

*Amateur*

# RADIO

For all two-way radio enthusiasts

**Eddystone EB35:  
Add a BFO for CW and SSB**

**A lesson from Mexico**



**On test: Surrey Electronics  
modified Yaesu FRG8800 receiver**

**FINAL INSTALMENT:  
BACK TO  
BASICS**

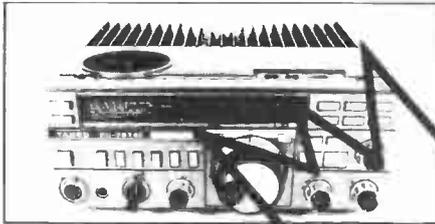
# R WITHERS

584 HAGLEY ROAD WEST, OLDBURY,  
QUINTON, B68 0BS BIRMINGHAM.

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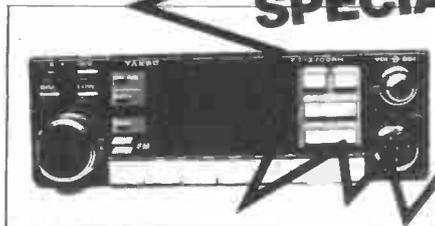


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MAJOR INDEPENDENT  
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- \* 100 Watt multimode \* AM, FM, CW, SSB
- \* Gen coverage RX \* Computer compatible
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THE ULTIMATE  
2mtr/70cms  
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15 FM CW SSB AM V15L	£49.50
15 FM CW V15F	£39.50

Raycom Limited



## A.R.M. MULTI P6 ANTENNA

Probably the most versatile  
Antenna ever designed

PRICE £39.25  
+ £2.50 carriage

This is one of the most exciting new products to be launched by RWC and is the result of many months of development by Antenna Research Manufacture based in Devon. The antenna has been designed to meet the growing popularity in multimode portable and mobile operation and is capable of being used on both vhf and uhf in both horizontal and vertical polarization modes, both portable and mobile. The antenna has the facility of being used as both omnidirectional modes as well as having capability of DF function. No ground-plane or radials are required and the antenna can therefore be used in a variety of applications on frequencies between 140-450 mhz. Colinear elements £4.75.

\* SEE THE REVIEWS \* or SAE LEAFLETS

## 10 Mtr MOD BOARD



PRICE  
£22.50

+ £1.00 post free  
packing. Kit now  
available at £17.50

This is a complete modification board designed to fit all CB radios that incorporate the SANYO LC7137 series of synthesizer chip. The unit comprises of a small pcb with six microchips and fits almost all current legal (CB 27/81) radios, the unit is supplied with full fitting instructions and can be fitted easily by most enthusiasts, with the current upsurge in interest in this band demand has been high as this means that over 90% of current CB radios can now be used on 10 mtr amateur band. See other ads for more information. Over 300 sold in 2 months! Complete radios available & other kits.

## ANNOUNCING THE SUPER YAESU FT757GX — MOD BOARD UNIT from Raycom

- The modification serves two major purposes
- (1) to improve VFO tuning and eliminate 'TUNING GLITCH'
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- UK price is £29.50 for the built and tested pcb with complete fitting instructions and £39.50 plus carriage for a unit factory fitted and tested. Instant fitting service available. Phone now.

£1000.00 instant credit available  
for licensed amateurs. Details upon  
request. Call now!

We also sell and service Cellular Radio, and  
PMR (Business) radio equipment.

Tel: 021 421 8201 (24hr answerphone)

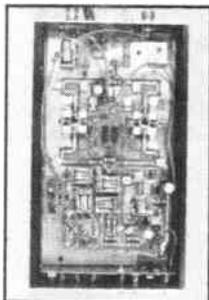
Telex: 334303 G TXAGWM



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RWC CREDITCARD

# Amateur RADIO

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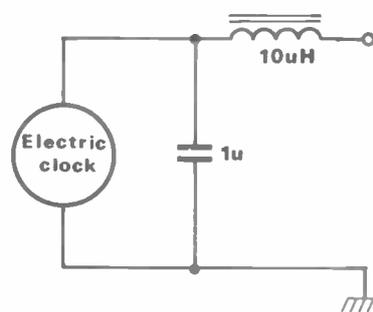
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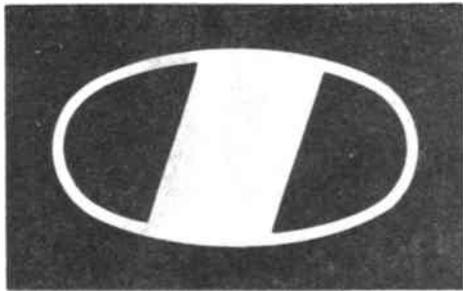
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# ICOM

## SO GOOD TO RECEIVE AND DURING T



 **British TELECOM**  
Approved Dealer for  
Mobile Phone Division

At this special time of year, when Christmas Greetings will be jamming the airwaves worldwide, Thanet Electronics send this message to you. During 1986 the ICOM range of equipment will continue its upward trend in the design and production of sophisticated amateur radio equipment.

Typical of the innovation one expects from ICOM is the new 'ultimate' receiver the IC-R7000. To whet your appetite, a brief specification is featured here.

You can visit our premises at 95 Mortimer Street, Herne Bay, telephone (0227) 369464 for demonstration, advice & sales of ICOM Amateur equipment. No matter what your requirements, base, mobile or handheld, ICOM have the answer.

**Attention all Amateurs & SWL's.** If you are thinking of buying an ICOM radio call us. Just pick up the 'phone and dial FREE Linkline No. 0800 521145, for retail enquiries about ICOM Amateur equipment & the address of your nearest authorised ICOM dealer. N.B. No trade enquiries via this special free link, thank you.

The ICOM IC-R7000 is the receiver that every discerning amateur would love to receive at Christmas. The IC-R7000 is able to give high frequency coverage up to 1300MHz without sacrificing SSB stability, which is maintained throughout the IC-R7000's entire frequency range, another example of ICOM's superb design.

For simplified operation & quick tuning, the IC-R7000 features direct keyboard entry. Precise frequencies can be selected by pushing the digit keys in sequence of the frequency or by turning the main tuning knob. FM/AM/SSB modes, frequency coverage 25 - 1000MHz and 1025 - 2000MHz (25 - 1000MHz and 1260 - 1300MHz guaranteed specification).

The IC-R7000 has 99 memories available to store your favourite frequencies including the operation mode. Memory channels may be called up by simply pressing the memory switch, then rotating the memory channel knob, or by direct keyboard entry.



# IC-R7000

## LIVE AT CHRISTMAS THE NEW YEAR



Listed here are just some of the 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.

A sophisticated scanning system provides instant access to most used frequencies. By depressing the Auto-M switch. The IC-R7000 automatically memorises frequencies in use, while the unit is in the scan mode. This allows you to recall frequencies that were in use. Scanning systems include, memory selected frequency ranges or priority channels scanning speed is adjustable. Narrow/wide filter selection. Five tuning speeds: 10Hz, 1.0KHz, 5KHz, 10KHz, 12.5KHz and 25KHz.

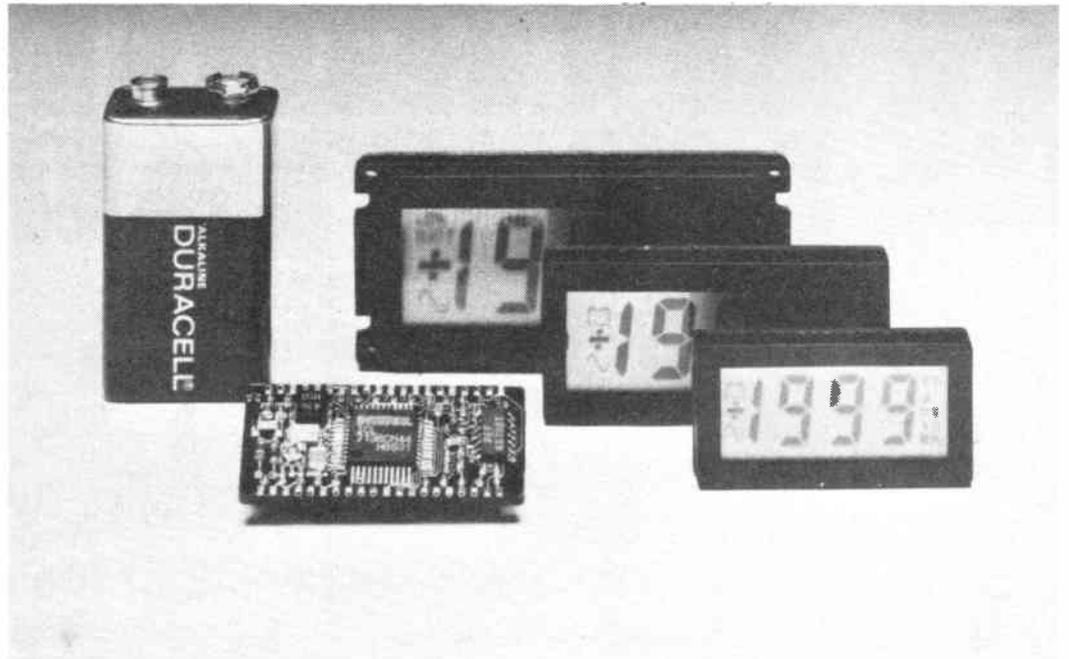
All functions, including memory channel readout are clearly shown on dual-colour fluorescent display with dimmer switch. The IC-R7000 has dial-lock, noise blanker, S-meter & Attenuator. Options include RC-12 infra-red remote controller and a voice synthesizer. Range extender also available.

For a more detailed specification of the competitively priced IC-R7000 contact your authorised ICOM dealer or telephone us direct on 0800 521145, our FREE Linkline service for Amateurs and SWL's.

- Alyntronics, Newcastle, 0632-761002.
- Amateur Radio Exchange, London (Ealing), 01-992 5765.
- Amcomm, London (S. Harrow), 01-422 9585.
- A.R.E. Comms, Earlestown, Merseyside, 09252-29881.
- Arrow Electronics Ltd., Chelmsford, Essex, 0245-381673/26.
- Beamrite, Cardiff, 0222-486884.
- Booth Holding (Bath) Ltd., Bristol, 02217-2402.
- Bredhurst Electronics Ltd., W. Sussex, 0444-400786.
- Dressler (UK) Ltd., London (Leyton), 01-558 0854.
- D.W. Electronics, Widnes, Cheshire, 051-420 2559.
- Hobbytronics, Knutsford, Cheshire, 0565-4040. Until 10pm daily.
- Poole Logic, Poole, Dorset, 0202 683093.
- Photo Acoustics Ltd., Buckinghamshire, 0908-610625.
- Radcomm Electronics, Co. Cork, Ireland, 01035321-632725.
- Radio Shack Ltd., London NW6, 01-624 7174.
- Ray Withers Comms, Warley, West Midlands, 021-421 8201.
- Scotcomms, Edinburgh, 031-657 2430.
- Tyrone Amateur Electronics, Co. Tyrone, N. Ireland, 0662-2043.
- Reg Ward & Co. Ltd., S.W. England, 0279-34918.
- Waters & Stanton Electronics, Hockley, Essex, 0702-206835.



# STRAIGHT & LEVEL



## MINIATURE DPM

A new range of miniature LCD DPMs designed and manufactured in the UK has been introduced by Lascar Electronics.

All types utilise surface mount techniques to reduce the overall size. The DIL format is claimed to make the meters particularly easy to use by low or high volume

users. Each meter is also supplied with a 'snap-in' bezel for fast fitting.

Standard features include auto-zero, auto-polarity, 200mV fsd, programmable decimal points and low battery indication. A range of useful engineering symbols is incorporated on the LCD. Three different versions are available with character

heights of 15mm, 12.5mm and 10mm.

The DPM400 with its 10mm (0.4in) character height is, the company claim, the world's smallest off-the-shelf DPM. It retails at £16.95.

For further information, write to: *Lascar Electronics Ltd, Module House, White-parish, Salisbury, Wiltshire SP5 2SJ. Tel: (07948) 567.*

## PACKET+RTTY

ICS Electronics Ltd is now marketing AEA's Pakratt PK-64, a fully assembled Packet Radio controller which can be used with a Commodore 64 or 128 computer. Included with the controller is a new version of the company's advanced MBA-TOR software, which makes it the first packet controller with AMTOR, Baudot, ASCII and Morse.

The Pakratt controller shows messages and connect status simultaneously on the Commodore with a split-screen display. Letter perfect text from the text editor software can be sent while incoming messages are being monitored.

The 20Kbyte QSO buffer stores over 20 video screens of text. Disc commands enable the user to save speci-

fic operating parameters for quick set-up for emergency services, clubs and multiple frequency use.

Pakratt is available for £259 including VAT, plus £2.50 p&p.

For more information contact: *ICS Electronics Ltd, PO Box 2, Arundel, West Sussex BN18 0NX. Tel: (024 365) 590.*

## NEW CATALOGUE

Marco Trading recently published their latest 1985/86 catalogue. It contains 137 pages of components, test gear, tools etc for the electronic hobbyist, and is fully illustrated, complete with drawings and technical information.

The catalogue is available by post at a cost of £1.00 or to callers at the company's shop at a cost of only 65p. It comes

complete with some six pages of special offers, a pre-paid envelope and order form. Also included is a 50p credit note which may be used with orders over £5.00.

Every month, Marco is also offering at a greatly reduced price one item from their range with orders over £10.00. This month, it is a desolder pump for £2.99 plus VAT.

All mail order is despatched by return of post subject to availability.

Access or Barclaycard orders are welcomed either by telephone or post. Account facilities for companies, government depts, schools, etc are available upon request.

For more details please contact: *Marco Trading, The Maltings, High Street, Wem, Shrewsbury SY4 5EN. Tel: (0939) 32763.*

# All the latest news, views, comment and developments on the amateur radio scene

## MAINS SWITCH

The NE18 range of light action mains switch modules has been introduced by ITT Switches and Relays (UK) Ltd and covers a range of uses that is greatly extended by a choice of mounting configurations.

Designed to handle an inrush of 36A and a switching current of 6A, the NE18 offers a low cost alternative to the majority of mains switch forms, and with several contact options. It is available as a single switch with chassis, central mounting or multiple chassis mounting for up to 23 modules, having either impulse, latching or interlocking functions.

Another major feature of the new switch is the built-in option between either solder lugs or PCB mounting pins on one side of the body and a closed housing on the other, which enables it to operate in confined spaces. In addition, the NE18 has fixing clips and a locating plug built into the moulding for direct mounting into the PCB for rigidity.

Fully dust-proofed and with sealed contacts, the NE18 modules all conform to BSI, VDE, UL94 and 1054 specifications. Maximum switching voltage is 250V.

More information can be obtained from: *ITT Switches & Relays, The Mill House, Barry Avenue, Windsor SL4 1QS. Tel: (0753) 840141.*

## SOLDERING TIPS

3S-TIP are specially made as a long-lasting alternative tip for Weller TCP and ECP temperature controlled soldering irons.

Now they have been improved further by a new additional surface treatment of the areas wetted by the solder. Various tip designs are available, and now the supplier, Cobonic Limited, is offering free samples to all interested persons.

Information and a price list is available from: *Cobonic Limited, 32 Ludlow Road, Guildford, Surrey GU2 5NW. Tel: Guildford (0483) 505 260.*

## POWER DISTRIBUTION

Hewitt & Hill Communications Ltd are now marketing Electrak, a new domestic electrical power distribution system.

Electrak enables you to bring the power to the machine instead of moving the machine to the power source, as was previously necessary.

It is also claimed to be safer than the conventional 3 pin plug. For instance, it is not possible for a curious child's fingers to reach the current - only Electrak's special key plug can get to the power.

It is available as a double socket or a 5 socket strip, and can be fitted by an electrician or a DIY enthusiast.

More information is available from: *Hewitt & Hill Communications Ltd, Old Trinity Church, Wethered Road, Great Marlow, Bucks SL7 3AH. Tel: (06284) 74721/2.*

## SWITCH MODE PSUs

Coutant Electronics Ltd have introduced a new range of low-cost high technology flyback switch mode power supplies, capable of providing  $\pm 5V$ ,  $\pm 12V$  and  $+24V$  outputs.

Known as the CSC Series,

the units are available in open PCB, L-bracket or totally enclosed and are suitable for powering microprocessor based systems, intelligent CRT terminals, disc drives and small printers. Standard units are available in the power output range 30 to 150 watts and specially configured OEM units are available with up to four outputs at power levels to 210 watts.

Features include built-in RFI filter, surge over rating, 40,000 MTBF (mean time between failure) and specifications that meet all UL and CSA requirements.

Please contact for further information: *Coutant Electronics Ltd, Kingsley Avenue, Ilfracombe, Devon EX34 8ES. Tel: (0271) 63781.*

## DISC DRIVE INTERFACE

RCS Computer Services, who recently announced a low cost disc drive for the BBC Microcomputer priced at £66 (inc VAT), is now offering a BBC disc interface upgrade at £75 (inc VAT) for customers who purchase a drive at the same time.

In order to run a disc drive on the BBC an interface needs to be added, which until now has far exceeded

the cost of the drive itself.

Incorporating the Acorn DNFS ROM, the interface is supplied in kit form at this special price to purchasers of the RCS disc drive or can be fitted for £5 extra to callers at their Feltham facilities.

If purchased on its own, the interface kit is available for £95 (inc VAT).

For further information contact: *RCS Computer Services, Enterprise House, Central Way, North Feltham Trading Estate, Feltham, Middlesex TW14 0RX. Tel: 01-844 1200.*

## ELECTRONICS LEAFLET

CPL Electronics have sent us their current stock and price lists which give details of the electronic components, electronic kits and domestic electronic products which they manufacture and distribute.

In most cases the company is prepared to supply non-stock or difficult to obtain items for readers' specific projects.

For further information contact: *CPL Electronics, 8 Southdean Close, Hemlington, Middlesbrough, Cleveland TS8 9HE. Tel: (0642) 591157.*



S-152

## CLUB NEWS

### Repeater news

The RSGB's Repeater Management Group has submitted the following UHF repeaters for DTI approval: GB3HL, West London, RB3; GB3BV, Hemel Hempstead, RB1; GB3GH, Gloucester, RB5; GB3DD, Dundee, RB10; GB3WJ, Scunthorpe, RB5; GB3RE, Chatham, RB11; GB3GM, West Glasgow, RB12 (RTTY/Data).

The franchises for the repeaters on channels RB1, 3 and 5 will not be released until negotiations with the Scandinavians regarding mutual non-interference/co-existence are complete.

A separate batch of 24cm TV repeaters will also be submitted, consisting of: GB3HV, High Wycombe, RMT3 (FM); GB3PV, Cambridge, RMT2 (FM); GB3SX, Hastings, RMT1 (AM); GB3GT, Glasgow, RMT2 (FM); GB3AF, Durham, RMT2 (FM).

GB3UD, the Potteries ATV repeater, will come on the air on 19 October on RMT2 (FM video), with an input of 1249.0MHz, and an output of

1318.5MHz. The sound is 6MHz higher. The site is Mow Cop, about 1,000ft asl. The project has recently been taken over by the Stoke-on-Trent Amateur Radio Society. Reports would be gratefully received by G6UKP.

### WAB mobile run

Terry Dansey G0BIX and Bill Gerrard G4ZRB made a Worked All Britain mobile run on 28 and 29 September.

As you may already be aware, the idea of WAB working is to make contact with as many different Ordnance Survey squares as possible, and they decided that a way of giving as many stations as possible a chance to work new squares was to attempt to activate the whole 100 squares, to be found within the 100kms square known as 'SU', while running mobile.

To complicate things further, they decided to work two bands (2 metres and 70cms) not often associated with long distance mobile operation, and as a further challenge it was decided to complete it within 24 hours.

The Worked All Britain

group helps to promote further knowledge in the geographic details of Britain, and also donates to radio charities such as the RAIBC. It also helps to create interest in the VHF/UHF bands when conditions are not too good.

Further information can be obtained from: *Brian Morris G4KSQ, 22 Burdell Avenue, Sandhills Estate, Headington, Oxford OX3 8ED.*

### Museum pieces

Rae Otterstad OZ8RO is always on the look-out for old equipment for exhibition in his museum in Denmark.

