learn it the way the book says it.

Table 3

Recommended phonetic alphabet

<table>
<thead>
<tr>
<th>A</th>
<th>Alpha</th>
<th>J</th>
<th>Juliett</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>Bravo</td>
<td>K</td>
<td>Kilo</td>
</tr>
<tr>
<td>C</td>
<td>Charlie</td>
<td>L</td>
<td>Lima</td>
</tr>
<tr>
<td>D</td>
<td>Delta</td>
<td>M</td>
<td>Mike</td>
</tr>
<tr>
<td>E</td>
<td>Echo</td>
<td>N</td>
<td>November</td>
</tr>
<tr>
<td>F</td>
<td>Foxtrot</td>
<td>O</td>
<td>Oscar</td>
</tr>
<tr>
<td>G</td>
<td>Golf</td>
<td>P</td>
<td>Papa</td>
</tr>
<tr>
<td>H</td>
<td>Hotel</td>
<td>Q</td>
<td>Quebec</td>
</tr>
<tr>
<td>I</td>
<td>India</td>
<td>R</td>
<td>Romeo</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>G</th>
<th>England</th>
</tr>
</thead>
<tbody>
<tr>
<td>GD</td>
<td>Isle of Man</td>
<td></td>
</tr>
<tr>
<td>GI</td>
<td>Northern Ireland</td>
<td></td>
</tr>
<tr>
<td>GJ</td>
<td>Jersey</td>
<td></td>
</tr>
<tr>
<td>GM</td>
<td>Scotland</td>
<td></td>
</tr>
<tr>
<td>GU</td>
<td>Guernsey</td>
<td></td>
</tr>
<tr>
<td>GW</td>
<td>Wales</td>
<td></td>
</tr>
<tr>
<td>GB</td>
<td>- used for special event stations, repeaters, beacons etc</td>
<td></td>
</tr>
</tbody>
</table>
Radio signals, radio teleprinter signals, plain language messages, which are remarks about matters of a personal nature directly concerning you the licensee and with a limited maximum power. All of these are specified in something called the Schedule, which you will also find in the RAE Manual and in Appendix F of How to become a radio amateur.

### Limitations
The amateur licence is subject to a number of limitations, all of which are quite straightforward even though these may not appear so because of the wording. The station, for example, may not be used on a bus, train or other public transport vehicle, nor in an aircraft. Also, the licence only allows you to transmit within certain frequency bands, using only certain types of emission, as listed, and with a limited maximum power. All of these are specified in something called the Schedule, which you will also find in both the RAE Manual and in Appendix F of How to become a radio amateur.

### The Schedule
From the Schedule you will notice that the amateur is allocated a number of bands over a very wide range of the frequency spectrum. The HF, VHF and UHF amateur bands are listed in Table 4 and you should make good note of the frequency coverage of these bands. Remember also that the amateur bands are not necessarily used exclusively by amateurs and that we have to share them with other services. 160m for instance, or Top Band as it has become known, is only available to amateurs on a basis of non-interference to other services, as are the 17m, 12m and 4m bands.

You can expect to be questioned on the Schedule as it is a very important aspect of the licence conditions; it is therefore worth spending some time reading it carefully and getting to know what you can or can’t do on the various bands. Some bands, for example, allow for only a fraction of the 400 watts PEP (26dBW) maximum power level mentioned last month. The maximum PEP allowed on 160m is 15dBW (approx 30W) with a corresponding carrier power maximum of 9dBW (approx 8W). At present only CW is allowed on the 17m and 12m bands with a maximum carrier power of 10dBW (10W).

### Possible restrictions
Except for the two bands just stated, most other modes of emission are allowed on the other bands (with possible restrictions) and the band plan is usually such that CW occupies the lower end of the band, CW and telephony the upper end and RTTY (radio teletype) a small segment in between these two. This is by no means a complete guide because some bands may have spot frequencies or a band of frequencies set aside for beacons, amateur satellite working, slow scan television (SSTV), etc. Also, despite the fact that it says for example, that the 30m band (10.1-10.15MHz) that the permitted types of transmissions are the same as those for some of the other HF bands there is a voluntary agreement within the International Amateur Radio Union (IARU) Region 1, which covers the UK and the rest of Europe, Africa, the USSR and Turkey, to restrict operation in this very small band to Morse and RTTY only. This sometimes confuses candidates as they often think that this band is subject to the same restrictions as the other ‘new’ bands, 17m and 12m but this is not so and the agreement is purely voluntary.

You will also notice on the Schedule that the status of the amateur service is listed as primary or secondary on certain bands, and again this has been a favourite question area in the past. Holders of the Amateur Radio Licence B only are not permitted to use the frequencies below 144MHz, nor may they transmit in Morse except where the following exceptions apply. If the class B licenese also holds a valid Amateur Radio Certificate then he can indeed operate someone else’s station on the HF bands provided the necessary supervision is present as explained earlier.

The other exception is that as a result of discussions between the Department of Trade and Industry and the Radio Society of Great Britain, class B licence holders have been allowed to use Morse code in their contacts for an experimental one year period that commenced on the first of April this year. All that the licensee has to do is apply to the RSGB for a Notice of Variation to the Class B licence. You should not be required to know about the latter for the exam and this has been mentioned for information only.

### Emission designation
Something that is often forgotten is that the licence requires that the class of emission be recorded in the log book, not simply the type of mode of operation. We shall look at the requirements for the log book next month, but it is worth covering this point now. It is not correct to enter in the log that your mode of transmission is SSB, CW, FM or whatever. The proper way is to use the emission designators. These are symbols used to designate the various classes of emission and which have been listed as primary or secondary on certain bands.

### Table 4

<table>
<thead>
<tr>
<th>Band</th>
<th>Frequency limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>160m</td>
<td>1,810 2,000MHz</td>
</tr>
<tr>
<td>80m</td>
<td>3,500 3,800MHz</td>
</tr>
<tr>
<td>40m</td>
<td>7,000 7,100MHz</td>
</tr>
<tr>
<td>30m</td>
<td>10,100 10,150MHz</td>
</tr>
<tr>
<td>20m</td>
<td>14,000 14,350MHz</td>
</tr>
<tr>
<td>17m</td>
<td>18,068 18,168MHz</td>
</tr>
<tr>
<td>15m</td>
<td>21,000 21,450MHz</td>
</tr>
<tr>
<td>12m</td>
<td>24,890 24,990MHz</td>
</tr>
<tr>
<td>10m</td>
<td>28,000 29,700MHz</td>
</tr>
<tr>
<td>4m</td>
<td>70,025 70,500MHz</td>
</tr>
<tr>
<td>2m</td>
<td>144,000 146,000MHz</td>
</tr>
<tr>
<td>20cm</td>
<td>430,000 440,000MHz</td>
</tr>
</tbody>
</table>

(There are also a number of microwave bands available above 1,000MHz)

### Table 5

<table>
<thead>
<tr>
<th>Type of emission</th>
<th>Description</th>
<th>Designator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morse</td>
<td>on-off keying of a carrier (CW)</td>
<td>A1A</td>
</tr>
<tr>
<td></td>
<td>frequency shift keying</td>
<td>F1A</td>
</tr>
<tr>
<td></td>
<td>audio frequency shift keying</td>
<td>F2A</td>
</tr>
<tr>
<td>Telephony</td>
<td>amplitude modulation (AM)</td>
<td>A3E</td>
</tr>
<tr>
<td></td>
<td>frequency modulation (FM)</td>
<td>F3E</td>
</tr>
<tr>
<td></td>
<td>double sideband (DSB)</td>
<td>A3E</td>
</tr>
<tr>
<td></td>
<td>single sideband, suppressed carrier (SSB)</td>
<td>J3E</td>
</tr>
<tr>
<td>RTTY</td>
<td>frequency shift keying</td>
<td>F1B</td>
</tr>
<tr>
<td>Facsimile</td>
<td>frequency or AF shift keying</td>
<td>F2B</td>
</tr>
<tr>
<td>Television</td>
<td>fast scan TV using AM double sideband</td>
<td>A3F</td>
</tr>
<tr>
<td></td>
<td>fast scan TV using FM</td>
<td>F3F</td>
</tr>
<tr>
<td></td>
<td>slow scan TV</td>
<td>F3C</td>
</tr>
</tbody>
</table>
BACK TO BASICS

Recorded messages

Still on the subject of messages, the licence also sets out conditions by which recorded messages can be transmitted. If you have contact with another amateur station and you record his transmission, you can retransmit that recording back to the originating station for his (or her) intended reception, provided that the class of that original station is not included in your retransmission. You are not allowed, however, to transmit for any purpose tape or grammophone recordings of the type intended for entertainment purposes, as amongst other things you would probably be breaking some form of copyright.

We have now covered quite a lot of the licence conditions, so the rules for keeping a log book, non-interference, frequency control, etc will be left until next month. However, there are still one or two points that need looking at before closing. So far most of the conditions have related to the transmitting equipment, its operator and operation, but there are also clauses in the licence that relate to you, about what the licensee is allowed to receive or do with the messages he might receive.

Quote — unquote

Firstly, the licence does not permit the reception of messages sent on the frequency or frequencies, and by means of the class or classes of emission, which are in current use at the station for the purpose of sending. This is all quite straightforward but in the notes there is quite an important clause about the reception of unauthorised messages. Once you have your licence, if you receive a message for some reason, the receipt of which isn't authorised to you, then you are not supposed to disclose anything about the contents of that message, its origin, destination or even the fact that you heard the message in the first place to anyone other than "...a duly authorised officer of Her Majesty's Government, a person acting under the authority of the Secretary of State, or a competent legal tribunal...".

The above has been quoted directly from the licence because you are often asked in the RAE exam to whom you are allowed to disclose such a message, so please learn and remember what is reproduced here.

That's not all of it though. You should not retain any copy of that message nor make any use of it or allow anyone else to do likewise. If there was another person operating the station at the time the message was received then he too is bound by the same conditions. Most of you will probably already know that it is an offence anyway to disclose anything received by you which are unauthorised, whether you are a licensed radio amateur or otherwise. This refers to such activities as tuning in to frequencies used by the Police, for instance. So, if one day you happen to suddenly pick up a transmission that you shouldn't, the best thing to do is to pretend it never happened.

Remember, for another month except to repeat once again what was said earlier. The licence conditions are a very important part of the RAE exam so please make sure that you read them through and understand them thoroughly. You will only kick yourself afterwards when you open the exam paper and you haven't done so.

You will no doubt have noticed that I have used a number of extracts directly from the licence conditions as set out in How to become a radio amateur. This has been necessary because it would have been incorrect to state things otherwise and will hopefully avoid ambiguity. This point of view is also shared by the DTI and full acknowledgement is given to them for the permission to do so.

I hope that all of you who are intending to sit the RAE in December are by now having a go at Ray Petri's Questions and Answers, which usually follow at the end of each month's session.