He is particularly interested in the following: R1124c receiver, R1125 marker receiver, R1084 ground station receiver, 10A/11841 control unit, type 12A test oscillator, type 5A test set, TR1196 Tx/Rx, A1134a junction box, AR77 receiver plus any WW2 equipment or manuals, etc.

If you can help, contact OZ8RO at the following address and he will arrange for the equipment to be collected. *Rae Otterstad, Vejdammen 5, DK-2840, Holte, Denmark. Tel: 010-452-801875.*

### Border Award

The Oswestry and District Amateur Radio Club are currently publicising a new award, the Border Award for 144MHz and above, which will be presented for working 10 Shropshire stations and 5 in each bordering county (Clwyd, Cheshire, Staffordshire, Hereford & Worcester, Powys, Shropshire).

All contacts must be on one single band using one single mode, as permitted by the licensing conditions, and contacts via repeaters are not valid. The award begins on 1 January 1986.

Certificates will be numbered according to the band and mode used.

Club events using G4TTO, G1ORA or special call signs are eligible for the award along with any mobile or portable stations in the appropriate counties.

Claimants should forward their lists of stations worked/heard (including band, mode, date, QTH), certified correct by two licensed operators or SWLs, plus £1.75 to: *Oswestry and DARC, Mr T Parsons G6XPO, 90 Castle Street, Oswestry, Salop.*

### Dutch radio

Radio Nederland Wereldomroep is responsible for the publication of three very interesting booklets: *Infodutch* (Information Of Direct Use To Computer Hobbyists), *Shortwave Software* and *The Booklist - A worldwide survey of SW related publications.*

*Infodutch*, edition 2, is aimed at SWLs who use a home computer in conjunction with a short wave receiver. It includes hints on software, hardware and bulletin boards, plus radio related software information and suppliers' addresses.

*Shortwave Software*, edition 2, contains three computer programs that have a direct connection with short wave radio. The listings are printed and in most instances it will simply be a case of typing them into the computer.

*The Booklist*, edition 8, is a guide to the growing number of books, tapes and magazines available for short wave listeners.

Further details are available by sending an SAE to: *Radio Nederland Wereldomroep, PO Box 22, 1200 JG Hilversum, Holland.*

The European DX Council Committee is organising a survey with the help of Radio Nederland Wereldomroep, with the aim of checking the use of radio related software amongst computer enthusiasts.

The results of the survey will be made available both to the software manufacturer and the hobbyist.

A copy of the questionnaire is available at the aforementioned address.

### Scouts and stout

The Denby Dale and District Amateur Radio Society have sent us a copy of their latest newsletter, *CQ*, which, although generally interesting reading, incorporates, curiously, a 'ladies' corner'.

This latest edition has a recipe for Guinness cake - something for the radio amateur 'widows' to do on those long lonely nights, perhaps?

OK, but if she has an interest in radio, how's the XYL supposed to make Guinness cake and study for the Radio Amateurs Exam?

The club was involved in two JOTA (Jamboree-on-the-

## Oswestry and District Amateur Radio Club

# BORDER AWARD

Band	_____	Mode	_____
Award No	_____	Award No	_____

### THIS CERTIFIES THAT

has submitted satisfactory evidence of having worked/heard 10 stations in Shropshire and 5 in each bordering county, plus one club member using a single band and mode on 144.M.H.z. and above.

\_\_\_\_\_ Award Manager \_\_\_\_\_ Date

Club Stations G4 TTO & G1 ORA

Sponsored by MARSTONS - Brewers of fine border ales

air) stations in October with the local Scout group.

Very few Scouts can ever hope to actually attend one of the events, but with the help of local radio amateurs Scouts all over the world can contact others in similar organisations.

For more information on the society contact: *G Edinburgh G3SDY (Secretary), 37 Westerley Lane, Shelley, Huddersfield HD8 8HP. Tel: (0484) 602905.*

## Video

On 2 December Leighton Linslade Radio Club will present a video called *A History of Radio*, which should be of interest to anyone with an academic bent (an academic bent what...?).

The club has a new secretary, Debbie Jones, who will be pleased to answer any queries you might have about other events and activities in the coming months.

Contact Ms Jones by writing to: *36 Greenway, Newton Longville. Tel: (0908) 649238.*

## My favourite piece

The Farnborough and District Radio Society sees out the old year with a Christmas social on 11 December, and has a few noteworthy events planned for 1986. Among these, on 8 January, is the 'Off the Cuff Film Night' by G4MBZ and 'My Favourite Piece' – an equipment evening by the members. Sounds intriguing? Why not pay a visit?

Meetings start at 8pm at the Railway Enthusiasts' Club, Access Road, off Hawley Lane, Farnborough.

For further details contact: *P Taylor G4MBZ. Tel: Farnborough 837581.*

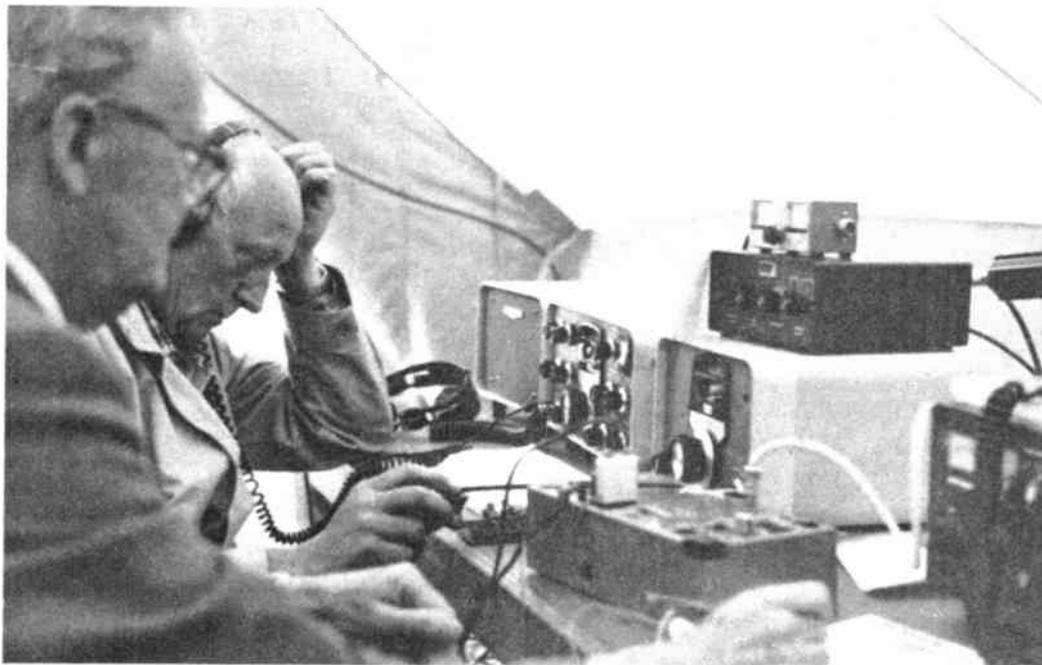
## Manchester

South Manchester Radio Club meets every Friday at the Norris Road Community Centre, Norris Road, at 8pm.

If anyone wants more information they should contact the club secretary, Dave Holland. *Tel: (061) 9731837.*

## December drinks

The City of Bristol Group, affiliated to the RSGB, are holding their Xmas party on 16 December. If you are in or around that part of the country, why not take advantage of a couple of promising dates on the South Bristol ARC's winter calendar.



## Old timers – old equipment

*G3DWW and G3ESH operating a home built Heathkit SB101 and a Mk123 resistance type suitcase transmitter at the Wimbledon and District ARS summer camp at Chessington Surrey. Information about the club and its programme of meetings for the rest of the year may be obtained from the Secretary, George Cripps, 115 Bushey Road, London SW20 0JN. Tel: 01-540 2180*

On 18 December there will be an Xmas Families Evening, and for those of you who overdo the New Year's Eve celebrations, the dog that bit you will oblige on 1 January at the 'Hair of the Dog Night' – start the year as you mean to go on!

For further information about the City of Bristol 'do' phone the Honorary Secretary, Colin Hollister, on (0272) 508451 during office hours. If you want to know more about South Bristol's activities generally, contact Len Baker G4RZY. *Tel: (0272) 834282.*

## North London rally

We have received advance information of a forthcoming rally, organised by the Verulam Amateur Radio Club for 1 December at 11.00am.

The first Verulam Radio and Electronics Rally will be held at the St Albans City Hall. Admission is 50p and there will be a wide range of trade stalls, a bar, a raffle, food etc, and talk-in will be on 70cm and 2m.

For more information contact Hilary on St Albans 59318.

## Biggin Hill repeater

The Biggin Hill Amateur Radio Club has informed us that progress is at last being made with plans for its 70cm repeater, GB3KB.

The site originally proposed was at the top of

Westerham Hill, but this was rejected by the RSGB. Now a site has been proposed at Farnborough and tests have already shown that it will provide a good signal in the difficult areas of Chislehurst and Orpington, as well as serving the valleys of Biggin Hill.

There is apparently no interference to other users nearby, and RSGB and DTI approval is awaited.

Further information is available from Robert Sentf G0AMP, QThr.

## Edgware ham news

The Edgware and District Radio Society are having a junk sale on 12 December and there will be two 80m nets on 3.775MHz ±QRM at 0915 on 24 November and 29 December.

The club meets on the second and fourth Thursdays of each month at: *Watling Community Centre, 145 Orange Hill Road, Burnt Oak, Edgware.*

## Across the pond

The Irish Radio Transmitters Society has been computerised and is now tightening up its rules. In the past, subscription payment was a little casual so a couple of changes have been made. Now, when subscriptions have not been renewed after 2 months from the due date, the newsletter and QSLs will

no longer be sent.

While most subscriptions remain due on 1 January, the subscriptions of new members only will become due each year on the first of the month following the date of their election. They suggest that perhaps other clubs might benefit from similar reforms.

The society's address is: *PO Box 462, Dublin 9, Eire.*

## Morse lessons

Abergavenny & Nevill Hall ARC is a registered examination centre for the May 1986 Morse examination session and holds Morse classes every week on club nights.

The club meets every Thursday at 7.30pm in Pen-y-Fal Hospital above Male Ward 2. J B Davies GW4XQH, the club secretary, will supply more details. Write to: *109 Croeson Parc, Abergavenny, Gwent NP7 6PF.*

## Computer night

The Maltby Amateur Radio Society's Computer Night is on 6 Dec, so if you are interested in this aspect of the hobby take your computer.

Other events taking place in December are the Christmas junk sale on the 13th and a social gathering on the 20th.

Further information is available from Ian Abel G3ZHI (Secretary) on Rotherham 814911.

# L·E·T·T·E·R·S

LIMITED BY GUARANTEE

## RADIO SOCIETY OF GREAT BRITAIN



Patron: HRH The Prince Philip, Duke of Edinburgh, KG Member: Society International Amateur Radio Union Founded 1913 Incorporated 1926

To All Members of the Society

AN INITIAL RESPONSE TO EGM PROPOSALS BY MESSRS. LUNDEGARD, SMITH AND CROSLAND

A document bearing the title "Extraordinary General Meeting of the Radio Society of Great Britain" has been circulated to a number of Clubs and Members around the Country. This seeks support for an Extraordinary General Meeting of the Society in order to produce fundamental changes in the way in which the Society is organised. Before Members take any action, they are earnestly asked to consider the following points:

1. There is nothing in the document which suggests that the gentlemen proposing these changes, Messrs. Lundegard, Smith and Crosland have any special qualifications for making constructive proposals in the more relevant topics.
2. The proposals are a mixture of existing practice, some new but not very good suggestions and some tired old ideas, many of which have already been rejected by both the previous and present Councils and being either in the interest of RSGB, its Members nor of amateur radio in general.
3. Some of their proposals would kill a lot of much of the wisdom and experience accumulated over the years at a stroke in the membership. For what?
4. We suggest that Members think carefully at documents of this type in which radical changes are proposed with a total and unadmission of the relative advantages and disadvantages of such changes. Members should not commit themselves in any way, particularly by giving proxy votes, until they have heard further from the Society.
5. Members are urged not to be misled by the flowery and address appearing on the 'proxy form' recently sent to them. This proxy form has not been prepared with the authority of the Radio Society. Proxy forms will be issued later, if necessary.
6. The Society will be fully open to written proposals on this matter. In addition, the November issue of *Radio* will contain the Society's views on this and associated topics.
7. The Society is particularly concerned that a substantial proportion of the Society's valuable *Radio* subscription effort is being diverted to an external Members' subscription) as being directly away from promoting amateur radio in order to deal with documents sent to them. What do you, the Members, really want?

Juan Heathcote

Juan Heathcote, G4CJH  
President RSGB

October 1975

General Manager: Mrs. J. D. A. Evans-Gibson

11, The Arcade, 100, Strand, London WC2R 0EJ. Tel: 01-275 6100. Fax: 01-275 6101. Telex: 25200. Registered No. 214411 England

### EGM

In common with all members of the RSGB, I have recently received a letter in connection with a proposed EGM of the society. I must make it clear that I have no connection with any of the gentlemen named. The RSGB are using mass publicity to defeat the people who are trying to raise the EGM and I feel it is only right that similar publicity is given to an opposing view.

Let us first take some of the points in the letter itself:

1. 'There is nothing to suggest that the gentlemen proposing these changes have any special qualifications'. Why should they? Surely if members of the society feel that changes should be made then they are entitled by the rules of the society to put forward such proposals? Or is it a case of 'we will only take proposals from people who support our views?' It is, in any case, an attempt to discredit members of the

society.

2. 'The proposals are a mixture of existing practice . . . (then why object to them being included?) . . . some new and not very good suggestions . . . (in whose opinion are they 'not very good?') . . . and some tired old ideas that have already been rejected by council' (perhaps this implies that people who feel they may have good ideas cannot put them forward for consideration by the general membership—a case of Daddy knows best, dear, now run away and play?).

3. 'Look carefully at documents . . . in which radical changes are proposed'. Agreed, but are these *radical* changes? To my mind none of them are: they simply provide for a more open society in which the members (who have to foot the bills) are able to determine who organises the RSGB and the direction in which it is going to move.

### OPEN LETTER

We recently received a copy of a letter sent to the president of the RSGB which readers may find of interest:

I can only call your letter in response to the proposed EGM an insult to the members of the RSGB who care about democracy.

Having attended last year's AGM, I can understand the frustration of many RSGB members who are not able to put their case forward in any other way.

If the society was run in a more 'open' and less secretive manner, I feel sure that you would not be facing the forthcoming EGM.

Remember, justice must not only be done, it must also be seen to be done.

Having spoken to many members of the society from all over the country, it is quite obvious that you are out of touch with the membership's feelings at grass roots level.

Instead of trying to hide behind the 'rules', come out into the open and face your membership. You can only ignore the silent majority for so long!

**M J Butler G4UXC,  
Worcestershire**

### 934MHz

I have been following with interest the recurrent clamourings for a novice band.

I personally am not in favour of such a licence as I see a perfectly suitable alternative—934MHz. I have so far been very impressed with what I've heard on this band. People are really disciplined in their operating techniques and use call signs/jargon very similar to ham talk. All that is necessary to get on the air is to rush out and buy the usual (silver?) box, a beam/collinear/rotator/sundries and away you go in a pleasant environment without having to pass any exam.

It seems too that over the last decade the class B licence has been used almost as a novice licence, a short cut to the full ticket. Nearly every newly licensed class B licensee I hear is enthusing about how they're going for the CW test only a month or so after they've just received their B ticket.

I admire more those who took both tests in one go and went straight for the full licence.  
**Bob Mersh G8JNZ, Kent**

If you really want to see a 'closed society' at work you need look no further than the recent announcement as to how one goes about getting a resolution placed on the agenda of the AGM. This would seem to entail the collecting of signatures of 10% of the membership (in the region of 4,000 signatures!).

Not all those listed in the *Call Book* are members of the society, so you need to get a membership listing from HQ and I am informed that the charge for this is £275. Having obtained your signatures you then have to send a deposit of £200 for each proposal. At this point the proposal goes before council to see if it 'is suitable for inclusion', and if they decide it is not then out it goes.

There is no certainty that, having gone through all the rigmarole, your proposal will get to the AGM and neither is there any mention of the return of deposits, so

presumably you do not get your money back. You certainly won't get a refund if you return the list.

The membership itself has a lot to answer for because it does not get involved in the AGM etc. The AGM is held in London within easy reach of several thousand members, and yet the attendance of ordinary members at last year's event probably amounted to no more than 200 people and these were easily outvoted by the large number of proxy votes that were held by members of council. Please, if you value your society, turn up and vote.

Due to the fact that I am an official of the society I must ask that you do not publish my name or call sign. I assure you that this is not because I do not want to stand up and be counted but simply because the best place to influence things is from the inside . . . and I want to stay there!

**A Member**

# L·E·T·T·E·R·S

## MORSE MARGARET

Mr Brian Burrows of West Yorkshire sent us the following poem which was written by an XYL he knows while she was studying for the RAE. This same lady, Margaret G0CYV, also passed the Morse test after only ten weeks and three days' study!

Read this:

What have I let myself in for?  
A radio ham I would be  
I thought I'm no fool  
I'll go back to school  
At the ripe age of fifty plus  
three

The day came around it was  
then that I found  
My courage deserting me  
when  
I walked into the class  
And there was no other lass  
Just me, in a room full of men

Typing's next door, came a  
voice from the back  
But the teacher (a charming  
young man)  
Said sit down my dear  
It will soon become clear  
And I'll get you through the  
exam

Electricity, where does it  
come from?  
Asked he with a glance round

the hall  
My confidence grew  
Cos I always knew  
It came via the plug on the  
wall

Formulas are really quite easy  
Said he with a certain aplomb  
He'll never fool me  
It's easy to see  
He's making a hydrogen  
bomb

We'll talk about chirp and its  
causes  
I'm confused  
And I really can't see  
How birds come into this  
subject  
I wish now I'd stuck to CB

Each week the pupils get  
fewer  
They've thrown in the towel  
and gone  
The room's quite bereft  
There's only me left  
The position is now one to  
one

The exam time draws near  
alarmingly fast  
And we're reaching the end of  
the course  
But this solitary lass  
is determined to pass  
And then we'll get down to  
that-----:.....

## ALL CHANGE!

For some time now, the radio press has been plagued by various individuals and pressure groups who demand sweeping changes to the amateur licence in some form or other – generally with the single aim in mind of gaining access to amateur radio by means of the least possible effort from themselves.

In all spheres some change is inevitable – to resist all change is unwise. However, in my opinion, to grant these gentlemen (*and ladies, we hope – Ed*) access to the HF spectrum, whether under the guise of a novice licence or the much mooted RSGB intermediate licence, is to invite chaos to the already much overcrowded bands.

However, with change in mind, there is one way that these gentlemen may be accommodated and at the same time perk up activity on a much under-used band.

Consider the following suggestions for a 'P' (probationary) licence:  
(a) The candidate must pass parts 1 and 2 of the present RAE;  
(b) The candidate must pass a 5wpm Morse test;

(c) On achieving (a) and (b) the candidate would be issued a probationary licence, ie GP0AAA;  
(d) For a period of two years, the licensee would be granted use of the 160 metre band. The power limit would be 10 watts, the mode of operation CW (A1A);  
(e) On completion of the two year period, the licensee *must* take a 10wpm Morse examination;  
(f) A pass in this examination would grant the licensee full access to all amateur bands on full legal powers;  
(g) Failure to achieve the 10wpm exam would mean the return of the licensee to 160 metres and the probationary status, until such time that he considered himself able to retake the 10wpm test;  
(h) Existing class B licensees could obtain a class A licence by the same route (with the exception of condition (a), and at the same time retain their VHF facility).

The above procedure would appear to be a logical answer to a thorny subject. 160 metres is a somewhat neglected band these days, but in my experience has proved to be a happy hunting ground for the QRP/CW enthusiast – and a proving ground for the aspiring 'ham'. Should any one doubt the DX abilities of the 160 metre band, then I would be happy to show them QSLs from the USA, Canada, North Africa, and most of Europe.

In addition, 10 watt CW transmitters are easy to build and on completion you're sure to get a blessing from the Rev Dobbs and his G-QRP club!

**HN Kirk G3JDK**

## ALL THE ANSWERS?

I read all the letters printed in *Amateur Radio*, and find that there are a few amateurs who think they have all the answers.

As for myself I failed my RAE, but I can assure you that I am taking the December exam – then I shall be able to join the 'elite'.

It annoys me when I read the comments about CB. After all, we all have to walk before we run.

**Richard E Freeman**

## 27MHz OR 934MHz?

As a long time SWL and also a CB operator, I would like to take issue with certain comments made by Angus McKenzie in his very interesting article on 934MHz (*AR, September '85*) regarding 27MHz users.

The 934MHz band and its users are keen to help anyone and keep the band clean – but this also applies to 27MHz users. All right, you do get wallies, both men and women, who use four letter words in everyday conversation. Also, especially on SSB, there is much talk about who said what, equipment, aerials, etc.

Regarding Mr McKenzie's comments on requesting directions, as a van driver I would, literally, be lost sometimes without my CB and I would never get any work done if I complied with every request to call in for a cup of tea.

You will find many 26/27MHz users trying for DX on low power cheap CB sets

from any available high ground.

Spend an evening on 27MHz – there are friendly people about who do maintain good standards.

Yes, I would like to obtain an amateur licence, if I can learn parrot fashion the relevant parts of Mr Benbow's book, *Radio Amateurs' Examination Manual*.

Until then, I will keep my CB up and have fun trying for that rare DX on equipment which was not built for that purpose.  
**N Ashby, Middlesex**

## APATHY

I write to thank you for instigating your 1985 Amateur Radio Prefix Awards and thereby issuing the best challenge myself or Ian Hawkins G1FXG have, in our short but highly enjoyable radio operation, worked towards.

The major advantage of these awards is the fact that QSL cards are not required as

proof of contact, thus ensuring a quick turn-around from fulfilling all the requirements and receiving the awards, which to top it all are free of charge!

Given the fact that certain contributors to *Amateur Radio*, namely Glen Ross G8MWR and Trevor Morgan GW4OXB, have put a tremendous amount of effort in to get the system started, it is sad that the number of people claiming the awards is relatively small.

Why this is I do not know, but it seems to be the general rule of apathy which claims a great deal of amateurs once they have their licence.

This state of apathy is also shown towards other awards. I have received awards in June which were started in January, to find the award number is '5'.

Surely we can do better than that? Lack of support will only lead to these awards being withdrawn.

**Mick Marlowe G1IPA, Suffolk**

PHONE  
0474 60521



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AD161/2 0.90	BC252A 0.12	BF158 0.22	BU125 1.25	2N2119 0.28
AF106 0.50	BC252A 0.12	BF160 0.27	BU126 1.80	2N2905 0.40
AF114 1.95	BC258 0.25	BF173 0.22	BU204 1.95	2N3053 0.40
AF121 0.60	BC258A 0.35	BF173 0.22	BU204 1.95	2N3054 0.50
AF124 0.65	BC284 0.30	BF177 0.28	BU208 1.39	2N3055 0.52
AF125 0.35	BC300 0.30	BF178 0.26	BU208A 1.82	2N3702 0.12
AF126 0.32	BC301 0.30	BF179 0.34	BU208B 1.85	2N3703 0.12
AF127 0.65	BC303 0.28	BF180 0.29	BU226 1.80	2N3704 0.12
AF139 0.40	BC307B 0.09	BF181 0.29	BU326S 1.80	2N3705 0.20
AF150 0.40	BC327 0.10	BF182 0.29	BU407 1.24	2N3706 0.12
AF178 1.95	BC328 0.10	BF183 0.29	BU500 2.25	2N3708 0.12
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AY102 2.95	BC478 0.20	BF197 0.11	BUY69B 1.70	2N4427 1.95
BC107A 0.10	BC527 0.40	BF199 0.11	MJ3000 1.95	2N4444 1.15
BC107B 0.10	BC527 0.40	BF199 0.11	MJE340 0.40	2N5294 0.42
BC108 0.10	BC548 0.10	BF199 0.14	MJE350 0.45	2N5295 0.45
BC108A 0.11	BC549A 0.10	BF200 0.40	MJE520 0.45	2N5298 0.50
BC108B 0.12	BC550 0.10	BF241 0.16	MJE295S 0.45	2N5485 0.45
BC109 0.10	BC555 0.08	BF245 0.30	MPSA13 0.29	2N5496 0.95
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BC147B 0.12	BD139 0.32	BF422 0.32	OC42 0.78	2SC1449 0.90
BC148A 0.09	BD140 0.30	BF423 0.28	OC44 0.78	2SC1678 1.35
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BC157 0.15	BD166 0.30	BF593 0.23	OC75 0.95	2SC1969 1.95
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DF92 0.70	EC98 2.25	GS12D 12.00	PC89 0.70
DF96 0.80	EC98 2.25	GS12D 12.00	PC89 0.70
DF97 0.80	EC98 2.25	GS12D 12.00	PC89 0.70
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EAC91 2.80	EC98 2.25	GS12D 12.00	PC89 0.70
EAF42 1.30	EC98 2.25	GS12D 12.00	PC89 0.70
EAF801 2.80	EC98 2.25	GS12D 12.00	PC89 0.70
EF84 1.80	EC98 2.25	GS12D 12.00	PC89 0.70
EB41 3.98	EC98 2.25	GS12D 12.00	PC89 0.70
EB91 0.88	EC98 2.25	GS12D 12.00	PC89 0.70
EBC33 2.98	EC98 2.25	GS12D 12.00	PC89 0.70
EBC41 1.50	EC98 2.25	GS12D 12.00	PC89 0.70
EBC81 0.80	EC98 2.25	GS12D 12.00	PC89 0.70
EBC90 1.50	EC98 2.25	GS12D 12.00	PC89 0.70
EL36 1.95	EC98 2.25	GS12D 12.00	PC89 0.70
EL38 4.78	EC98 2.25	GS12D 12.00	PC89 0.70
EL41 3.80	EC98 2.25	GS12D 12.00	PC89 0.70
EL42 2.00	EC98 2.25	GS12D 12.00	PC89 0.70
EL81 8.95	EC98 2.25	GS12D 12.00	PC89 0.70
EL82 0.58	EC98 2.25	GS12D 12.00	PC89 0.70
EL83 5.18	EC98 2.25	GS12D 12.00	PC89 0.70
EL84 0.75	EC98 2.25	GS12D 12.00	PC89 0.70
EL85 4.60	EC98 2.25	GS12D 12.00	PC89 0.70
EL86 0.85	EC98 2.25	GS12D 12.00	PC89 0.70
EL90 2.15	EC98 2.25	GS12D 12.00	PC89 0.70
EL91 0.85	EC98 2.25	GS12D 12.00	PC89 0.70
EL95 1.78	EC98 2.25	GS12D 12.00	PC89 0.70
EL153 12.18	EC98 2.25	GS12D 12.00	PC89 0.70
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# Radio 'hams' get A LESSON F

Tony Smith

Radio amateurs passing third party messages for relatives of those affected by the Mexican earthquake provided a unique service. When normal communications were disrupted amateur radio came into its own by providing world-wide emergency communications on behalf of the general public.

In Britain, as elsewhere, amateurs transmitted messages and received replies direct from Mexico, or through relay stations in other countries. According to the RSGB over 500 enquiries were sent, with a good success rate in terms of returned information. The Foreign Office actively co-operated with the special arrangements set up to handle enquiries, and the DTI informed the RSGB that it would take no action to hinder the passing of third party traffic connected with the emergency.

This latter assurance was necessary because, even though it was an

emergency situation, an event occurring overseas is still outside the scope of the existing licence conditions, and all third party transmissions are actually illegal!

Despite all this it was a magnificent effort, with some operators, both through Raynet and individually, spending many hours on the air, proving once again the willingness of amateurs to put themselves and their equipment at the service of others when the need arises.

### A different attitude

It was encouraging, of course, that the authorities collaborated in 'bending the rules', but what a difference on the other side of the world! In exactly the same way, Australian amateurs rallied to send enquiries about the effect of the earthquake from worried relatives and friends.

Third party message carrying is allowed in Australia as a normal day-to-

day amateur activity and by coincidence, an amateur radio public access station, enabling visitors to send simple greetings by radio, had been set up at a carnival in North Sydney when news of the disaster came through.

The carnival station, and others throughout Australia, immediately went into emergency operation. The media was briefed that facilities existed for enquiries to be sent to Mexico and the response was overwhelming; whole families converged on the Sydney station, queueing to send messages home. Traffic into Mexico was initially routed via American stations, while the US State Department airlifted five amateurs with their equipment to assist Mexican operators handle the traffic.

### Immediate agreement

International agreements are normally required for two-way traffic between different countries. Australia already had an agreement with the USA, but had not yet obtained one with Mexico. Urgent representations were made to the Mexican Ambassador and the Department of Communications, and an immediate international third party agreement was entered into. In Mexico City the only TV station remaining on the air periodically screened a notice from the ambassador, telling Mexicans with relatives in Australia that they could now send messages there through amateur radio stations.

In all, some 700 messages were sent by Australian amateurs, at a time when radio conditions were particularly poor. To cope with an increasing backlog, the Red Cross sought assistance from Telecom Australia and the Overseas Telecommunication Commission. Three co-ordinating amateurs were then given free telephone facilities to pass messages to American amateurs, who in turn relayed them by radio to Mexico City. Free national facilities were also made available, enabling replies received from Mexico to be telephoned urgently to recipients throughout Australia.

### No hesitation

Because amateur radio third party working is legal, the result of an agreement negotiated between the Wireless Institute of Australia, the DOC, and Telecom, there was no hesitation and no qualified approval required, before full recognition and practical help became available. Of course, British amateurs provided the same service, but within a totally different structure.



The amateur station set up at Willoughby



DECEMBER 1985

# messages through ROM MEXICO

## G4FAI reports

Individually they were obliged to begin passing third party traffic, not knowing if they would be penalised for their actions. Even the Red Cross, which called out Raynet on a *national* basis, was unable to exceed its authority and refer to *international* operations.

How different it would be, and how much more satisfactory, if we had third party privileges all the time, as is the case in Australia, America, Canada, and over 40 other countries. Regular message handling would be the best training possible for future emergencies, and agreements with other countries would ensure that a world-wide communication facility was immediately available whenever required.

### How it worked

The mechanics of the Australian operation are interesting, and illustrate the point. Regular nets exist to pass messages nationally and internationally, and amateurs are free to use them or ignore them. If they want to pass messages direct to other stations, they can. If they don't want to be involved at all, they don't have to be.

On 21 September, the Australian traffic net was in normal operation, handling a number of routine greetings and messages, when stations began calling in with welfare traffic for Mexico. All routine traffic was suspended and, as enquiries crowded in, standard ARRL radiogram procedures were employed to send messages via an extended Australian-American traffic network, which normally operates daily at 0500Z on 14.280MHz, with additional emergency traffic being handled on 40 metres.

### ARRL nineteen

ARRL codes exist for a number of emergency situations, but with the enormous amount of traffic involved the message sent in most cases was 'ARRL nineteen', which means: 'Request health and welfare report on...'. The message transmitted included the name of the person(s) enquired about, with an address and telephone number in Mexico. Enquirers also supplied their names, addresses and telephone numbers in Australia for the receipt of replies, if and when received.

The point is, of course, that the organisation was already in existence, there was a suitable procedure to use, and there were amateurs who knew what to do and how to achieve immediate effective communication with the disaster area. As Mexico showed, radio

amateurs can provide an invaluable service from thousands of miles away. The world has changed drastically since our radio regulations were framed. Shouldn't they be changed to catch up with the times?

### How to do it

Changes in the regulations have to be negotiated with the DTI by the RSGB, acting on behalf of the amateur radio movement. If amateurs feel that something should be changed, the first thing they have to do is to tell the RSGB what they want. If the society doesn't know the wishes of its members it makes decisions for them. This is inevitable, and is one of the reasons why many organisations seem to incur the wrath of those they represent.

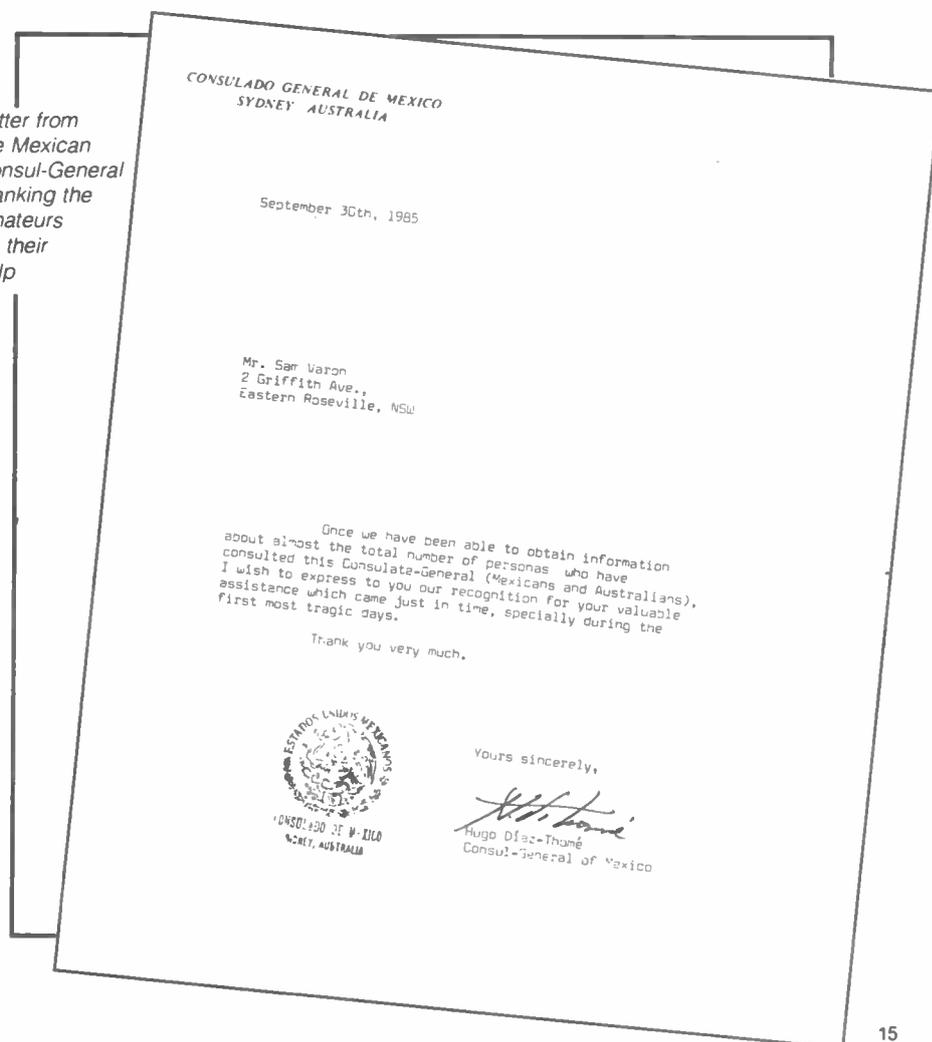
At present, the RSGB has a cautious approach to third party working. It has negotiated limited privileges, enabling special event stations to put non-

licensed persons on the microphone to send simple greetings to other stations in the UK, the US, Canada and the Falklands. But this is more of an interesting novelty than anything else, and certainly cannot be compared in any way to full third party working.

Amateurs interested in extending their operating activities to include a useful and potentially invaluable facility can do several things to start the ball rolling. If they don't already belong, they should join the RSGB. As members, they should write to the society expressing the view that if over 40 other countries have third party working, then Britain should have it as well. Finally, anyone interested in taking a more active part in spreading the word could write to me (SAE appreciated), with their ideas on the subject.

Please address all mail to: *Mr Anthony Smith, 1 Tash Place, New Southgate, London N11 1PA.*

*Letter from the Mexican Consul-General thanking the amateurs for their help*



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# ANGUS MCKENZIE

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## TESTS

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In the April 1985 issue of *Amateur Radio* I welcomed the introduction of the Yaesu FRG8800 to the market place. I found it to have a much better basic performance than the older FRG7700, with the addition of superb ergonomics. Some two years ago in this magazine I compared the original Yaesu FRG7700 with a much modified version re-engineered and available from Surrey Electronics. This model is no longer available because Yaesu have now withdrawn the 7700 from the market, the 8800 being its replacement.

Trevor Brook, who runs Surrey Electronics (The Forge, Lucks Green, Cranleigh, Surrey GU6 7BG), spent many months closely examining the circuits of the FRG8800. He realised that, whilst much of the circuit design was somewhat surprisingly poor, the basic model could be modified to professional specifications and give audio quality at least as good as that of his earlier model, but of course with the excellent new ergonomics.

### Broadcast and communications

He refers to his modified version as the 'Broadcast and Communications Receiver 2'. Within this review I will look at each modification in turn and comment on the improvement that it offers.

In the normal version one has to put in dry batteries to hold the memories and to supply current to the digital clock circuit when the receiver is disconnected from the mains. In the modified version, both nicads and a charging circuit are fitted, which is far more practical than the original arrangement.

The smoothing of the mains power supply was not particularly good and this has been greatly improved in the modified version, which includes the addition of a very much larger electrolytic capacitor. The hum rejection of the regulated circuit has also been substantially improved.

In the original version a 14dB antenna attenuator is automatically switched in below 1.6MHz, thus changing the overall receiver sensitivity and gain. The sudden change when tuning across 1.6MHz was particularly annoying, and in combination with the new Surrey Electronics professional active antenna the new circuit, which cuts out the attenuator, allows a user to get an accurate estimation of signal strength over the entire range of the receiver from 150kHz to 30MHz. A 20dB attenuator is fitted on the back panel, which operates at all frequencies, although this was not fitted on the review sample, which was the first production one.

The first IF is at 47.055MHz, whilst the second IF is at 455kHz. There was quite a considerable ripple in the passband response of the original, fairly broad,



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## Surrey Electronics modified YAESU FRG8800

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### HF receiver

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first IF crystal roofing filter, but what was more serious was that whilst an additional filter sucked out the image which was 910kHz high, at RF this additional suck-out only removed the image carrier and not the highest frequency modulation sidebands.

I had not noticed this particular problem before, but on checking out an unmodified receiver some breakthrough of image was noted, which at worst was only -48dB! In the modified version, Brook has added additional suck-out filters to greatly reduce the problem of sideband imaging, as well as improving the passband ripple of the original filter. The worst image sideband response is now around -80dB.

The first IF amplifier on the normal model is subject to full AGC control, but this restricts the available dynamic range of the audio output. The AGC circuits have been totally redesigned and work directly on later stages, with a delayed AGC working on the first IF stage only. The AGC threshold level is now controllable by a potentiometer on the front panel, which is used to control the general AGC voltage applied to the first IF stage.

Furthermore, peak AGC detection was used for all modes originally, but Brook has now changed this to SSB and CW only. For AM he has substituted a far more appropriate average detection system to stop peak AM modulation from affecting the AGC line, which would otherwise create noticeable distortion at very high modulation levels. Fast and slow AGC switching is still available on the peak and average detection systems, which have been redesigned.

The first 455kHz roofing filter, with around 20kHz bandwidth, feeds the noise blanker diodes. The matching to and

from this filter has been improved to give a much flatter passband.

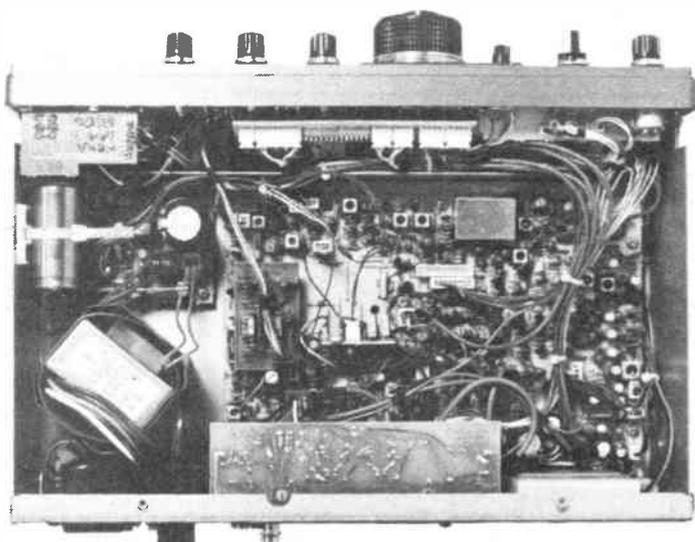
The skirt response of the main filters was not particularly good, and Brook found that much of the problem was due to leakage through the HT supply and other routes. Improved decoupling of various lines around the filters achieves rather better selectivity at more distant spacings from the carrier in the modified version, thus removing much of the effect of spitting and twitching from strong off channel transmissions at high audio frequencies.