Final note

One final note, a new RAE syllabus was published by the City and Guilds of London Institute earlier this year and this will come into effect from May 1986, making no difference to anyone taking the exam this year. The new syllabus places a greater emphasis on the practical side of amateur radio than before with a doubling in the number of questions on operating procedures and a reduction in the content of the electrical theory section. Copies of the new 1986/88 syllabus (765 Radio Amateurs' Examination) can be obtained by sending £1.50 to: The City and Guilds of London Institute, 76 Portland Place, London W1N 3NG and you will also receive a set of sample questions from past papers. I trust that you noticed in last month's issue of Amateur Radio that the next exam dates are Monday 2 December 1985 and Monday 12 May 1986 and as I stated in the June and July issues, I certainly hope this did not inconvenience anyone, it must have been due to a breakdown in communication – Hi! 73s 'til next month.

Acknowledgements and references

Radio Amateurs' Examination Manual – G L Benbow G3HB (RSGB) Department of Trade and Industry/Radio Amateur Licensing Unit City and Guilds of London Institute

Useful addresses

The City and Guilds of London Institute, Electrical and Telecommunications Branch, 76 Portland Place, London W1. Radio Amateur Licensing Unit, Post Office Headquarters, Chetwynd House, Chesterfield, Derbyshire S49 1PF Radio Society of Great Britain, Lambda House, Cranborne Road, Potters Bar, Herts EN6 3JW WP Publications, 11 Wayville Road, Dartford, Kent DA1 1RL

please mention AMATEUR RADIO when replying to any advertisement
1. Transmitter interference is generated:
   a) in practically any stage of a transmitter
   b) in overdriven power amplifier stages only
   c) in class C driver stages
   d) in the multiplier stages only

2. When a transmitted telephony signal occupies a bandwidth greater than that necessary for the transmission of intelligible speech, it is likely to:
   a) cause adjacent channel interference
   b) cause severe key clicks to local TV
   c) cause image channel interference to local hi-fi equipment
   d) pass through the ionosphere into space

3. An AM telephony transmitter operating on the HF bands causes interference to the reception of transmissions in other frequency bands which are well separated from it. It is likely that this interference is due to:
   a) mains hum on the transmission
   b) an inefficient ground plane at the transmitting station
   c) an inefficient ground plane at the receiving site
   d) harmonics and spurious emissions from the transmitter

4. Poor frequency stability of a transmitter will be attributed to the:
   a) multiplier stages
   b) power amplifier stage
   c) carrier frequency oscillator
   d) items in a) and b) above

5. To reduce the possibility of frequency drift and to eliminate ‘chirp’:
   a) the antenna must be 50 ohm resistive
   b) the PA stage must be tuned to the upper sideband of the transmission
   c) the carrier oscillator must have a stabilised dc power supply
   d) a narrow-band, bandpass filter must not be fitted at the transmitter output

6. Regarding amateur telephony transmissions, Adjacent channel interference is likely to be caused when:
   a) the third harmonic is 40dB below the carrier
   b) the second harmonic is 60dB below the carrier
   c) audio modulating frequencies exceed 3kHz
   d) audio modulating frequencies do not exceed 1kHz

7. Referring to question 6, having received complaints that you are causing adjacent channel interference, the first thing you might do is to:
   a) ensure that your third harmonic is better than 60dB below the carrier
   b) increase the level of second harmonic to 10dB below the carrier
   c) ensure that you have an audio low pass filter in the audio/microphone amplifier circuit of the transmitter, with a cut-off frequency of 2.6-3kHz
   d) fit a band-stop filter in the transmitter output circuit

8. Which of the circuit diagrams below will match your choice of answer to question 7 above?

9. Figure 1 shows the possible frequency spectrum of a transmitter operating at a frequency of 10MHz. The signals at 20 and 30MHz are respectively referred to as the:
   a) second and third harmonics
   b) first and second harmonics
   c) fundamental and first harmonic
   d) sidebands

10. Referring to Figure 1, between the carrier frequency $f_c$ and the two harmonics shown other emissions are spotted. These are generally referred to as:
    a) harmonics
    b) sub-harmonics
    c) spurious emissions
    d) extra-radiating emissions

11. Referring to Figure 1, an effective reduction in the level of unwanted frequencies higher than the carrier frequency can be achieved by fitting:
    a) a suitable low-pass filter in the transmitter output
    b) a suitable high-pass filter in the transmitter output
    c) a band-stop filter centred on the transmitter output frequency
    d) a balun to the mains supply lead

12. Figure 1 might give the impression that harmonics above the third do not exist. What do you think?
    a) Japanese receivers are not capable of generating harmonics above the third
    b) harmonics of higher order than the third radiate insufficient energy to worry about
    c) the filtering action of the antenna removes all harmonics higher than the third
    d) the ‘x’ axis of the diagram has been reduced for simplicity. Harmonics of much higher order are often present and are quite capable of causing interference

13. Which is the cheapest and simplest instrument for detecting the presence of harmonics?
    a) SWR meter
    b) Digital frequency meter (frequency counter)
    c) Moving coil meter in series with a diode
    d) Absorption wavemeter

14. A more accurate method of detecting and measuring the frequency of harmonics present at the output of a transmitter is to use a:
    a) frequency counter (not selective)
    b) suitable communication receiver (beware spurious receiver responses)
    c) thermocouple ammeter (beware of overload)
    d) bolometer (read instruction book first)

15. What is the most likely cause of harmonics at the output of a transmitter?
    a) Overdriven and non-linear RF amplifier stages
    b) High impedance ac mains supplies
    c) Antenna tuner units which are not earthed
    d) Incorrect coatings on the cathode of the PA valve
16. For maximum efficiency the RF stages of an amateur FM transmitter are operated in class C. Class C operation of RF amplifier stages:
   a) produces an output signal free of all harmonics
   b) produces an output signal nearly free of all harmonics
   c) is likely to produce more harmonic content than classes A and B
   d) will produce less harmonic content in the output signal than class A stages

17. A through-line power meter, terminated in a 50 ohm dummy load is connected to the output of a transmitter, and indicates a power of 40 watts when there is no RF drive to the PA stage. What do you suspect is wrong?
   a) Close coupling from a nearby transmitter
   b) Static due to a charged cloud passing overhead
   c) Parametric oscillation in the power meter circuit
   d) Parasitic oscillation in the PA stage

18. The output signal of a transmitter contains excessive harmonics. A possible cure might be to:
   a) reduce the level of drive to the PA stage
   b) increase the level of drive to the PA stage
   c) reduce the effective regulation of the carrier oscillator
   d) increase the supply voltage to the carrier oscillator

19. OK then, your efforts in the above question have not had the effect hoped for. You remember that you removed something from the system yesterday, simply because it did not seem to do anything except reduce the power to your antenna from 30 to 27 watts; in other words it seemed to lose 3 watts. Anyway, your friendly local interference investigation officer is walking down the drive with a formidable looking detector in his hands. In frenzied panic you dip into the dustbin and find and replace that certain 'something' which reduces your harmonics and saves your bacon. What did you replace?
   a) The antenna terminals
   b) The calibrated short circuit (csc)
   c) The low-pass filter
   d) The high-pass filter

20. The S-meter calibration of a typical communication receiver may be about 6dB per S-point. What will be the difference in S-meter readings before and after the filter is fitted in question 19?
   a) Practically no difference, because the filter has an insertion loss of about 0.5dB
   b) The S-meter reading will halve as there is about 6dB insertion loss
   c) The S-meter reading will increase by 2.5 S-points
   d) The S-meter reading will increase by 30 S-points

21. The modulating signal to an AM transmitter is too high and causes overmodulation. Which one of the following waveforms will be observed on an oscilloscope?

22. Overmodulation of the carrier wave will cause harmonics of the modulating signal to be radiated as unwanted sidebands. This causes a type of interference known as:
   a) sideband natter
   b) sideband splatter
   c) sonic sidebands
   d) sub-audio interference

23. The maximum deviation of the carrier wave in an amateur narrow band frequency modulation (nbfm) system will be about:
   a) ±75kHz
   b) ±2.5kHz
   c) ±10kHz
   d) the same as a single sideband transmission

24. Which one of the following transmissions is least likely to cause interference?
   a) F3E FM telephony
   b) A3E AM telephony
   c) J3E SSB suppressed carrier
   d) A1A AM telegraphy

25. When telegraphy (as distinct from telephony) is being used, arrangements shall be made to ensure that the risk of interference, due to key clicks being caused to other wireless telegraphy, is eliminated. Which one of the circuit arrangements below is suitable for use as a key click filter in a telegraphy transmitter?

26. Refer to the key click filter that you selected as your answer to the previous question. It causes the keyed waveform to rise and fall slowly when the key is operated and released. Which component or components of the filter are responsible for the slow rise of the leading edge of the waveform when the key contact is closed?
   a) L
   b) R, L and C
   c) C and L
   d) R and C

27. Referring to questions 25 and 26, which component or components of the key click filter are mainly responsible for the slow decay of the keyed waveform when the key contact is opened?
   a) L
   b) R, L and C
   c) C and L
   d) R and C

28. A UHF television receiver is overloaded by a nearby VHF 145MHz amateur transmission. A possible cure is to:
   a) fit a bandpass filter in the transmitter output
   b) fit a high pass filter at the TV antenna socket and a braid-breaking choke between the TV and the antenna downlead
   c) rectify the mains supply to the TV receiver
   d) rectify the mains supply to the transmitter

29. Shown below is a selection of filters. Which one matches part of your answer to the previous question?
30. The second harmonic of a transmitter operating on 18MHz is interfering with a nearby TV receiver. It has been decided to fit a harmonic trap in the form of a 4 open circuit coaxial stub across the output socket of the transmitter. Assuming the co-ax has a velocity factor of 0.67, what is the approximate length of the stub?
   a) 5.6m
   b) 2.8m
   c) 1.4m
   d) 0.67m

31. A VHF CW transmitter is initially set to operate on a frequency of 144.100MHz. In the first three hours of operation it drifts 2kHz towards the lower band edge before it becomes stable. Under normal circumstances is it likely to cause interference in the adjacent frequency band, and what will be the carrier frequency when the transmitter has stabilised?
   a) Yes/143.690MHz
   b) Yes/144.009MHz
   c) No/144.980MHz
   d) No/144.998MHz

32. A perfect transmitter, emitting no harmonic or spurious emissions:
   a) could still cause overloading to nearby TV receivers and hi-fi equipment
   b) will never cause overloading to nearby TV receivers
   c) will only cause second harmonic interference
   d) will still require a low-pass filter in the output

33. When testing an amateur transmitter for TVI one of the best indicating devices to use is:
   a) an absorption wavemeter
   b) a valve voltmeter
   c) the TV suffering interference
   d) the nearest DTT monitoring station

34. Your SSB transmission breaks through on a neighbour’s imported hi-fi system. The best course of action, after checking your station, might be to:
   a) fit speaker lead chokes and mains filters to the hi-fi
   b) bypass the hi-fi’s audio input leads with 470pF capacitors
   c) screen the hi-fi’s printed circuit boards with silver paper
   d) leave the hi-fi alone and advise the owner to consult his dealer.