Brook has also added a buffer amplifier in between the noise blanker diodes and the main 455kHz filters to give improved filter matching and overall signal-to-noise performance.

### New fittings

A new IF board has been fitted, together with new 6 and 12kHz bandwidth 455kHz IF filters for improved AM reception. The original 'dim' button no longer operates display dimming, but is used to switch between the two AM filters. This offers the user a far more appropriate selection of filters for optimum AM reception, and it is still possible to use the 2.7kHz SSB filters with the normal switching.

In the original version, the group delay characteristics of the filters were not particularly good as there was a marked difference in time delay between the upper and lower sidebands of AM as reproduced through the entire receiver up to the detection circuits. This contributed to fairly high distortions of high modulation peaks of AM, although the receiver was acceptable at lower modulation levels. Additional circuitry has been added to make the two edges of the filter more equal in time delay, and the



matching both in and out of all the filters has been greatly improved to give better linearity across the top of each filter.

The gain distribution has now been altered throughout the first and second IFs, in order to optimise better distortion versus signal-to-noise ratio. This has improved the hiss levels, especially on AM, to allow the receiver to give an output good enough for professional monitoring and rebroadcasting.

Better optimisation of comparative levels from the outputs of the AM, product and FM detectors has been achieved, together with a greatly improved audio response, allowing the line output to be virtually flat from below 20Hz to around 6kHz. The frequency response is almost entirely controlled in the modified version by the characteristics of the filters themselves. A degree of LF cut has been retained in the internal loudspeaker amplifier, however, which seems sensible.

#### Improved feed

As in the modified 7700, Brook has replaced the fairly poor Yaesu AM detector circuit (which, believe it or not, uses a voltage doubler), with a greatly improved constant current feed AM detector with far superior distortion characteristics. This enables the new version to give the lowest distortion I have ever noted on AM.

In the original review of the FRG8800 I criticised the muffled quality of NBFM reproduction. In the modified version, the de-emphasis has been completely changed and the tone control now allows the user to optimise the overall response of FM reasonably well, with greatly improved readability of many NBFM signals. The HF end is now far better.

In the original circuit an electrolytic capacitor in the squelch circuit was put into the PCB with the polarity reversed, which seems rather odd for Yaesu. In the new version it has been put the right way round with the value altered. This removes an LF thump which was created

by the original circuit when the squelch came on or off.

Although I was reasonably impressed with the S-meter characteristics of the original model, the scale is rather less cramped at the top end, resulting in improved S-meter linearity, although this is not a particularly important point. The audio pre-amplifier has been replaced by an improved circuit, which offers a better clipping performance and reduced distortion. Many of the audio response improvements were also made in this part of the circuit.

When the audio response was improved at the LF end, Brook found that an earth loop around the audio and power supply circuit caused some hum breakthrough, which was not so obvious with the original curtailed LF response. A change to the earth routing is therefore put in to correct this.

The green optical filter across the complete display on the front panel has been removed to give a brighter display, which is therefore easier to see. New identification labels have been put on the receiver to make it obvious that the unit has been modified. The various buttons and controls have been re-labelled as appropriate.

Two modified versions are available; one including all the above modifications together with a fixed level unbalanced audio output, which is capable of driving into 600 ohms with the improved responses etc, and a more professional version which includes an electronic floating 600 ohm output for feeding balanced lines at a fixed level, the output being on a studio type XLR male connector.

The latter version also has modifications to the mains wiring to meet stiffer safety regulations, together with a buffered IF output driven from the 455kHz IF after the main filters.

Unfortunately, in the professional version the extra circuit board for the floating output takes up the compartment that is normally used if you wish to

add the optional VHF converter system, which is a pity, but the converter can be added to the semi-professional modified version.

All the Yaesu computer controlled facilities are retained, and I have not been able to find any other modifications to the receiver.

#### Subjective tests

Although I was quite impressed with the original FRG8800, it was fascinating to be able to compare unmodified and modified versions at the same time by feeding various antennas to both receivers in tandem.

My impression of the unmodified version was still very much the same as it had been for the April review, but when we compared AM with the new filtering facilities it became obvious that the AM quality had been greatly improved in audio quality and where rejection of adjacent channel and various spurious was concerned.

The background hiss level on a strong AM broadcast was clearly better on the new version, and the reproduction quality should be completely dependent on the quality of the transmitted signal. SSB quality did not materially change, but again the rejection of twittering caused by the breakthrough of strong off-channel transmissions seemed much less annoying on the new version due to the improved skirt rejection below -50dB or so.

When we tuned to long wave on an appropriate antenna, we noted some strange audio beat tones in between 300 and 400kHz which were caused by the image problem of the original model. However, these were totally absent in the modified version. When listening on frequencies displaced by 910kHz from very strong broadcast signals, there was definitely far less rubbish around on the new version.

I had a tune around the 27MHz CB area, and whilst the programme content was as boring as usual, the intelligibility of the transmissions on FM was very much improved, and the transmissions were nowhere near so muffled. The same applied to a few 10m FM signals heard during the evening of the listening tests. The squelch action was clearly much less obtrusive, and there was no click or thump audible when it acted.

There seemed to be no change in the already overall RF sensitivity and front end intermodulation performance, and I noted that the synthesiser was not the quietest I have known. However, the removal of the 14dB fixed attenuator below 1.6MHz was definitely beneficial when tuning across medium wave during the day-time on a modest antenna. Long wave sensitivity on the modified version appears to be excellent.

We had a long listen to the output of strong medium wave stations, such as LBC and Capital Radio, with the balanced floating output connected to studio monitoring equipment. The AM quality was as good as I have yet heard,

although I noted what appeared to be a permanent 10kHz whistle from Capital Radio beating with adjacent carriers.

The bass response was quite remarkable, and much cleaner than usual from bass guitars and other LF instruments. High frequency distortion was so good that one could very easily hear substantial differences in the qualities of different transmissions, showing that some medium wave transmitters are in fact rather dreadful!

## Laboratory tests

As I covered, fairly exhaustively, the very many facilities of this receiver in the original review, we decided that we were justified in carrying out just simple checks of input sensitivity and intermodulation, concentrating on the overall signal-to-noise ratios, frequency responses and distortion characteristics of the modified version.

The SSB RF sensitivity was identical to that of the normal version, although the change in FM de-emphasis degraded the FM 12dB sinad sensitivity by 1dB. The AM distortion was stunningly low throughout, for even at 90% modulation distortion of middle and high audio frequencies was below 0.53% on the loudspeaker output, and down to an astonishing 0.35% with 1kHz modulation on the 600 ohm floating output, this figure representing what I believe to be the distortion of my generator!

With slow AGC 80Hz distortion was only just above 1%, which was remarkable. Using the 12kHz filter, 3kHz modulation produced a THD of only 0.5% at 90% modulation, hardly any higher than the distortion at 1kHz. Distortions using the 6kHz filter were either the same or marginally inferior to those produced with the 12kHz one. The FM distortion was virtually identical to that produced by the unmodified model, and the product detector was not remeasured as it sounded very similar.

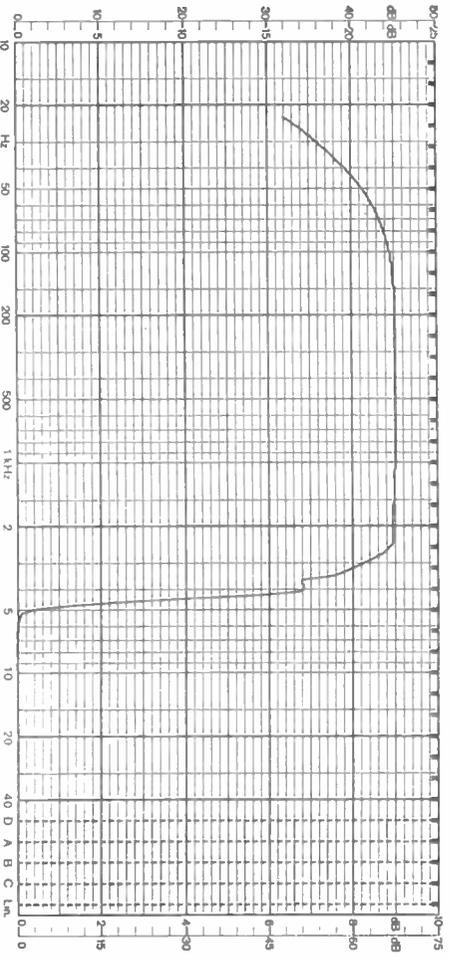
The new version, unfortunately, takes rather more current from the power supply, and whilst we obtained the same rather limited power of 1.3W into 8 ohms for 10% distortion, it was not possible to reach a continuous 10% distortion into 4 ohms. This was because the additional current caused instability of the power supply, the entire front panel display dimming or blinking on and off, and the audio appearing and disappearing with the lower resistance load applied at a high drive level!

There is an 8 ohm resistor in series with the HT feed to the loudspeaker amplifier, and this obviously limits the current, but also, unfortunately, the maximum output voltage, which is why this receiver in all its versions gives about half the power it should. Quite clearly, Yaesu should have used a more meaty mains transformer.

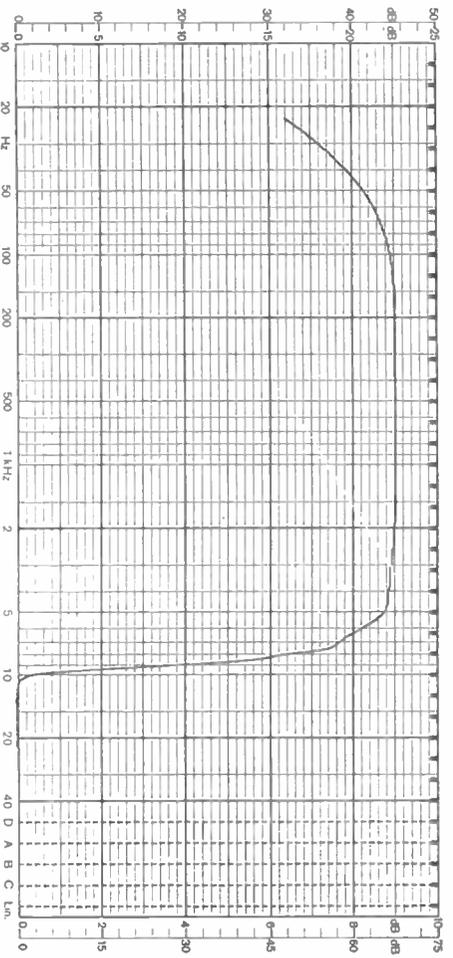
The plots accompanying this review show not only the superb AM response of the 12kHz filter from VLF to HF on the floating output, the measurements being taken at an RF input level of -40dBm at 30% modulation, but also the responses



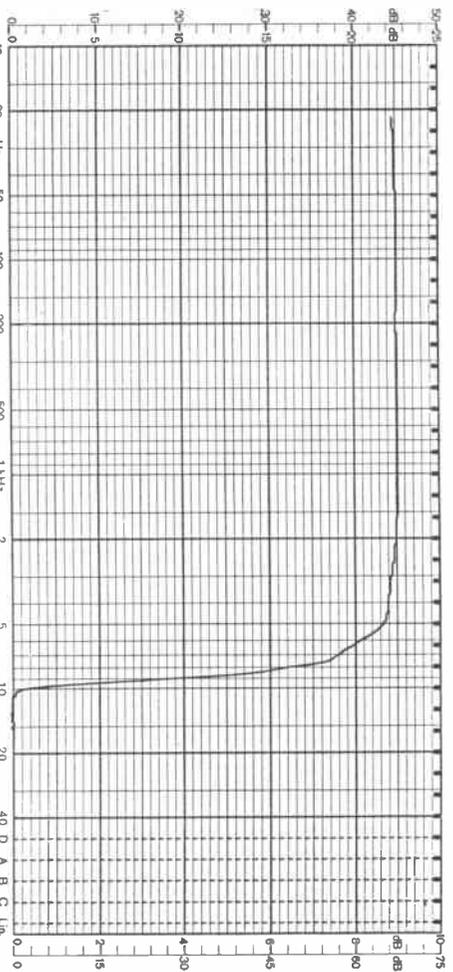
AM response at loudspeaker output using 6kHz bandwidth filter



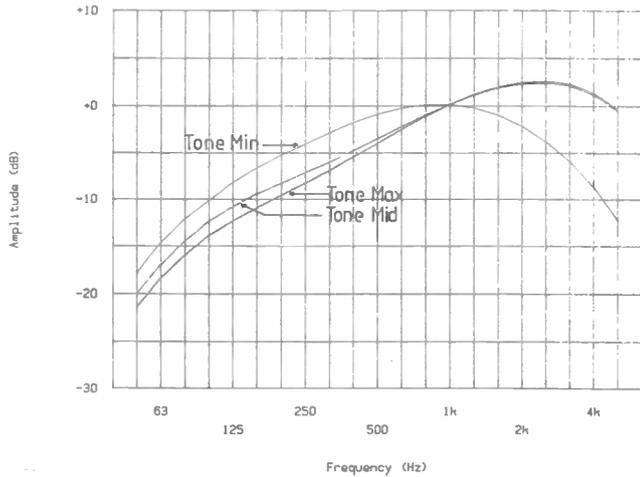
AM response at loudspeaker using 12kHz bandwidth filter



Response on 600Ω balanced line output using 12kHz filter



# G3OSS TESTS



FM Rx responses with tone control min, mid and max position

of the 6 and 12kHz filters on the loudspeaker output at a maximum level of around 125mW. It will be seen that the loudspeaker amplifier is around 3dB down at 50Hz, but it attenuates very rapidly below this frequency. The HF responses are virtually identical on both outputs.

Looking at the 6kHz filter plot, the HF turnover is at 3kHz, and the attenuation above this frequency is very rapid, which is ideal. What is certainly important to me is that the responses are very flat between 55Hz and 3 or 5kHz, dependent upon the filter chosen, thus leading to a superb audio reproduction quality within the transmitting constraints of AM broadcasting.

Three responses are taken of FM with the tone control at max, mid and fully down positions, to show the amount of HF variation that is available. The control only starts biting hard below the mid point. We checked the SSB selectivity for -6dB (3.8kHz), -40dB (5.1kHz), -60dB (5.9kHz), -70dB (7.5kHz) and -80dB (7.8kHz). The selectivity is almost identical down to -40dB, but there is a noticeable improvement at -60dB and a very startling one at -70 and -80dB, thus

showing the effectiveness of the additional decoupling of the circuits around the filters.

We checked signal-to-noise ratios on AM and FM with flat measurement responses either from 400Hz to 30kHz or from 10Hz to 30kHz, the latter of course taking hum into account. Typically, the modified model gives just a marginally better signal-to-noise ratio on the floating output, 60dB s/n being noted here for an input RF level of -40dBm (2.2mV). This is extremely good, but in addition we noted that there was much less HF hiss than usual present in the output. With hum included the ratio was just under 55.5dB, which is excellent.

The loudspeaker output measurements were only marginally inferior when referred to an output level of 125mW/8 ohms. On increasing the RF input level the s/n improved slightly. The FM s/n ratios averaged at around 52dB with or without hum filtered out. This figure is slightly higher than expected because it was taken with the tone control flat out before the responses were taken, leading to some HF boost in the noise measurement, which therefore is satisfactory.

The S-meter required around 80µV to achieve S9 right across the range of the receiver, showing a remarkably consistent gain. The 20dB indicated segments above S9 required an average 14dB increase in RF level per segment, whilst an average of 5.5dB per S-point was noted between S3 and S9. However, please note that the S-meter is only actually marked for each two S-points, and that there are three minor segments in each 20dB marking above S9.

The AGC characteristics are now quite interesting, for I would describe the onset of AGC as being very soft rather than a sudden threshold. This means that whilst there is a 3dB drop in audio output level when the RF carrier on SSB has been reduced to -90dBm (7.5µV), a further reduction in RF of 19dB produced only a 7dB reduction of audio level. This seemed to allow band noise to be reduced whilst not significantly affecting the subjective level of average SSB signals, thus avoiding pumping effects. With AGC set at slow, the time constant seemed just about right, even strong signals avoiding nasty pumping.

## Conclusions

If you are professionally involved in broadcast monitoring, or particularly want the buffered IF and floating audio outputs, I can recommend the professional version, although it is a lot more expensive at £850 plus VAT than the modified domestic version, which is £720 plus VAT. 5% discount is given for cash with order.

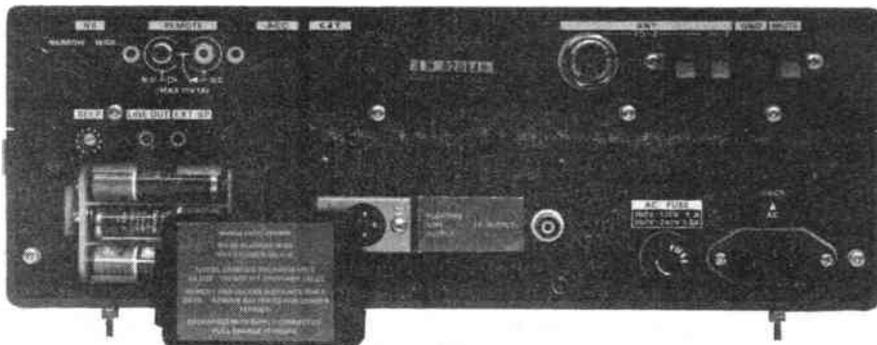
You may well feel that the normal version of this receiver is good enough for your requirements, but if you are interested in quality reception, especially of AM signals, then I am sure you will notice the considerable improvement in the quality of the professional version, especially if you feed the output into a high quality external system.

Broadcasting organisations should be very interested in the professional version, which is probably by far the best value for money model on the market. Perhaps if more AM radio stations bothered to monitor their outputs regularly on a receiver such as this, they might realise that they may be transmitting some rather excruciatingly bad quality. You only have to compare the audio qualities of some of the Radio Moscow transmissions of the same programme on different bands and frequencies with this receiver to see what I mean!

A strong recommendation, then, for the domestic modified version if you are fussy about quality, but you are not likely to notice much difference on the internal speaker if you just listen to short wave broadcasts casually. Note that I have already praised the ergonomics features, including the memory to VFO functions and direct frequency entry in the original review. So, in weighing up, remember that in the modified version the price includes the two new AM filters as well as all the other modifications.