35. It is advisable to filter the mains supply where it enters the cabinet of a transmitter. Which one of the filter arrangements below looks the most suitable for this purpose?

To make reading the answers as difficult as answering the questions we’ve printed them back to front. However, all becomes clear when you gaze into the looking glass...

OK then, no more questions this month. Transmitter interference is the antisocial aspect of the hobby. You are tested on your knowledge of this subject in the first paper; for the 1985 exam there will be 12 questions on the subject and for the 1986-88 examinations there will be 15.

For obvious reasons it is essential that every operator has an in-depth understanding of the causes and possible cures for interference. I say possible cures simply because text book solutions are not always the answer and even a person with plenty of experience can start to run short of ideas and cash when trying to solve a difficult case.

Transmitter interference is more likely than anything else to bring you a visit from your friendly local interference investigation officer. If you should receive a visit ask to see his credentials and cooperate as fully as possible. Ask his advice; he is only too willing to help, but remember he has solved many cases before yours so offer your advice sparingly. You wouldn’t dream of advising a great big red faced police sergeant that he ought to get the double yellow lines shifted, when he is simply trying to get the traffic flowing and your ‘MOT failed’ banger is causing the obstruction, would you?

The causes of interference will be discussed as appropriate throughout a course of instruction, but the lecture you must not miss is the one specifically on interference. It should preferably come in the last couple of weeks of the course so that it is fresh in the mind; it accounts for about half the questions in the first paper.

If you sat the May examination you will have received the results by now, about a month earlier than usual – well done C&G.

For the majority of you I hope that congratulations are in order, especially to the students who attended my course at Rede School in Strood, and worked like slaves, with no tea breaks and not one nervous breakdown.

Don’t despair if you didn’t pull it off this time, have a chat with your tutor – he really wants you to pass. Get his opinion of where your weaknesses lie and work harder on this area next time round.

Now, just in case you’ve not already purchased it (or even heard of it!), I’ve written a Q&A book specially for the RAE student. It contains about 1,100 questions (with multiple choice answers of course). The questions have been divided into sections and selected to progress with each part of the RAE syllabus. It also contains the C&G syllabus for 1986-88 and some computer programs written in BASIC for the Commodore 64 (which will run on most machines with suitable mods) to assist with the RAE calculations and provide Morse tuition.


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<tr>
<th>PL259 PLUGS</th>
<th>to take 10.3mm coax</th>
<th>£1.20 each</th>
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<tr>
<td>REDUCERS for 9mm (UR79) Coax</td>
<td>£0.50 each</td>
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<td>4 PIN MICROPHONE PLUGS</td>
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<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Price</th>
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<td>30x21/32x21mm deep</td>
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### Regulators

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### Morris

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<tr>
<td>7905</td>
<td>12/15/24 plastic</td>
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<tr>
<td>CA3085</td>
<td>T099 Variable regulator</td>
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### Computer ICs

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<tr>
<td>2N3773</td>
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### Quartz Halogen Lamps

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<td>H1 12v</td>
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### Transformers

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<tr>
<td>2N3182</td>
<td>2N3183</td>
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### Thermal Cut-outs

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<td>85'C</td>
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<td>120'C</td>
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### Vero Pins

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### Ceramic Filter 50p

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<th>Item</th>
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<tbody>
<tr>
<td>6m or 9m</td>
<td>£0.00/£3.00</td>
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### Electronic Components

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**Regulators**

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- CA3085 T099 Variable regulator: £1.00

**Computer ICs**

- 2N3773 NPN 25A 160V: £1.80 10/£16.00

**Quartz Halogen Lamps**

- H1 12v 55w (car spot): £1.25

**Transformers**

- 30x20: Changeover £1.00

**Relays**

- 2N3055 Ex eqpt tested: 4/£1.00

**PTFE Min. Screened Cable**

- 10m: £1.00

**Kynar Wire Wrapping Wire 2oz Reel**

- 2oz reel: £1.00

**Thermal Fuse**

- 240: Thermal Fuse 121'C 240v 15A: 5/£1.00

**Thermal Cut-outs**

- 77'C: £0.80
- 85'C: £1.00
- 120'C: £1.00

**Vero Pins**

- 0.1" Vero: 200/£1.00

**Ceramic Filter 50p**

- 6m or 9m: £0.00/£3.00

---

### ELMASET INSTRUMENT CASE

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### Vero Pins

- 0.1" Vero: 200/£1.00

### Ceramic Filter 50p

- 6m or 9m: £0.00/£3.00
News and comment from Glen Ross G8MWR

Six metres
For the first time we are able to start with this band knowing that it is definitely ours! For a long time there has been speculation as to whether or not we would get it and this has now been laid to rest by the announcement of an amateur band between 50 and 50.5 MHz.

From what can be gathered at the moment it seems that we will have this on the basis of an exclusive primary user which in itself will make a nice change from our usual position. Anything else that you may have heard, as of 1 August, is pure conjecture and there is plenty of that flying around on the bands.

Crystal ball operators, stargazers and soothsayers are all getting into the act and the 'authentic information, straight from the top' providers are legion. The RSGB are, rightly, not going to spoil negotiations by shouting things from the house-tops (some unrequired publicity held up the 50 MHz permits for some time), but surely they could at least indicate the lines on which they are hoping to negotiate?

Policy
The big question of the day is 'will class B operators get the band?' and here at least we have some information to go on. It has been publicly stated and previously reported in this column without comment from them, that the policy of the RSGB is that they will only accept an allocation if it is available to all operators.

This statement was made by a senior member of the VHF committee at the 1983 Midlands VHF convention, and when asked to state categorically that the band would be refused if it would not be available to class B operators, he confirmed that this was the official policy.

What now?
I believe that the RSGB is negotiating with this result in view, but let us be rather more realistic about things. The great thing with any achievement is to get a foot in the door. Having got this you are then in a position to discuss things to try and get an improvement of existing terms.

Based on this argument the RSGB must know that it would be extremely foolish to refuse an allocation simply because preconceived objectives have not been met. If they did so then we would have no band to discuss and the PMR boys would probably get it instead.

In the best interests of the hobby they must accept it on whatever terms can be obtained and then try to improve those arrangements as and when possible.

Options
One of the major obstacles to be overcome is the fact that there are still a lot of continental TV stations on the band, and under international treaty there has to be a 'degree of immunity to interference' built into any arrangements we may make. This could be done in several ways. The first and most obvious is that the band would only be available outside TV hours, as it is to the present permit holders. The second way would be to reduce the number of operators on the band.

This could be done by making it available to only one class, and as there are roughly the same number of class A and B licensees I suggested to an RSGB official that it could be made available to class B only and the same effect would be produced. This went down like a lead balloon for reasons I could not comprehend!

The idea can be substantiated by the fact that class B operators are at least conversant with different types of VHF propagation and therefore interference problems would be less likely than if class A operators, many of whom have never been on VHF, got the allocation...

(People muttered something about dedication and Morse tests...)

More ideas
Power limits and aerial size and polarisation could play an important part in the negotiations as they would be an obvious way to reduce any problems. A power limit must be a strong contender and already exists on both Top Band and four metres, so is nothing new to the hobby. A restriction on the type and polarisation of aerials has not been part of our licence since the 1930s, as far as I am aware, and would not be a welcome step.

A self-imposed restriction on the size of the aerial will probably happen anyway once most people realise how large a six metre beam is (roughly three times the width and length of the same beam on two metres). The last idea would be a geographical one with a power limit on all stations south of a line, say, Gloucester to the Wash. We have a power limit on parts of 430 MHz for stations in the south of the country so, again, this would not be breaking new ground, but it would lead to a lot of ill feeling.

Predictions
'All very interesting', you might say, 'but what are we going to get?' No one knows, but having consulted 'Old G8MWR's almanac', let's make an educated guess. The band will be opened late this year to class A operators (and, just possibly, class B) with a radiated power restriction during the hours of TV, full power being available at all other times. If class B operators do not get the band initially it is likely that it will be released to them one year later when the effects of interference from amateur operators has been seen to be virtually non-existent.

Partisan?
I sometimes get comments to the effect that I seem to be for class B and anti class A operators. Nothing could be further from the truth. Both classes have made up their minds about what they want to do and are getting on with it. What I do object to is the tendency to think that class A people are somehow more the 'true amateurs' because they have taken a Morse test. True, amateur spirit is in experimentation and investigation of new techniques and there is as much, or more, of this going on on the bands above 30 MHz as there is...
below that magic frequency. Another	hing that annoys me is that so often
there seems to be one law for the rich
and another for the poor.

Crossband
An example of this is the fact that class B
operators are not allowed to work
crossband from, say, two metres to
50MHz whilst the illegal crossband
activities of class A people are actually
publicised. I have commented before
that this is not on; you are only allowed to
operate crossband to frequencies that
are on your licence schedule and 50MHz
does not appear on an A class licence
any more than it does on a B.

The mole
The only other country to have a 50MHz
permit is Norway and several of them
have now been worked. The mole has
reported that there is a possibility of the
LA 5 getting the go ahead to operate on
70M Hz also, although no details are yet
available. If this does happen it will
certainly gladden the hearts of our
70MHz operators as it will widen their
horizons considerably.

47GHz world record
There is life up here and we congratu-
late HB9MIN and HB9AMH for setting a
new world record on 13 January this year.
The new distance is 53kms. The gear at
HB9MIN ran 2 milliwatts to a
0.6 metre dish and HB9AMH was using 10
milliwatts and a 0.4 metre dish. The
contracts were made using wide band
FM and signal reports were around 5 and
3 both ways. The fact that the tempera-
ture at the time was minus 11 degrees
centigrade helped propagation but
would certainly have put me off trying!

Resolution
At the start of the year I suggested that
you try a new band or mode and, feeling
that I ought to follow my own advice, I am
now up and running on 24GHz. It is early
days yet but five contacts have been
made so far; initial tests were done with
G4IAG and G4ISM over distances of a
few km. The best result so far was getting
5 and 9+ reports at a distance of 23kms
from G3FYX. All this running just
5 milliwatts of wideband FM to a 20dB
horn; the equipment, including the horn,
being inside a 5 by 7 by 2 inch die-cast
box — a 24GHz handheld? What did you
do?

Certificates
The first one this month goes to G6CSY
(Orpington) who claims a Bronze 144
award which was gained in a day’s
operating as GW6CSY in the low power
contest. He ran 3 watts to a long yagi! Not
being content with that he then claimed
the same award for his home station
where he has 5 watts to a 9 ele be am. That
one took a bit longer to get though.

Close down
That brings us to the end of this
month’s column. It is nice to get
comments from so many of you. You may
not get an individual mention but the
comments I hear are based very much on
what I hear from you. Letters please to: 81
Ringwood Highway, Coventry, or you can
try Prestel on 203616941. Have fun.
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**B.N.O.S. ELECTRONICS LTD. DEPT AR, BIGODS HALL, GREAT DUNMOW, ESSEX CM6 3BE. TEL (0371) 4677**
Secondhand Equipment Guide

by Hugh Allison G3XSE

Thanks

A few months ago in this column I described a CR100 look-alike receiver that a reader had bought and wished to identify. I am grateful to Peter Bonson in Wokingham for writing in and informing me that it was an HR22. I am also grateful to those of you who wrote in pointing out that EC10s run on nine volts (positive earth) not twelve as I stated. Head hang in despair.