## Warning:

This rig should be left plugged into the mains to keep the nicads charged. Failure to observe this can cause the rig microprocessor to have problems in operation. If the rig does not work on switch-on, remove the batteries (see below), switch off and on again, then replace the batteries



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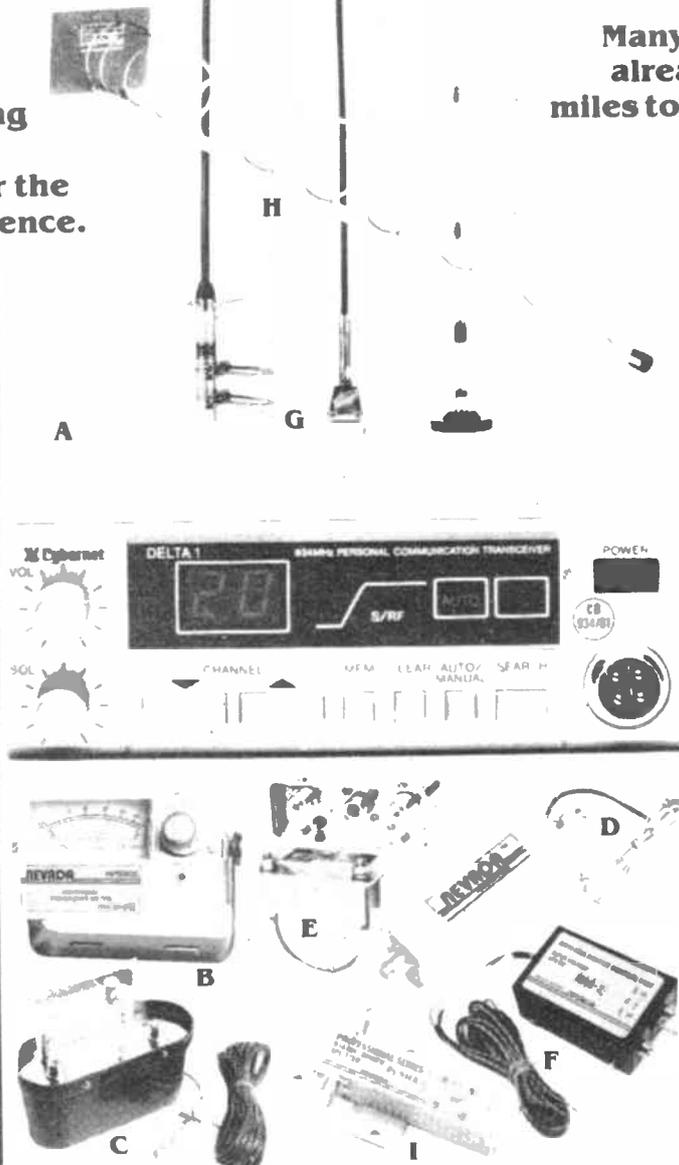
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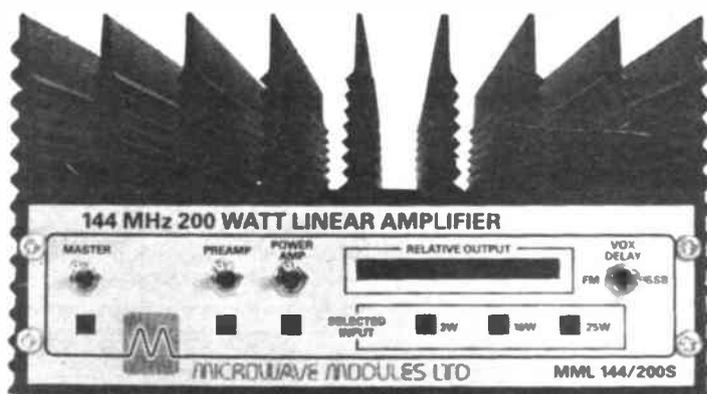
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Professional Series

# MICROWAVE MODULES

## MML144/200S

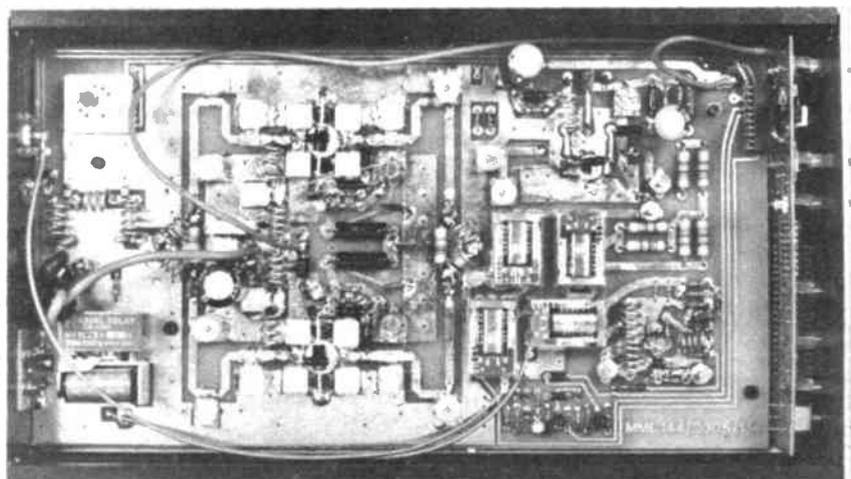


### 2m linear

This model is not only the largest in Microwave Modules' range of 2m linears, but it offers some very useful facilities. A receive pre-amp is included, and switches on the front panel include: master power on/off, separate switches for linear and pre-amp on/off, and another switch to select the Tx hold time – instant drop-out for FM or delayed drop-out for SSB/CW. The front panel also includes LEDs to indicate functions in operation, and a row of ten LEDs to indicate relative output power.

On the back panel is an SO239 socket for interconnection with a transceiver and an N-type socket for antenna interconnection, other types of socket being available to special order. Heavy duty twisted wires are used for interconnecting with 13V dc, these feeding through a locking grommet to the interior. (The manufacturers have informed me that they will be introducing even thicker 40A cables shortly with added filtering). A phono socket on the back is provided for an external PTT connection, the linear going to Tx when the inner is shorted to outer.

*Inside the underside of the linear*



Underneath the chassis is a three-way switch which has to be turned with a screwdriver and is reached by pulling off a rubber bung. This switch selects the input sensitivity range, the manufacturers specifying that the linear should reach full output on 3W, 10W or 25W input. As will be seen later, the linear is actually too sensitive, full output being reached when the input is driven at an average of only half the specified level.

An additional wafer on this switch is used to fire up any of three power indicator LEDs on the front panel, so that you can see at a glance which input range you have selected. The linear is fitted with the largest heatsink I have yet seen on a solid-state linear, occupying almost twice as much cubic capacity as that of the linear's main chassis!

In the 25W input sensitivity range the drive is taken directly to the output pair of transistors, two NPN Thompson type SD1477s in a parallel combination with separate drives and an output combiner, whereas in the 3 and 10W ranges a driver transistor is included giving extra gain, and is fitted with an attenuator for the

10W range. The driver is a SD1278 NPN.

The receiver pre-amp consists of a dual gate GaAsfet. type NEC NE411 (3SK124), in a noise matched configuration, having a good sensitivity but a rather high gain, which is undesirable, and a bandwidth which is rather wide.

#### Subjective tests

We have used this linear with a number of different rigs, including a Trio TS711, a Yaesu FT290 and a transverter giving up to 10W PEP output. When used on FM no trouble was experienced, with outputs of at least 200W. On SSB I found, as usual, that the Tx hold time was rather too short, thus causing the linear to drop out very frequently. This tended to cause a spit when it came in again. MM are considering making this hold time variable, so look out for this. The PTT socket, allowing hard external PTT, works perfectly well with a relay operated short on Tx line, but since the current drawn by the circuit is fairly high (just over 100mA), as it has a low impedance, the PTT socket on some rigs, will not be suitable.

The output power LEDs are very useful as they show that you are putting out power, which of course is a reassurance. It was useful to be able to switch the linear and Rx pre-amp sections independently. However, although the pre-amp has a very good sensitivity, it has too much gain, and this is particularly unwelcome as the bandwidth is excessive. This will mean that strong out-of-band signals will be amplified almost as much as the in-channel ones, and in some locations, especially if you are using a high gain antenna, intermodulation products will be produced in-band, which could cover up weak stations. The resultant system intercept point will be degraded, and even a relatively good rig will become very poor with the pre-amp switched in.

The most serious problem with this linear is that on all input power ranges, and especially the 3W one, only a very small input PEP is required to achieve full output. This in effect will mean that a rig such as an FT290 giving from 2.5 to 3.5W PEP output will overdrive this linear

# G3OSS TESTS

and create considerable spreading, so it would be better to use the 10W input range and suffer a slightly reduced maximum power output.

As an example, we found on the third sample that only 1.2W PEP was required on the 3W range to reach 200W output, 2.2W PEP input producing 230W PEP with considerable spreading and compression. On the 10W input range, 3.6W input gave as much as 150W output. With 10W PEP input from the transverter I was accused of spreading very badly. By far the most satisfactory input range was the 25W one, in which 15W PEP input was said by listeners to be relatively clean under contest conditions, but when driven at 25W spreading was becoming fairly marked, although as this range omitted the input driver its distortion was clearly far better.

There is rather a history to this review, for despite requesting a sample from the manufacturers for some eight months, none arrived. I was kindly loaned a brand new one by G6TLI, Phil, and all these subjective comments apply to his sample, as well as later ones.

The original two-tone plots were poor, and after discussion with MM they eventually agreed to send a checked unit down to me for review in the hope that it would be better than Phil's one. Alas, it was actually slightly worse, but this is not the end of the story.

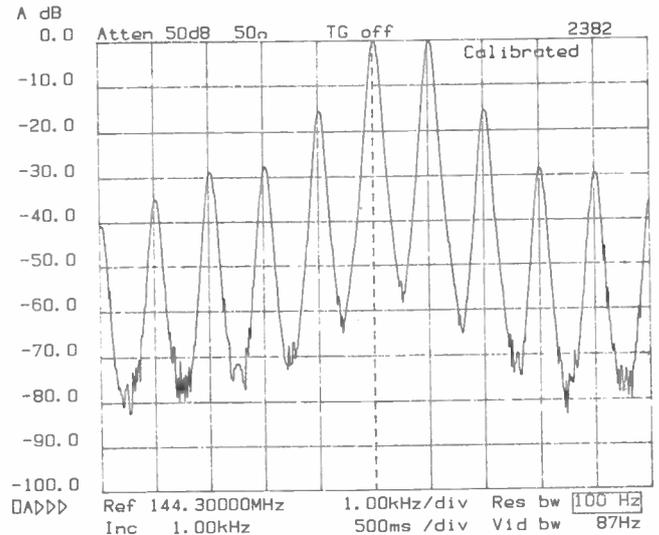
## Measurements

We originally took measurements on my HP analyser, but after a field trial we began to take measurements for publication with the new Marconi 2382 analyser, which takes more time over a plot because of its increased dynamic range and definition. After around 30 seconds of two-tones at 200W PEP output there was an ominous crack, and as I walked across to the linear to switch it off, there was another louder one, followed about a second later by my switching off. Before the first crack, the analyser plot was looking very poor, but just before the final switch off, and after the bangs, a colleague had noted that the picture had cleaned up! After a minute, we switched on again, and obtained another plot which was a lot cleaner (see opposite), switched off, then opened up the apparatus.

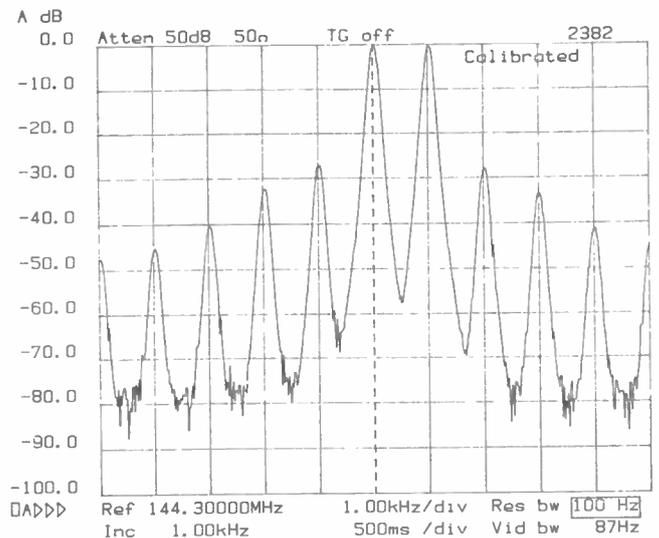
Two electrolytics had hit the dust, either side of a choke in the feed to the driver transistor. MM agreed to fix the problem, and returned it some weeks later. They advised me that the problem occurred because the two-tones were rather close together, and the 1kHz frequency difference between them caused the electrolytics to have much too high a ripple current through them.

Although I agree in part that two-tones are not totally representative of speech, I do feel that a solid-state linear should be designed to withstand a two-tone test for 30 seconds or so. However, when we replotted the third sample (the second one repaired), we were much more careful to keep the testing time to an

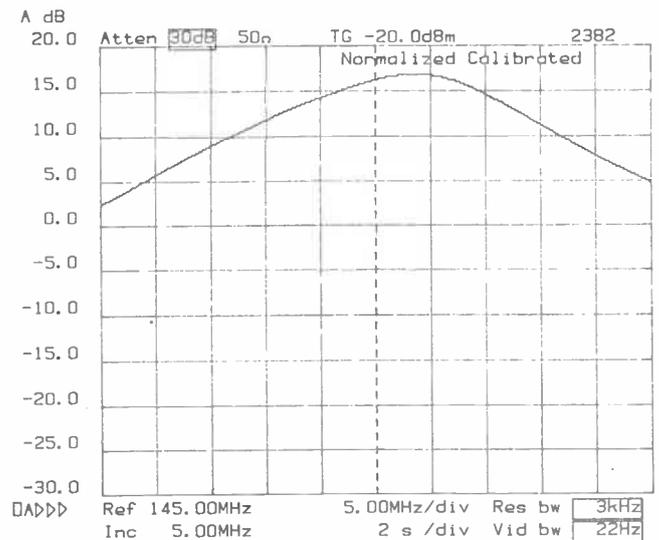
*Two-tone IM plot showing excessive and compressed output of 230W PEP. Note high IM products*



*Two-tone IM plot with only 300mW PEP drive. Note grossly excessive gain producing 75W PEP output*



*Rx pre-amp gain versus frequency. Note excessive bandwidth and very high gain*

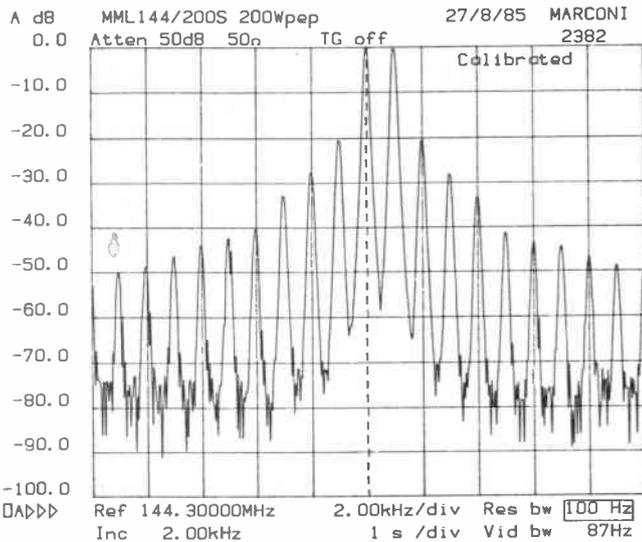


absolute minimum.

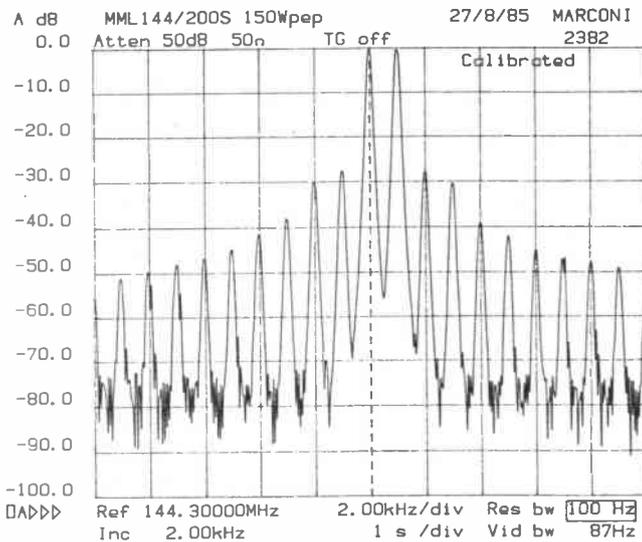
One or two failures have been reported in the States, but I do not know how many, if any, have failed in the UK. These experiences are a warning to avoid too much compression on SSB if you are using the linear at full power, although

FM should not be a problem as there is no difference component. MM has now agreed to change the electrolytics which blew up from a 100mA rating to 1.2A, which should avoid the blowing up problem in future. I liked the styling of the linear, and interconnection is simple.

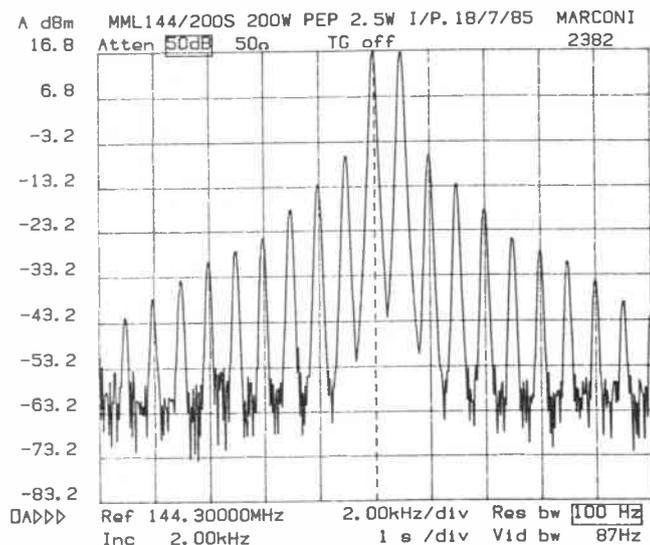
# G3OSS TESTS



Two-tone IM plot at 200W PEP for only 1.2W PEP



Two-tone IM plot with clean 3.6W PEP drive giving 150W PEP output. Note too much gain and excessive high order products



Two-tone IM plot at 200W PEP output, 2.5W PEP input on 2nd sample after explosion. Note decreased gain and improved IM products

## Laboratory tests

The typical dc current drawn when the linear is giving full output power is 28 to 32A, depending on whether the driver stage is in use or not. On looking at all the two-tone plots, I think you can see that even with only 1.2W PEP input drive on

the 3W input range the output at 200W PEP shows very high order products, which would cause some very noticeable spreading.

With the drive increased to 2.2W, well below the manufacturer's input rating, the low order products are high, and 5th,

7th, 9th and even 11th order are not reducing fast enough. When the linear was driven on the 25W range the lower order products at 15W PEP drive were reasonably good, and high orders were a lot better than on the more sensitive ranges, but there was a deterioration in spreading with 25W PEP drive.

## Sensitivity

The input SWR on all sensitivity ranges was 1.33:1 or better and this did not degrade when the linear was switched off, showing the relays and internal wiring to give an acceptable match. The sensitivity for full output of G6TLI's sample was just a little closer to specification than the main review sample was, and the manufacturers have agreed to redesign the input attenuation to produce less gain, which should result in an improved spreading characteristic. However, I am deeply concerned about the rather high levels of high order products, even at low drive levels (see 300mW drive plot).

The overall frequency response of the pre-amp section is shown, and surely 17dB gain is excessive here, as is a gain which is still an average of 4dB at 120 and 170MHz. Earlier samples, including G6TLI's, had a gain of 10dB at 120/170MHz, which is ridiculous.

The pre-amp's input intercept point measured extremely well for a single GaAsfet at +2dBm, but you will have to bear in mind that the 17dB gain will mean that your rig's intercept point will deteriorate by 17dB, and so the system performance will depend virtually entirely on that of the transceiver. The input sensitivity measured approximately a 1.5dB noise figure, which is good. We noted only 0.5dB loss between input and output sockets with the linear switched out.

## Conclusions

We measured this unit three times over. In fact G6TLI's sample was actually better than the second and third ones, which were both the main review sample. I am most disappointed that, judging by the samples tested, the linear could cause considerable spreading in the two more sensitive ranges, but if you are going to use SSB at 15W input or less into the least sensitive range, the performance should be satisfactory.

If you want to use the linear for FM, then any of the ranges should work well, but you should remember that you will be exceeding the licence regulations for maximum allowable power output, unless you have at least 3dB co-ax cable loss! I feel that the manufacturers still have some work to do in order to improve linearity, and tests with single carriers at various input levels soon proved that there was considerable compression coming in above fairly low power levels.

I can recommend the linear for use on FM on all ranges, but you might have problems with your neighbours on the band if you use it for SSB on the two more sensitive ranges.

# BNOS LPM50-10-100

## 50MHz linear amplifier

Now that the 50MHz band is virtually upon us I felt it appropriate to review this product, which offers a very useful performance and which can be highly recommended for the band.

At the beginning of the year I reviewed both the Icom 50MHz transceiver type 551 and the muTek 50MHz transverter, and last month I reviewed the trio TS670 transceiver which also includes the band. All these units give only 10W output or so, but you will need 100W on SSB if you are going to make a serious impression on the band.

This new BNOS linear includes an Rx pre-amp, which can be independently switched in or out with a push switch on the front panel, additional switches selecting linear on/off and SSB or FM hold time when RF sensing is being used.

A row of seven LEDs indicate power output and an eighth comes on if there is any overload condition. LEDs also indicate linear, pre-amp on and the selected hold mode. A large heatsink covers the entire top of the chassis, and the linear is supplied with a mobile mount allowing it to be suspended.

Input and output connections on the back panel are SO239, and a 3.5mm jack socket is fitted for external PTT interconnection. Unlike the very low impedance PTT line on the Microwave Modules linear, this BNOS is of very high impedance, thus requiring only 380µA of current to pass through to switch the linear over to Tx. This is an infinitely better design and should be far easier to interface. The two 13V power leads pass into the back panel with a locking grommet and are fused at 15A in the positive lead, the wires being fairly thick and twisted together.

The PA device is an MRF492, and the Rx pre-amplifier is a BF981. The review sample drew 12.5A maximum on transmit, but BNOS's specification allows for more current than this on some samples.

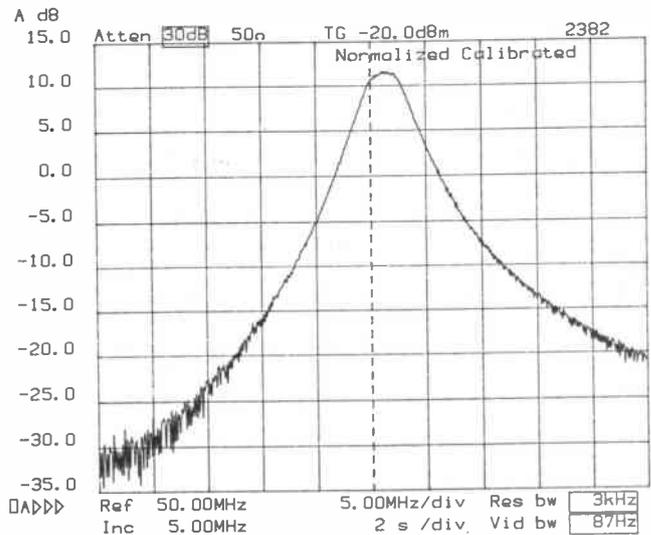
### Subjective tests

A few of these amplifiers are already in use in the UK by special licensees who have found them most effective. I used the review sample with the Trio TS660 and found the performance to be excellent, no reports of spreading being given and the transmitted quality hardly varying when the linear was switched in and out.

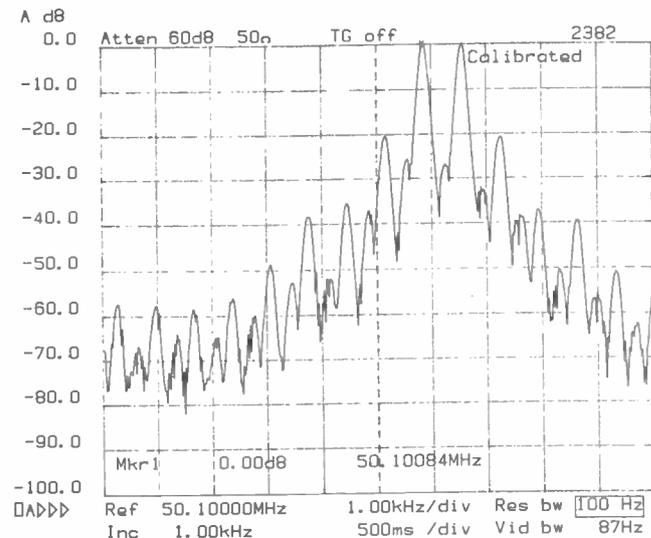
The pre-amp worked well and improved the system noise figure quite appreciably, although as the band is slightly noisy anyway the TS660 is almost sensitive enough on its own, especially if one is using a beam antenna. The ergonomics are excellent, and this model seems to be very reliable. The Tx hold time on SSB was, as usual, a little too short, but you can make this longer quite easily by increasing the time constant of the hold circuit.

For all the main measurements of the linear we used the Trio TS660 as a drive source, with the linear output feeding through a dummy load attenuator to the Marconi spectrum analyser. The first plot

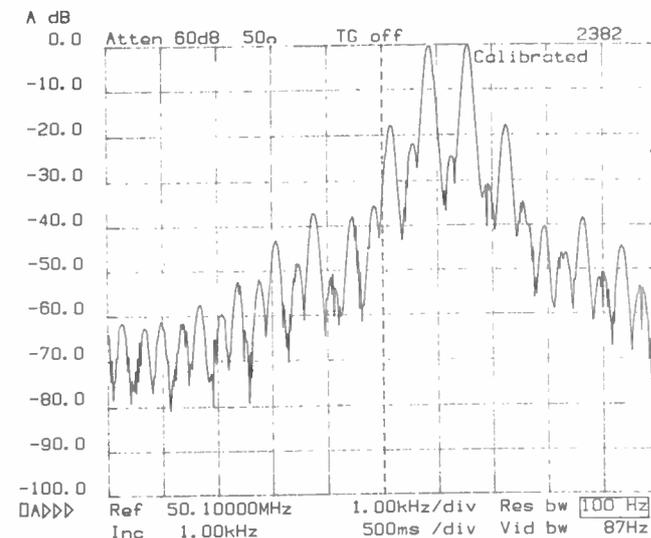
*Rx pre-amp gain plotted against frequency*



*Two-tone IM plot showing performance at just under maximum output*



*Two-tone test showing IM performance at maximum output with 10W PEP drive from Trio TS660*



## G3OSS TESTS

shows the overall system performance at 95W PEP output, and you will see that the high order distortions are falling down quite reasonably, and much faster than on the Microwave Modules machine.

We took another plot at 110W PEP output, using the full 10W drive from the Trio and found all the products were around 3dB worse, which is quite normal. Note that on the plot there are some audio intermodulation products caused by the Trio driver.

I thought it important to check the linear at a lower drive level, and we used a Marconi 2117 linear RF power amplifier fed by two signal generators. The second plot shows the overall intermodulation developed at 54W PEP output, from which you can see that at lower drive levels the linear is surprisingly clean. When the linear was switched off we noted only a very small through loss of around 0.25dB, and no input matching problems were encountered, showing a good input SWR.

The Rx pre-amp had a gain of 12dB in-band at 52MHz, falling to 10dB at 50MHz and around 53MHz. Unity gain was reached at 47 and 57MHz. You can see from the plot of the gain and response that the BNOS bandwidth is much less than the Microwave Modules one, but of course the frequency is much lower. Even so, the Q of the circuit is higher, which is highly desirable, thus keeping



strong out of band signals from seriously degrading the subjective intermodulation performance.

The input sensitivity was excellent but the input intercept point was disappointing at  $-12\text{dBm}$ , for it should have been some 12dB better, and BNOS have promised to look into this and correct it. We took a look for second harmonic distortion from the linear when running at full power, for unfortunately this harmonic falls at 100.2MHz in the middle of band 2. Under normal conditions our reading of  $-58.5\text{dB}$  would be completely acceptable, but in this case I think we need better rejection. Accordingly, BNOS have now designed a high power

low-pass filter which gives a very considerable second harmonic rejection with only a very small through loss, which I strongly recommend.

### Conclusions

I very strongly recommend this linear, which sets a very good example of a good solid-state linear performance, although the Rx pre-amp intercept point should have been a little better. Once the band is opened up, this linear will undoubtedly become very popular and should help keep the band clean. You will need a power supply for it, capable of delivering at least 15A to be sure of avoiding current limiting or trip out.

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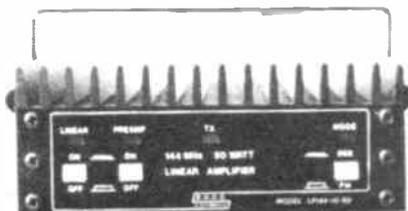
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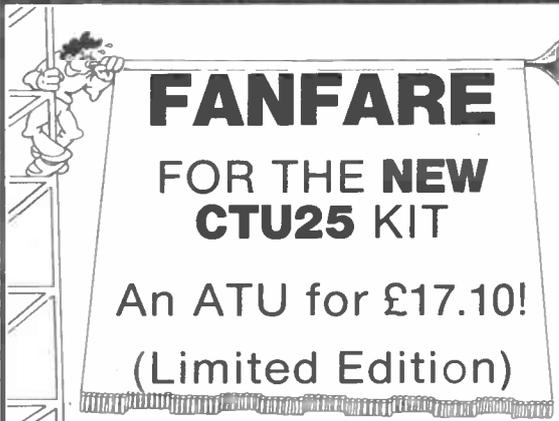
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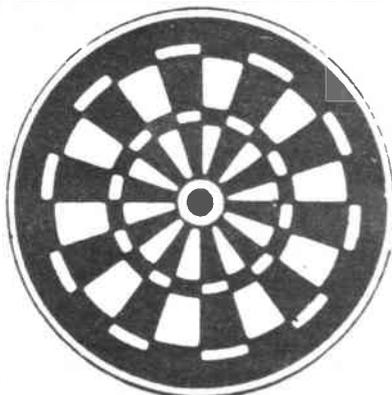
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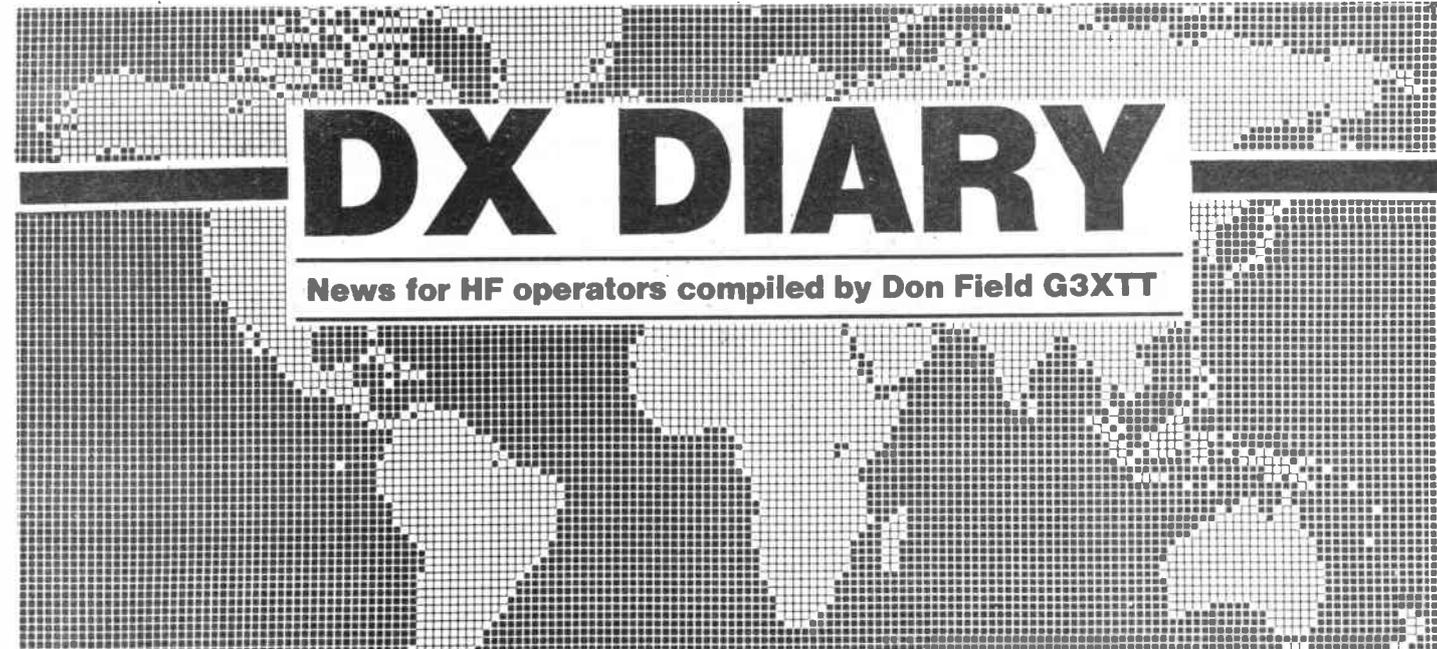
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# DX DIARY

News for HF operators compiled by Don Field G3XTT

I write this column in the aftermath of the CQ Worldwide DX Contest. As always the contest generated a lot of activity on the bands, and many amateurs will now be faced with the tedious task of writing up the logs and mailing them to the USA before the deadline.

For those who went on DXpeditions there will also be the job of replying to the hundreds, sometimes thousands, of QSL cards which will be arriving in a steady stream. These various chores lend themselves to the ubiquitous personal computer, a device to be found in many shacks nowadays.

## Logs by computer

Using a computer for contest logs can be a great time saver. Once all the QSO details have been entered, the computer can be used to generate the contest entry itself in whatever format the organisers require. It can produce an alphabetical check log to enable duplicate contacts to be spotted and removed, it can calculate the score and it can even be used to generate sticky labels printed with the QSO details for QSL purposes.

Not very long ago it would have required a mainframe computer to handle anything other than the briefest contest log, but nowadays many home computers have sufficient memory to cope with hundreds, or even thousands, of contacts. Curiously, most of the published programs for contest scoring are written in BASIC, which makes them difficult for the non-program-

mer to tailor to his individual requirements.

A much easier way to generate your own program is to set the log-sheet up as a spreadsheet, a facility which comes as standard with many of the home computers currently available. The Sinclair QL, for example, supports ABACUS, and CP/M-compatible machines (such as the new Amstrads) can run Supercalc. I have also on occasion used a word processing package for contest logs; this happened to be one which also allowed sorting of lists into alphabetical order, essential for duping purposes.

There are many other uses for computers in the HF operator's shack. Most HF enthusiasts, for instance, maintain all kinds of lists; lists of countries and zones worked and confirmed by band, lists of QSLs sent and received towards various awards, lists of nets and schedules and much more.

All these lend themselves to being held on a computer for easy reference and updating. Again, very specific programs can be written in BASIC or other programming languages or, alternatively, a word processing or a database package (eg ARCHIVE, available for the Sinclair QL) can be used much more easily. A database package will permit sorting of the list by way of key fields (band, country, etc).

## Number crunching

A computer, of course, lends itself well to repetitive calculations, and can be employed for propagation

predictions, for calculating distances, bearings, sunrise and sunset times, and whatever else may be useful. One program available actually plots a map of the world and can simulate dynamically the effect of the earth's rotation on sunrise and sunset for any time of the year.

On the technical side, programs can be written for predicting and evaluating the performance of beam antennas, for calculating the parameters of an antenna matching network (valuable, for instance, when trying to match a short vertical on Top Band) and, of course, for circuit design purposes.

## Datcomms

A third area of use for personal computers is in data communications, whether by CW, RTTY, Amtor, SSTV or packet radio. Most of these are already in use on the HF bands, although the use of packet radio has been largely confined to VHF so far. Many articles have been published on all of these communications systems.

Unfortunately, unlike the applications I mentioned in previous paragraphs, these require an interface between the computer and your rig, which means having to build or buy some additional hardware. They also involve using the computer at the same time as the rig, which may lead to problems with mutual interference. It is a sad fact of life that radio transceivers and computers are often uneasy bedfellows, especially if the computer is in an unshielded plastic case.

Another communications application is the use of on-line mailboxes and databases for the sharing of radio-related information. The RSGB's recently introduced Databox is an example.

## The future

Despite the problems of interference, the future will undoubtedly bring a much greater harmony between the radio set and the computer. We are already seeing the emergence of so-called computer aided transceivers, and it may not be too long before our stations will be able to carry out QSOs without our intervention at all. I read a tongue-in-cheek article based on this idea in a copy of the American *QST Magazine*, published back in the 1950s.

It hasn't taken long for such fiction to be turned into reality. Indeed, AEA Electronics, who market the 'Doctor DX' program for the Commodore C64 computer, have now introduced a program called 'Doctor QSO', which simulates one side of a CW QSO by drawing randomly upon typical phrases such as: 'the rig here is an XYZ300'. Are we really so stereotyped and predictable in the information we exchange that we can be simulated by a machine?

## DX news

Enough of the speculation. Let me now turn to the very real and current world of the HF bands. First, I need to bring readers up to date on two items of news in my last column. ZL1AMO's operation from Tokelau Island was postponed until mid to late

November, and he may even be on the bands at the time that this issue appears. The trip was expected to take in Western Samoa as well.

## Pacific DX

While on the subject of Pacific DX, ZM8OY is now operational from Kermadec Island and has been heard in ZL2AAG's net on 40 metres in the mornings.

I also mentioned rumours of a Brazilian foray to Sao Tome. This may not have happened for the simple reason that a group of German amateurs got there first. In October DF3KX, DK9KX and DJ9ON appeared at short notice and were active for a fortnight.

A number of British amateurs were able to contact them on five bands (80-10). The QSL route is DK9KX for SSB contacts and DJ9ON for CW contacts. As with most German-organised expeditions, this operation was well run and easy to work once their operating schedule had become apparent.

## Tonga and Thailand

Ernie VK3DET and his wife Kim will be in Tonga from 25 November until 3 January. Although a holiday rather than a DXpedition, Ernie has been issued with the callsign A35TN and hopes to be quite active on the HF bands.

The Thai Radio Club station HS0A will be active in the CQ WW CW Contest at the end of November. One of the operators is German and has been asked to look out for European contacts on 40 and 80m.

## Flores Island

The Uruguay DX Group will be active as CV0U from Flores Island off the coast of Uruguay from 6-8 December. The

operation will take in all the HF bands, on CW, SSB and RTTY, and the QSL manager will be CX2CS.

This will be the first time the CV prefix has been used for 10 years, so this is a nice one for the prefix hunters. For Islands on the Air enthusiasts, the island has the reference SA-30.

## News from Sweden

SM5DQC is currently compiling a database of information about operations from rare countries (specifically, those which have been inactive for at least 10 years).

He has already done this for the Yemen People's Democratic Republic, collating callsigns of stations which have operated from there in the past, their present whereabouts, QSL managers, and anything else he has been able to find.

He intends to start on Libya and Afghanistan next, and would welcome information from any readers who may have operated from those countries in the past, or who have information which might be relevant.

SM0AJU will be active from Tanzania as 5H3BH during the CQ WW CW Contest at the end of November, and will also be operational on CW and SSB before and after the contest (he will be there until 2 December).

## Lundy Island

I have been taken to task by John Serl of the Lundy Field Society and a CB enthusiast for suggesting in my September column that the helicopter service to Lundy will be discontinued. Apparently it always closes down in the winter months, but recommences at the end of March.

John suggests that those interested in visiting Lundy, whether or not for amateur radio purposes, should contact the Landmark Trust, Shottesbrook Park, Maidenhead, Berks, (tel: (0628) 825925), for further details.

## Twelve metres

The Twelve-Twelve World-wide organisation has recently been formed for 24MHz enthusiasts. Presumably it will be modelled on the Ten-Ten group which has been going for many years.

More details can be obtained by writing to: Steve Walz, WA5UTO, Box 222, Cherokee, Oklahoma 73728, USA.

## Awards

Details of the Worked All Britain Islands Awards are now to hand. Contacts must be made after 1 January 1986, and should be with islands defined as follows: 'An island is a naturally formed piece of land lying off-shore from the mainland of Great Britain and Northern Ireland, including the Channel Islands, and which at some time is surrounded by sea. The construction of a man-made bridge or causeway does not negate the status of an island. The island must be named on the 1:50000 OS map'.

## No cheating

Where a group of islands is named on the OS map and individual islands are not, then only one of the group will count towards the award.

The basic certificate will be awarded for contacting (or, in the case of SWLs, logging) 25 islands. Endorsements will be available for 40, 50, 60, 70, 80, 90 and 100 islands. The cost of the basic award is £2, and a

stamped and self-addressed envelope must be sent when applying for endorsements.

All claims should be made on the official record sheet, available from: Brian Morris G4KSO, 22 Burdell Avenue, Sanhills Estate, Headington, Oxford OX8 8ED, on receipt of an SAE.