Two of the letters on EC10s mentioned drift on or around eighty metres, which is a new one to me. Has anyone successfully cured this one?

On the subject of letters, many thanks to those who do write in. All are read with interest. Those that deal with repairs that have been done are noted, and those that require help are answered. If several are received on the same subject or ask the same questions, I bring the subject up in the column. Typical of these are the second letters I have recently received on the differences and/or faults on the Trio 2200 series and a sudden spate of tuning problems on Mizuho SB2M SSB portables.

Trio 2200 series

These early two metre FM portables are all about the size of a book and are a bit big and heavy by today's standards. A lot of them are now coming onto the secondhand market, probably due to their original owner buying a newer, smaller rig, and are financially appealing to the newcomer to the hobby. Unfortunately they have not been advertised 'new' for a long time and thus the newcomer may not know what he is buying.

Before the specific model details, a few general points. Crystal controlled variants (2200, 2200G and 2200GX) all require two crystals per channel, one for the transmitter and one for the receiver. If you are buying doesn't have the channels you want this could be bad news financially. Crystals normally cost about £2.50 each, thus £5 a channel. For twelve channels that could be an awe inspiring £60! Lowe Electronics have some crystals available for these rigs at £1 each. They also have a fair range of spares, so they are worth a try if you have problems.

Faults on all these rigs are uncommon; like most Trio equipment you can almost take an axe to them before they play up, but common 'owner induced' problems are either broken telescopic aerials or rotten batteries being left in the holder and eating it away. The battery carriers are non-standard but are (like the aerial) still available from Lowe.

On the subject of batteries, nicads produce about 1.2 volts and dry cells 1.5 volts. There are spaces for ten batteries (all models use pen-cells by the way). Since 10 x 1.2 = 12 volts, 10 x 1.5 = 15 volts, we can see why there should be two 'dummy' short circuit batteries provided with the rig. Use them with eight cells when using dry cells, and leave them out when using ten nicads. All variants are negative earth.

The handbooks supplied with the series are all from the (now thankfully past) era of Japanese English. The above specifications are subject to change without for improvement' is one of my all time favourites, but unfortunately there is one poor sentence in some of the handbooks that has led to much trouble, and I quote: 'minimum 13.8 volts, 0.8 amps'. What this actually means is that the rig should be run from an external supply of 13.8 volts maximum, with an 0.8 amp minimum current capability.

Don't connect it up to a 0-26 volt 5 amp power unit and turn the volts up full. Take my word for it, this produced a very unwell 2200GX and required lots of surgery to make it better again.

Beware the Kenwood branded variants by the way. Nothing wrong with them as such, just that they may appear a bit deaf by the way. Nothing wrong with them as such, just that they may appear a bit deaf, and/or low on output power, due to having been shipped from the factory aligned for 146 to 148MHz use in America. Although nothing a quick tweak will not cure, the rig may also be full of useless channels.

One final general point. Secondhand prices given below are for guidance only. I don't know where there are any for sale at this moment at these prices, and you are obviously free to buy or sell at any price you choose. They are merely the average prices that they have sold at over the past year. Prices refer to standard, clean examples complete with all supplied accessories and with three to five channels fitted. For extra channels add a couple of quid per channel and for a good set of nicads add a fiver.

TR2200. Approximately available between 1970 and 1974. One watt output, 6 channel capability. It was fitted with three now useless channels (two in the SSB end, plus the teleprinter calling one), a claimed receiver sensitivity was 1µV for S/N of 20dB, the price new was £69.50; guide price today about £30.

TR2200G. Available between February 1974 and May 1976. One watt output, 12 channel capability. 1µV still gives 20dB of quieting. The cost new was £86; value now about £45.

TR2200GX. Available between May 1976 and October 1978. Two watts output,elve channel capability. 1µV gives 30dB quieting, quite an improvement; also quoted as 0.4µV for 20dB quieting. It was fitted with the lovely, but sadly short-lived, tuning fork repeater access tone. Normally supplied with three channels SSB, plus 2200G. The price new was £130; today's value about £55.

TR2300. Available between October 1978 and November 1983. One watt output, eighty channel synthesizer (144 to 146). Receiver sensitivity as 2200GX. The price new was £175; today you will about £75, but too few seen for sale to be accurate.

Finally, it's worth mentioning the TR3200, which is really a 70cm version of the 2200GX. Very highly sought after on the secondhand market where they change hands for about £50.

Mizuho SB2M

This is a two metre SSB portable rig which produces about one watt output, CW or SSB. It is tunable via a novel variable Xtal oscillator (VOX) from 144.2 to 144.4MHz in four ranges. The frequency range is therefore not too handy for CW use, although the handbook gives details of use elsewhere in the band. Judging by both the letters received from readers, and the mountains of them in for repair recently, the variable capacitor used in the VFO, ie the tuning control on the front panel, is not up to the passing of the years. The problem seems to start, curiously, with a reduction in tuning range, typically down to only 25kHz per band, when the tuning becomes erratic and intermittent.

The repair is easy enough to do yourself, provided you have reasonable eyesight and a steady hand. This is not a repair to be attempted with a hangover. Neither the author or the magazine accept any responsibility for any damage done to a set while attempting the following repair. In addition to 'normal' tools, ie soldering iron, Philips screwdriver, etc, you will need a scalpel, an empty egg box, a 'Q-tip' and a roll of Izal toilet paper!