## Contests

December is a relatively quiet month for contests. Probably of most interest is the TOPS CW Club event, which is an 80m CW contest on 7/8 December, starting at 1800GMT on the Saturday and running for 24 hours.

The following weekend is the Spanish DX CW Contest, starting at 2000GMT on the Saturday and again running for 24 hours, and the ARRL 10 metre contest, which runs for the full 48 hours.

The latter is a splendid contest, at the peak of the sunspot cycle, but is much less interesting at times such as now.

Nevertheless, it should generate some interesting activity on the band, particularly from Africa and South America, which might not otherwise occur.

## Finale

That's it for this month. As always I am pleased to receive comments and queries from readers care of the magazine, and will always try to help where possible (for instance with QSL or contest information). If you need a reply it always helps if you are able to include an SAE, and when you plan that big operation for 1986 please ensure that *DX Diary* is the first to hear! A Happy Christmas to you all and all the best for 1986.

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# EDDYSTONE EB35

During the early 1960s the Eddystone Radio Company manufactured a series of radio receivers designed to meet the needs of the enthusiastic listener. One of these models was the EB35, a fully transistorised model using Mullard germanium transistors. This model was designed as an AM/FM broadcast receiver and at the time used components of the type normally found in professional communication receivers.

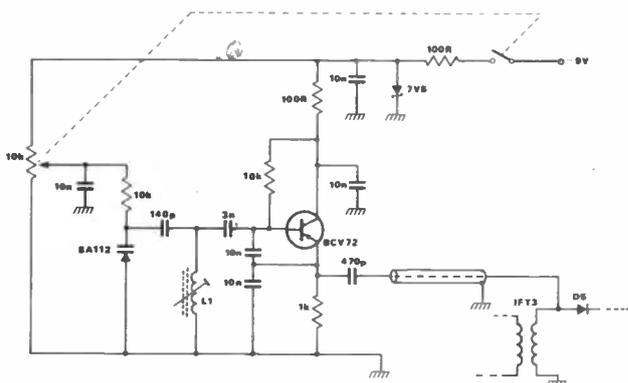
For its age, the performance of the set is good. The sensitivity is high and the set is also equipped with a number of additional features such as the broadcast VHF band. The radio covers from 150kHz to 22MHz in five bands, with a gap between 350kHz to 550kHz. Unfortunately the set was not designed to receive CW or SSB, which is a required if the radio is to be of use to the SWL.

This article describes a means of adding a beat frequency oscillator (BFO) to the receiver to provide reception of CW and SSB signals. The circuit described can be built and installed in a single evening at a cost of approximately £5.00. The pre-tuning adjustments provide flexibility so that this BFO can be used with a multitude of different receivers that have an intermediate frequency (IF) amplifier tuned in the range 450kHz up to 470kHz.

## SSB reception

Single sideband phone operation became popular during the mid-1960s, and extended the effective gain, compared with amplitude modulation, by up to 9dB. A transmitted fully modulated AM signal has two thirds of its power in the carrier and only one third of the power distributed in the sidebands. The sidebands carry the intelligence that will be converted at the receiver into an understandable signal. If at the transmitter the carrier is eliminated together with one side of the sidebands, the available transmitter power can be used to greater advantage. To recover the intelligence being transmitted the carrier must be reinstated at the receiver. This is usually undertaken just before the AM detector.

Fig 2 BFO circuit connected to the EB35



In the early days a BFO was used and its signal injected into the receiver detector at around the frequency of the last IF frequency to demodulate CW signals. In later receivers circuits have been designed for the demodulation of SSB. The disadvantage of the BFO approach is that the automatic gain control of the receiver will be activated continuously by the BFO signal, and will desensitise the receiver RF amplifier. Modern SSB demodulation is the reverse of the modulation methods used for generating an SSB signal in the transmitter.

A balanced modulator using two diodes in a bridge circuit is used so that when there is no audio signal injected into the bridge no BFO signal is released, and the receiver AGC system is not activated. When a signal is received the bridge is unbalanced and a demodulated signal is presented to the AGC system and audio circuit of the receiver.

## Model EB35

The Eddystone EB35 consists of an RF amplifier (TR1), a local oscillator (TR3) and a mixer (TR2), which is fed to the 465kHz IF amplifier (TR4 and TR5). TR6 is the AM detector which feeds the output audio stages comprising TR7, TR8, TR9, TR10 and TR11. The full circuit diagram is shown in Figure 1. AGC is obtained from the resulting audio output from the AM detector and is fed to the RF and IF amplifiers via an 8.2kohm resistor (R36).

The AM detector is connected to the secondary of IFT3 and comprises the rectifying diode (D5) and a low pass filter

(C93, CH1, and C76). During the alignment of the receiver the cores of IFT1, IFT2 and IFT3 were peaked for maximum output with a signal generator running at 465kHz connected to the receiver aerial socket with the local oscillator disabled.

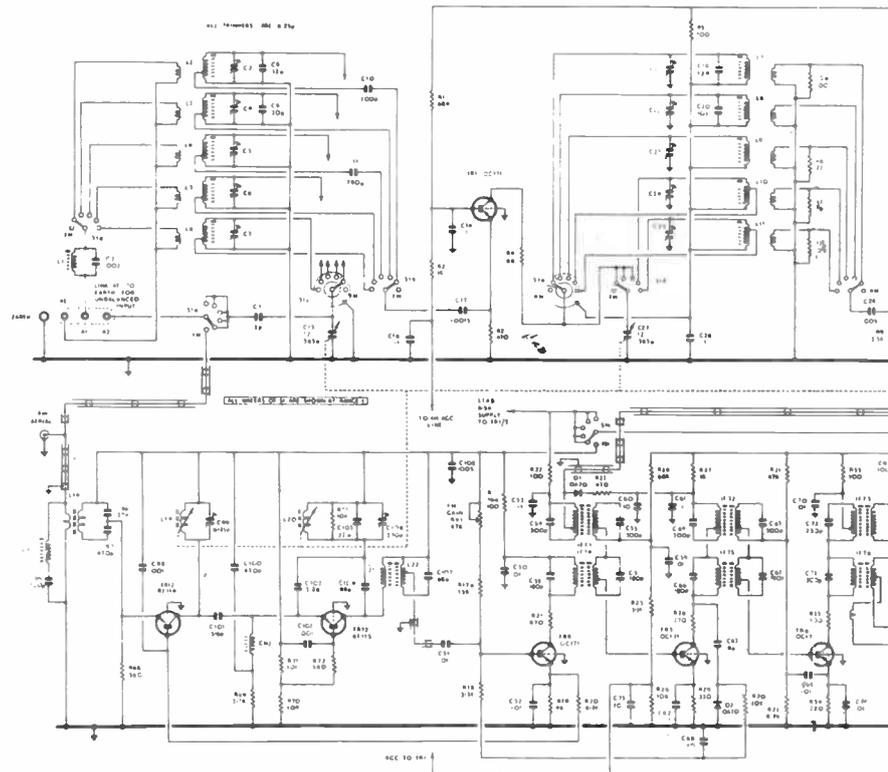
## SSB and CW demodulation

The author experimented with injecting a signal from a signal generator into the input of the AM detector. He found that the effect on the set AGC action was minimal. This method of demodulation was the simplest form, and if successful would avoid having to build a demodulator comprising a balanced mixer. The simple demodulator only now requires a stable BFO, the signal of which will be injected into the cathode of the rectifying diode (D5).

Another problem confronting the author was how to achieve the tuning of the BFO without having to drill holes in the front panel of the receiver. The least important functional control on the front panel of the Eddystone EB35 is the tone control. From the circuit diagram shown in Figure 1, the tone control circuit consists of a simple RC circuit comprising C94 and RV2. If the tone control potentiometer is removed it can be replaced with a fixed 4.7kohm resistor, which will be equivalent to the tone control being in mid position. The hole left in the front panel can now be utilised for tuning the BFO.

It is important, if SSB is to be demodulated successfully, that the frequency generated by the BFO must be

Fig 1 The receiver circuit diagram



# Construct a BFO for CW and SSB reception

by Roger Alban GW3SPA

sinusoidal and stable to avoid the continuous resetting of the BFO tuning to counteract drift. Where possible it is wise to use temperature stable capacitors where drift compensation is required. Among the best low cost capacitors available to the amateur are the dipped silver mica and polystyrene varieties. The BFO tuning coil should be mounted rigidly and be of high Q.

Whenever possible the coil should be without a ferrite core, as temperature changes will affect the permeability of the core material. If a variable capacitor is used as the means of tuning the BFO then it should be mechanically stable and of high quality. If a transistor is used as the active element of the BFO it should have an Ft considerably higher than the operating frequency of the BFO; this will ensure that the phase shift within the transistor is minimal.

The small signal beat of the transistor should be high to ensure that the feedback is sufficient to maintain oscillation. The lead lengths of components should be kept as short as possible to prevent the operating frequency from shifting when the leads are vibrated or moved. It is also essential to ensure that the operating voltage of the BFO is regulated and well filtered. In most amateur circuits a Zener diode regulator is used.

## Colpitts oscillator

Perhaps the most common oscillator circuit used is the Colpitts. This circuit has split capacitors forming part of the tuned circuit to provide feedback to

maintain oscillation. The circuit finally chosen by the author is shown in *Figure 2*. The tuning of the Colpitts oscillator is achieved by using a capacitance diode. This provides flexibility with the mounting of the BFO oscillator board within the receiver, as the tuning control can be remote from the PCB. However, if a variable capacitor had been used the PCB would have had to be mounted close to the variable capacitor, which is attached to the front panel.

In the EB35 there was not sufficient room behind the front panel to mount the BFO PCB, hence the use of a capacitance diode solution to solve the problem. The BFO is fed from a 7.5 volt stabilised supply produced by a Zener diode. The tuning coil (L1) is wound on a Radio Spares coil former, No. 228-090, together with a ferrite core, No. 228-107. One hundred turns of 36swg wire were closely wound on to the coil former.

The circuit was constructed on Veroboard and the layout of components is shown in *Figure 3*. The output from the BFO is taken via a 470pF capacitor and thin coaxial cable to the cathode of the rectifier diode (D5) on the receiver main PCB. The BFO tuning potentiometer was electrically connected to the BFO PCB using ordinary stranded wire.

It is advisable to have an on/off switch associated with the tuning potentiometer, so as to be able to switch the BFO on and off without the need of any additional switches. The oscillator PCB was firmly attached to the receiver chassis by two self-tapping screws.

## BFO alignment

With the BFO switched off and the set connected to an aerial, tune the receiver to a strong CW signal which can be heard in the loudspeaker as a loud thumping type of noise. Switch on the BFO and adjust the front panel tuning potentiometer until it is at mid range. Adjust the ferrite core of the BFO tuning coil (L1) until a zero beat is obtained with the incoming CW signal.

Allow the receiver to warm up for approximately five minutes to allow the local oscillator and BFO to become stable. Readjust L1 if necessary to obtain a zero beat with the CW signal. Switch off the BFO and retune the receiver to the amateur 80 metre band, looking for a strong SSB signal. Tune the receiver for maximum loudness of 'splatter' from the speaker.

Switch on the BFO and carefully adjust the tuning control on the front panel to demodulate the incoming SSB signal. On 80 metres, the SSB signal will be on the lower sideband. Mark the position of the BFO tuning control with a piece of self adhesive paper. Repeat the same exercise for the 20 metre amateur band. This time the SSB signal will be on the upper sideband. Again mark the position of the BFO tuning control to simplify the quick selection of either USB or LSB.

## Conclusions

Although the BFO was designed to be used in the Eddystone EB35, the vast majority of broadcast receivers manufactured during this period were designed with an IF frequency of either 455kHz or 465kHz and are suitable to be used with the BFO circuit described in this article. By using a capacitance diode to tune the BFO the PCB mounting position is more flexible.

On SSB the receiver performance was very good, even local strong signals being resolved without the use of the RF gain control, which is not included in the EB35. There were no apparent drift problems when the receiver had settled down after a period of ten minutes use. The addition of the BFO circuit has provided an inexpensive way for the keen short wave listener to explore the amateur bands.

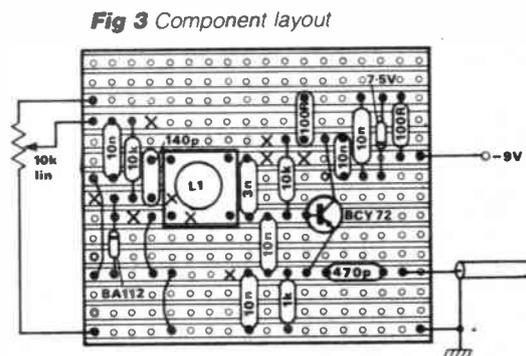
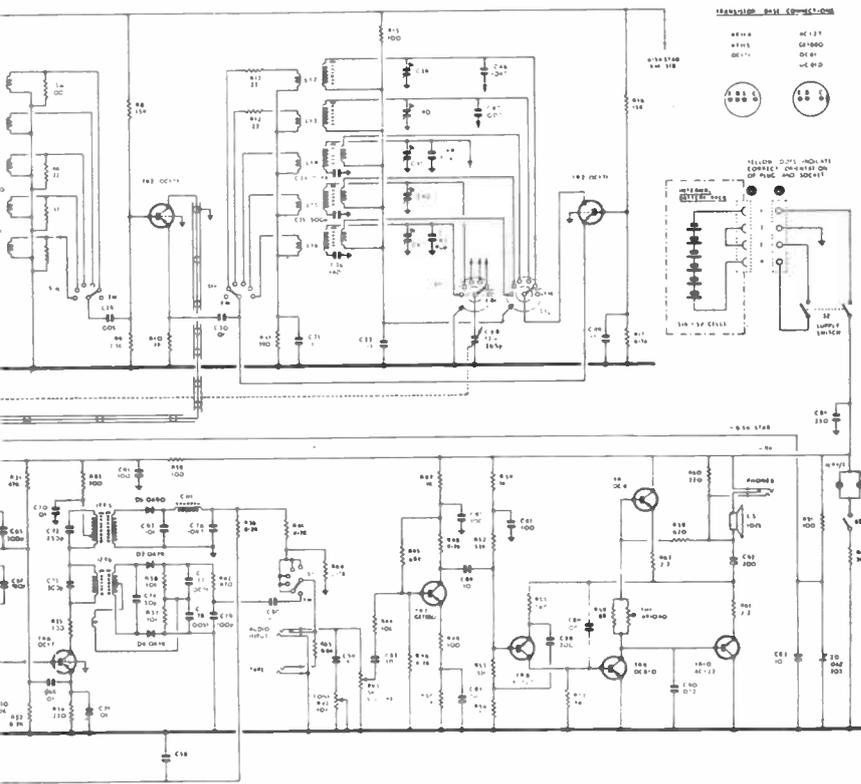


Fig 3 Component layout

# SHORT WAVE LISTENER

TREVOR MORGAN GW40XB

September turned out to be a very mixed month, according to reports received from readers, with some very good DX to be worked – even up on ten metres, which made a real change from the previous months. Some nicely positioned high pressure zones found their way over the Atlantic and gave some very good operating conditions, so listening actually became a pleasure on occasions.

These conditions gave our inveterate prefix hunters a field day and some of those lower down the scale suddenly found their scores mounting quickly...so to the awards.

## Ladies first

First in the frame is Sue Squibb BRS47568, who sent in a very neat computer list of her prefixes for a claim for Bronze and Silver in one fell swoop. From her QTH in Teynham, Kent, Sue captured 1Z9A, 3A2, 5B4, 6Y5, 7P8, 7S2, A99A, AE3T, BY1, CZ2, HH9, HS0, T77C, ZS6, and lots of nice catches for her 604 so far. Congratulations, Sue. You can read more about our Sue in the January issue!

Next in line is Gordon Blackney of Lowestoft, with his claim for Silver using a new Trio R600. Gordon, grieving over the demise of his old Rascal, has now put up an outside random wire fed via an ATU, and it certainly seems to be doing the job. He r v threatens me with an all CW claim as the dits and dahs are making sense! AF2, CX5, HK4, J28, LU7, PZ1, TI2 and 9Y4 featured in his claim.

Chris Foreman G17113 gets into the act again with a claim for Silver. With 5B2, 8R1, 9X5, AP2, HP3, T77C, ZB2 and ZS6 amongst the list, Chris spent most of August with the phones over his ears so had a well deserved month off after he'd put the claim in.

Chris queried how the award claims were progressing, so for all of you here are the figures so far: Bronze awards, 41 claims; Silver awards, 12 claims; and Gold awards, 3 claims. Only three

claims have been received from licensed amateurs, these being for CW working only. So, if there are any licensed operators out there who want a challenge...here it is!

Certificates are available for working 250 and 500 prefixes and a very nice engraved plaque is available for working the 1,000 prefixes. Claims to me, please, at: 1 Jersey Street, Hafod, Swansea SA1 2HF.

Next, to Eddie Brown of Wellingborough who frightened the life out of me by sending an extremely large parcel wrapped in nondescript brown paper (surely no one had that much of a grievance?! As was revealed by his subsequent letter, it was just his log book (phev!).

So to the contents. Eddie has developed his own form of log keeping, with colour coding for the frequencies the stations were heard on and separate sections for each country heard. Congratulations on getting the Bronze, Eddie, and I feel sure your FRG7 will serve you well.

## Name in print

A M Banthorpe of Hitchin gets his name into the awards with his 274 prefixes for a Bronze award. Using an AR88D with an ATU and long wire he offered A71, CX2, J42, 5B4, 6K5, 9Y4 and a nice mixed bag for the total. He also mentioned the Gozo (Maltese Island) net on Sunday mornings around 14280MHz at 0630-0800, which is worth a listen.

Logging 78 countries on the bands since January 1985 shows that the AR88D is still as good as it ever was. Congratulations!

Peter Caldwell of Sheffield is in line for a Gold soon as his Silver claim is in with plenty of time to squeeze in the Gold before the end of the year. Peter offered 1A0, 5Z4, A92, AC3, HH2, HK1, HW5, 8Q5, 9U5, M1C/T77C and included no fewer than 86 special event call signs in his batch! Peter is also chasing the Russian Awards and only needed

a couple for his Victory 40 at the time of writing.

Anyone using RTTY or CW reader programs on the Spectrum may be interested in a peculiar problem that Peter is experiencing. Apparently, the programs run fine until he aborts when the Spectrum does a funny on him, and all he gets is a black and white bar pattern with the odd coloured pixel. As I told Peter, I had a similar problem when the Spectrum was cold and when switched on I got a peculiar pattern on the screen. This cleared itself when the computer had warmed up a bit. Most peculiar! Anyone out there got a comment?

## Featured listener

This month's featured listener is Den Merriott BRS50367, of Bexley Heath in Kent. Den and his son, Gary, started their listening in the autumn of 1981 with a Grundig Satellit 1400, but the limitations of this receiver were soon realised and, in 1982, a Trio R1000 found its way into the shack and has served the duo faithfully to date.

Their aerials, consisting of a 60ft end-fed and a half-sized G5RV, are fed through a 'George Dobbs Special' antenna tuner. At a young 55, Den is a site agent during working hours and his spare time is spent at the local ballrooms and the British Legion where he is Standard Bearer, which enables him to travel to parades in Belgium and the UK. His interest in radio came at an early age when his father used an accumulator powered valve job in the '30s.

As with most listeners, Den has an old timer pal, in this instance G6HD, who has been instrumental in stirring up his interest – especially in CW, which G6HD calls 'the civilised way of communication'. Den obviously enjoys digging around HD's shack and his home-brew equipment!

Gary has now had a carrot, in the guise of a 2 metre rig, dangled under his nose to encourage him to take the

RAE, so it looks as though the dining room is going to be used more for matters other than eating...unless the prettier member of the junior Merriotts vacates her room!

## The mailbag

So to the mailbag, and with over thirty letters coming in to No 1 over the past month, the typewriter finger is feeling the strain! Firstly, my grateful thanks to those very kind listeners and amateurs who sent donations to the GB2WFF Ethiopia Fund. Piles of IRCs, postal orders and stamps were coming in from readers before the station came on the air! At the time of writing there are still four weeks to go before the off so I don't know how many listeners and amateurs are going to take part, but it looks good. My thanks also to the RSGB, who have supported the scheme wholeheartedly. The final outcome will be published as soon as possible after the event.