Remove the case and undo the four screws holding the front to the side cheeks, the tuning knob (secured by a grub screw) and the two cross head screws under the knob that secure the variable capacitor to the front. Unsolder the two wires (one black, one orange).
going to the capacitor, and unsolder the earth wire coming from the mic socket and going to the board with the filter on it. Undo the four screws holding the board with the filter on and it should just be possible to remove the variable capacitor. That's the easy bit. Now, with due regard to personal safety, cut round the bottom of the clear plastic cover on the capacitor and remove it. From here on always hold the capacitor with the spindle pointing downwards. Undo the four miniscule nuts and remove the trimmer plate. With the egg box closed you have two holes. Carefully lower the spindle into this hole and examine the upper end of the rotating shaft. It should have a tiny washer on it (only about one eighth of an inch diameter). If it's not there look on the underside of the trimmer plate, it sometimes sticks there. Remove the washer and rub it gently up and down the rough side of the Izal toilet paper with one finger. Clean both sides, then clean the end of the rotating shaft and the centre of the trimmer plate with the Q-tip. Do not be tempted to use anything like WD40, Electrolube etc. Now re-assemble the capacitor, using the minimum amount of glue to stick the clear plastic cover back on, then refit it into the rig.

This should cure the problem, and it only remains to go out and celebrate. The above variable capacitor cleaning routine works well on 'Search 9' and NR56 receivers, as well as the tuning capacitors in portable radios. Variable capacitors without the washer described above normally rely on pressure from the earth plane of the trimmer plate onto the rotating shaft to provide the earth connection. By pushing a fine sewing needle between the plastic trimmer plate and the earth plane it is often possible to resurrect dodgy variable capacitors.
FOR SALE

- G3/LLL, clipper for FT101 Mk 1/1B, £10. G404BC Tel: (0892) 46374.

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- Mullard DG 7-5 CRT complete with protective sleeve and base, ideal for small scope etc £30 ono or exchange for anything useful with cash adjustment. Tel: 01624 684756. Write to Mr Ken Brown, 44 Tenby Court, Monkton, Pembroke, Dyfed SA714F.

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- Burndent BF740 three channel hand-held, customised and tuned up on 70cm, RB14, complete with service sheets, good condition. Also homebrew charger, £30. Tel: OTHR Hughie GM1EMP, Great Opportunity for ex PMR rig. Tel: (041) 638 7149.

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Reasonably priced to suit your rig, head/neck band, electret mic, control box, variable mic gain, scanning buttons, plug fitted - superb quality. Priced from £20.50 inc.
FULLY GUARANTEED
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TEXAS INSTRUMENTS TOP SPECIFICATION DEVICES AT A PRICE WELL BELOW ANY OTHER SUPPLIERS AVAILABLE AS FOLLOWS - 7400, 7402, 7420, 7428, 7440, 7474, 7486, 7493. PRICE FOR PACK OF 10 (£1.00 - 50p)
WITH ORDER)
CATALOGUE CRAMMED WITH THOUSANDS OF ELECTRONIC AND MECHANICAL BARGAINS 75p (FREE WITH ORDER)

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SPINNEY LANE
ASPLEY GUISE
MILTON KEYS
OR TELEPHONE: 0908 583252

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150KHz-29999KHz, AM/SSB/CW 76-108MHz. FM 6 memory AM, 6 memory, FM, auto scan, digital tuning. LCD. Supplied with mains PSU. £169.74 inc VAT and carriage
For full illustrated tech. spec. S.A.E.
E.M.A. ELECTRONIC, Bhublipore, Bulfinch
Tel: 039-45-696 or 328

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AMATEUR RADIO EQUIPMENT
Bought, Sold & Exchanged
Used equipment always available
SAE list on request
R & S RADIO
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OR PHONE: (0305) 786930

Telephone
the advertising
department on:
0277 219876
for details

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<th>depth mm x width mm</th>
<th>ad space</th>
<th>1 issue</th>
<th>2 issues</th>
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SPECIAL POSITIONS

Covers: Bleed: Outside back cover 20% extra, inside covers 10% extra
Facing Matter: 15% extra

DEADLINES

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<tr>
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<th>ad copy</th>
<th>mono ad proof &amp; small ad</th>
<th>mono artwork</th>
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<td>4 Sep 85</td>
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<td>28 Nov 85</td>
<td>6 Dec 85</td>
<td>26 Dec 85</td>
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CONDITIONS & INFORMATION

SERIES RATES

Series rates also apply when larger or additional space to that initially booked is taken. An ad of at least the minimum space must appear in consecutive issues to qualify for series rates. Previous copy will automatically be repeated if no further copy is received.

A 'hold ad' is acceptable for maintaining your series rate contract. This will automatically be inserted if no further copy is received.

Display Ad and Small Ad series rate contracts are not interchangeable. If series rate contract is cancelled, the advertiser will be liable to pay the unearned series discount already taken.

COPY

Except for County Guides copy may be changed monthly. No additional charges for typesetting or illustrations (except for colour separations). For illustrations just send photograph or artwork. Colour Ad rates do not include the cost of separations.

Printed — web-offset. All single insertion ads are accepted on a pre-payment basis only, unless an account is held. Accounts will be opened for series rate advertisers subject to satisfactory credit references. Accounts are strictly net and must be settled by the publication date. Overseas payments by International Money Order or credit card.

FOR FURTHER INFORMATION CONTACT

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please mention AMATEUR RADIO when replying to any advertisement

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* British Made
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