From East Finchley comes a letter from Michael J Heels asking when the Prefix Award scheme ends. Well, Michael, the answer to that is simply...when I run out of claims which, at the present rate, will be in the distant future!

The starting date for the scheme was January 1985 and is on-going. There are plans in hand for other awards too, so keep taking *Amateur Radio* for the latest info. By the way, thanks for the IRCs, Mike.

## Dots and dashes

Philip Davies of Market Drayton has got himself a Microwave Modules MMS2 Morse trainer, so is now concentrating on the dots and dashes. Having gained his Silver award, he is chasing for the Gold and reckons there are a few new prefixes roaming around the CW ends of the bands.

Philip comments on a report elsewhere that the 40 metre band was useless due to broadcast interference, but with his 25 year old Eddystone 840A he's listed 350 odd prefixes on this band,

including TU2, 6W1, TZ6, ZL2, VK6, CO2/6/7, T42, VP9 and a multitude of other meritable catches.

On 23 September he heard both sides of a perfect QSO between 6Y51C and VU2CVP at 0238BST with R4-5 on both signals... and *no QRM!* By the way, see if you can catch IT9CGL on 20 metres calling itself a 'computer station' complete with synthesised voice!

Mike Hudson is still in the chase with the prefixes and warns me that he now has over 800! From his new QTH in Canterbury he is opening up the new station with his 9R59DS (away from the sea he had at Folkestone) acting as a ground plane, so we wish him luck in his new home.

Tony Ashton enquired about the Prefix Award after obtaining a Codar CR7OA (I had some fun with mine years ago, Tony), and has been bitten by the bug. Tony is hoping to make a preselector for the receiver but there are a few PR40 preselectors on the secondhand market (I saw three at Longleat at a fiver each), so perhaps one of these could be obtained. Good luck with the listening and the award chasing.

**Queen's Scout**

Pete Oliver writes to ask about the GB2RS award. Pete RS85097 is an ex-Scout leader and Queen's Scout, and is now an ardent SWL. Hoping to get in on the award hunting, Pete is a regular *Amateur Radio* reader. Thanks for the IRCs, Pete.

Tony Blackburn RS87156, of Stratford on Avon, is still chasing the Gold award and is up to 800 at the last count! Having changed QTH to the

Fire College at Moreton in the Marsh, Tony is finding the listening conditions somewhat different. 'Can't hear a thing', he moans, but what he does hear does seem to be 'different'. Another pile of IRCs were gratefully received.

**Slipped up**

Eddie Brown slipped up on the Prefix Award rules and thought the special event calls were excluded. No, Eddie, genuine special event calls are OK, but beware of the pirates and 'queer' call-signs. I remember logging a funny one some years ago who was chatting quite happily with a number of amateurs under the call 003/7E, and turned out to be the radio operator on a freighter off the coast of Brazil!

Eddie uses his FRG7 with a 60ft end fed lying across the roof of his semi and that of his neighbour, who has the nasty habit of using his lawn mower just as that exotic DX station gives his call-sign (ain't it always the same?). The ATU is a very old 'Joymatch', originally made for use with the 'Joystick Variable Frequency Antenna' that was mentioned a while ago in this column.

One mention of the listeners' bureau which was started up some time ago. Mail is being received, as arranged in the rules, and a lot of letters have been forwarded so it looks as though the idea has caught on. As an illustration of the use of the bureau, I had a letter from David Howes, who was experiencing problems with a newly acquired FRT7700 tuner. As I had not used one of these myself, I looked up one of the members who had a tuner of this

type, namely Peter Cardwell, who was able to telephone David and help him.

Most of the enquiries are dealt with directly so I do not actually know how things go. In fact letters are forwarded sealed as received, so I do not know the contents, but the quantity of letters being forwarded shows that the system is working.

If any readers are interested in exchanging information or just helping those without experience, please let me know so that I can put your name on the list. No addresses are published.

A very nice letter was received from Keith Jackson of Radio Berlin International who has asked for details of the bureau for future mention in their broadcasts and *DX News Sheet*. He also forwarded a few copies of the *RBI DX Bulletin*, which contained some very interesting propagation information, an article on coronal holes and their effect on propagation together with general club news.

**Technical QSL**

There was also a mention that the RBI will be issuing a new 'Technical QSL'. As they say, 'it stands every chance of becoming the most comprehensive vade-mecum of abbreviations in common use from the many fields of telecommunications'.

Certainly, it represents something different in the attitude of broadcast stations to the listener.

The RBI DX Club broadcasts in ten languages on alternate Mondays on medium wave 1359kHz, and on short wave from 13-49 metres (listen around).

Once again the White Rose ARS is presenting its Short Wave Listeners Contest. This is the sixth lower frequency band contest and is being held from 1200GMT on 18 January 1986 for 24 hours. The contest is world-wide and there are separate sections for CW and phone. No mixed entries please.

Bands are 1.8, 3.5 and 7MHz, and the full rules can be obtained from: David A Whitaker, 57 Green Lane, Harrogate, N Yorkshire HG2 9LN. This club promotes contests for short wave listeners throughout the year and it would be nice to see some of our readers among the winners. Why not give it a go this year?

**Sad news**

Sadly, I have just received news from G4UKJ (Derek) that Geoff Newman, manager of the GB Special Event Bureau, has passed away. Geoff was one of those people who are little known in the amateur radio world, having worked quietly in the background receiving little praise for the hard work he did, which was only appreciated by those who used the bureau.

It's a bit late now to say thanks to Geoff, but I'm sure that I echo the wishes of all amateurs and short wave listeners in offering condolences to his family.

Well, that's it again for yet another month. To all of you I wish a Merry Christmas and good fortune for 1986. Thanks for the masses of letters, award claims, QSOs and offers of assistance you've given me over the past twelve months... it makes it all worthwhile!

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# SUPPRESSING VEHICLE INTERFERENCE

by Roger Alban GW3SPA

Having recently converted a CB set for use on the 10 metre amateur band, I decided to install the set in my ever trusty five year old BMC car. It was only after having connected the set into the car that it was appreciated what a noisy environment a motor car is. It was soon realised that if satisfactory mobile operation was to be achieved something would have to be done to reduce the noise generated by the many electrical items used in the vehicle. It also soon proved evident that hanging large values of capacitance from various pieces of electrical equipment in a vain attempt to cure the problem was not going to work.

It was therefore decided to abandon mobile working for the time being and examine the various text books to determine a satisfactory means of solving the problem. This article has been written as a result of the experience obtained in suppressing vehicle electrical noise.

## Back to basics

Every time a contact opens, or for that matter anything changes or interrupts the flow of electric current, the changing magnetic field cuts other conductors in the cable harness and induces unwanted interference currents which can find their way into the mobile radio via the power supply lead. When a contact carrying current opens a spark usually occurs across the opening contacts causing electromagnetic energy to be radiated, which in turn finds its way into the mobile radio via the aerial socket. Interference will also be transmitted along other conductors forming part of the vehicle's electrical system.

The energy radiated as a result of a spark is broadband and can cause interference at very high frequencies which include VHF and UHF. Re-radia-

tion can also occur from associated metalwork belonging to the vehicle body or mechanical parts. A good mechanical connection between two pieces of metal does not necessarily mean that you also have a good electrical connection. For example, at a high frequency a bonnet lid hinge will appear to be a perfect insulator. At a frequency of around ten metres, the resonant quarter wave length is approximately 9ft. A length of exhaust pipe or bonnet lid becomes a good re-radiator.

All vehicles manufactured in the United Kingdom must comply with regulations concerning the levels of interference. These regulations are designed to ensure that there is the minimum of interference to domestic radio, television and radio communications from vehicle ignition systems. To achieve these minimum suppression requirements resistive type (carbon impregnated) high tension cables are usually fitted on present day vehicles; the earlier regulations were often met by using a resistive brush in the distributor cover. In the author's case the interference problems had been made worse because a home-made transistorised ignition system had been fitted to the car earlier to improve the engine characteristics of the vehicle.

## Logic system order

Before embarking on a witch hunt, take one step backwards and check the installation of the mobile radio system. Ensure that both the radio chassis and the aerial fixing base are securely bolted to earth, ie the metal part of the vehicle body. Clean away any paint or underseal so as to give a good metal-to-metal contact between aerial mounting base and vehicle body.

In the case of a new vehicle, paint or

underseal may have to be scraped away. In older vehicles, corrosion may have formed around the aerial fixing and the metalwork will need to be cleaned with a wire brush. Having made these preliminary checks we now need to establish if the interference is aerial borne or via the electrical supply to the radio, or both.

## Supply interference

Park the vehicle in such a position that the radio will not be affected by any external interference, such as fluorescent lighting etc. Disconnect the aerial from the radio and attach a 50 ohm dummy load to the aerial socket. Turn up the RF gain and volume controls of the mobile radio. With the engine switched off, switch on and operate the various pieces of vehicle electrical equipment, such as wipers, washers, heater motor and direction indicators, to establish those items that are causing a problem. It is interesting to note that when a 60 watt tungsten halogen lamp is switched on from cold it can produce a peak current surge of around 70 amps.

The cable harness feeding power to the bulb is asymmetric, ie the cable carries current flow in one direction only (see *Figure 1*). The return path is via the car metal bodywork. This means that in the case of cables carrying abrupt changes, or interruptions in current flow, a counter magnetic field does not exist (as would be the case in a tightly twisted pair of wires) to cancel the magnetic field surrounding the cable. It is therefore free to radiate and the cable will behave like an aerial.

So, the best place to install any form of interference suppressor is close to the source of interference. The interference suppressor is likely to comprise a simple inductance and capacitance network forming a low pass filter.

Fig 1 Current distribution in cable loom and metalwork

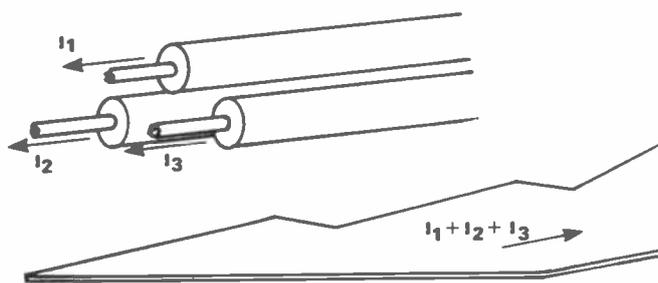
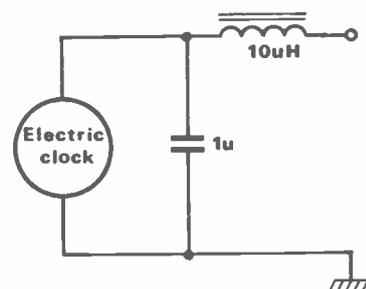


Fig 2 Suppression circuit for electric clock



# VEHICLE INTERFERENCE

## Electric clock

With the ignition turned off, you may find you can hear a regular ticking noise from the loudspeaker of the radio. The most likely cause of this interference is an electric clock fitted in the vehicle. Connect a  $1\mu\text{F}$  capacitor between the clock feed and earth, and fit a  $10\mu\text{H}$  choke in the feed lead to the clock (Figure 2).

It is important to connect the LC low pass filter as close to the supply terminals of the clock as possible, to ensure that the supply cable does not act as an aerial and cause further interference problems.

## Windscreen washer motor

With the ignition turned on, or in the auxiliary position, press the switch to operate the windscreen washer motor. If a whining noise is heard from the loudspeaker then a suppressor circuit will need to be fitted similar to the circuit used to suppress the electric clock.

## Heater motor

If, when the heater motor is switched on, a whine or crackle is heard from the loudspeaker, a suppression circuit will need to be fitted. Again, an LC low pass filter will be fitted as close to the motor supply terminals as before. Some heater

motors are dual speed and will require both the motor supply terminals to be suppressed. The choke should have an inductance of around  $10\mu\text{H}$  and be capable of handling a current of approximately 7 amps to allow for surge currents when the motor is first switched on. The capacitance should be rated at  $1\mu\text{F}$ , 250 volts dc working.

## Windscreen wiper motor

The modern windscreen wiper motor is likely to be dual speed and have an automatic park facility built into the wiper motor. A typical circuit diagram is shown in Figure 3. It can be seen that the modern motor has five supply leads, each of which needs to be suppressed. Only the motor supply leads need to be fitted with an LC low pass filter. The terminals used for the automatic wiper parking need only be fitted with chokes. Again, the inductance of the chokes must be around  $10\mu\text{H}$  and be capable of handling a current of around 7 amps. The capacitance used should again be  $1\mu\text{F}$ .

To reduce vibration noise, the manufacturer will have mounted the wiper motor on rubber anti-vibration mountings, with the motor body not directly connected electrically to the metal body of the vehicle. It is advisable to connect a wire strap between the metal case of the motor and the vehicle body. The metal strap can be made from the outer braid of coaxial cable.

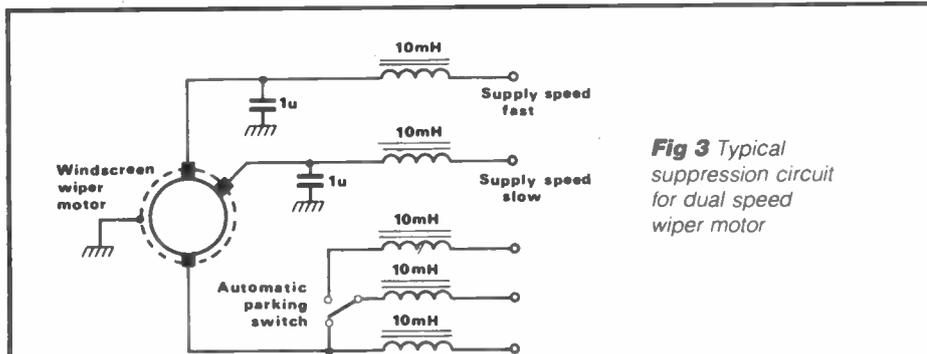


Fig 3 Typical suppression circuit for dual speed wiper motor

Fig 4 Suppression circuit for direction indicators

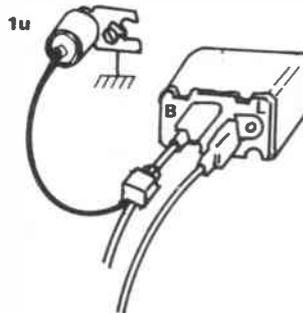


Fig 5 Suppression circuit for brake lights

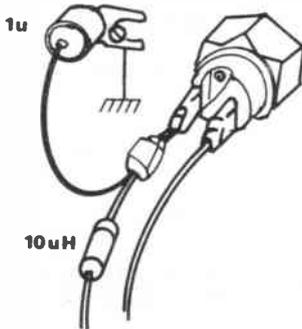
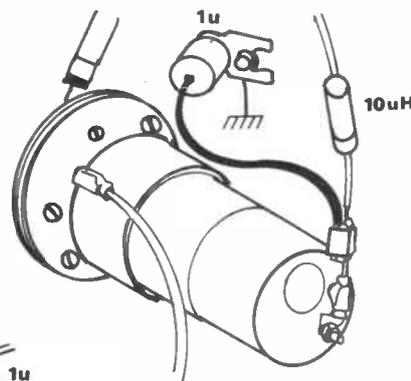


Fig 6 Suppression circuit for electric fuel pump



## Direction indicators

If a clicking noise is heard when direction indicators are operated, then a  $1\mu\text{F}$  capacitor should be connected between the terminal marked 'B' on the flasher unit and the vehicle body (see Figure 4).

## Brake lights

When the brake light switch is operated with the ignition switch on it may cause a clicking noise. A  $1\mu\text{F}$  capacitor should be connected between the feed terminal of the brake switch and car body to prevent this. If this does not completely cure the problem then a 7 amp,  $10\mu\text{H}$  choke must be fitted in the line feed close to the brake switch (see Figure 5).

## Electric fuel pump

If when the ignition is switched on a whining noise, crackle, or ticking noise is heard, then it is likely to be originating from the fuel pump. An LC filter will be required to be connected in the feed cable to the fuel pump as illustrated in Figure 6. A  $1\mu\text{F}$  capacitor must be fitted close to the pump supply terminals. A  $10\mu\text{H}$ , 7 amp choke should be connected in the supply lead close to the supply terminal.

## Alternator noise

The vehicle alternator can produce a 'whine' which varies in pitch with engine speed and power load. With the headlights on, for example, the interference increases. The increase in interference is caused by the alternator internal

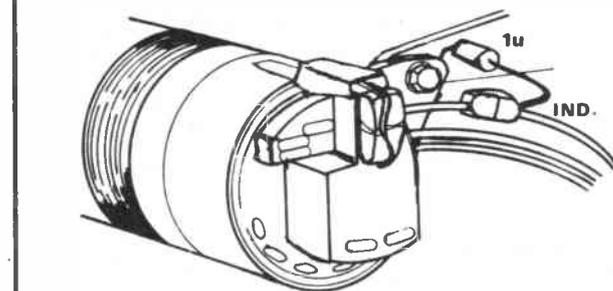


Fig 7 Suppressing alternator noise

## VEHICLE INTERFERENCE

voltage regulator, which produces a 'crackling' noise. The interference problem can be cured by connecting a  $1\mu\text{F}$  capacitor between the terminal marked IND, which is connected to the warning lamp on the dashboard, and earth, as shown in *Figure 7*.

In the situation of other alternators which do not have a terminal marked IND, but have an external regulator box, connect a  $1\mu\text{F}$  capacitor between the regulator positive terminal and earth. Whatever you do, *do not connect a capacitor to the field terminal*, as this will interfere with the voltage control of the output of the alternator.

### Generator noise

In older vehicles a dc generator will be found instead of an alternator. Direct current generators produce a 'sputtering' whine, which varies with motor speed. This noise is caused by sparking at the commutator brushes. As the brushes wear the interference becomes worse.

The interference problem can be reduced by connecting a  $1\mu\text{F}$  capacitor between the terminal marked D on the regulator box and earth. If this is not satisfactory, then you will have to connect a choke in line near the output terminal of the generator. The choke will

have to be handmade and wound, with the heaviest gauge coated copper wire you can find, around a ferrite core.

You should also remember that the dc generator is capable of producing an output current as high as 30 amps. Take care to use copper wire that is capable of handling this high current. Also ensure that the choke is well insulated and will not come into contact electrically with the metal body of the vehicle. It is wise to disconnect the battery before commencing work on the dc generator. This advice also applies to vehicles fitted with an alternator.

**Continued next month**

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# Club Talk

Glen Ross G8MWR, a well practised talker, reveals that there is more to organising a club talk than meets the proverbial!

## 'Right lads. . .'

'That seems to have brought us to the end of the notices. Don't forget the bar closes at 10.30 and Tim is still trying to cadge a lift to the rally on Sunday. . . er . . . where did you put that bit of paper? Never mind. . . we now come to the part of the evening you have all been waiting for. . . Hello, Fred, you're late again. You've missed all the best parts. Where was I? Oh yes. . . tonight we are having a talk on. . . (whispers. What the hell is he talking about, Charlie? Eh. . . what the devil is that? Oh. . . got it!).

'Right, the talk tonight is about switched mode RTTY (sounds interesting) and we are fortunate to have that well-known expert (Alec, what did you say his name was?) Jim Riddle G9VIP to tell you all about it. He's come all the way from. . . (Wake up, George. Where's he from?). Well, it's a long way so please show some interest - and don't forget the DF hunt on Friday'.

Sporadic applause as the speaker gets to his feet. 'Ladies and gentlemen, it. . .'

'Hang on a minute, mate. If any of you guys want another drink, get 'em now before the bloke starts his chat - right lad, away you go!'

## Sounds familiar?

I sincerely hope not! But the unfortunate fact is that something like that is all too common. It seems amazing that most clubs rely very heavily on the 'Club Talk' to keep the diary of events full, and yet so few of them seem to have any real idea about what it takes to get the system up and running in a smooth fashion.

Those of us who are cajoled into travelling long distances in all sorts of weather know how we would like to see it organised and perhaps the ideas that follow are worth having a look at.

## The choice

If you are going to get a good program of talks you have to put in a lot of thought about who you are going to ask. That sounds so obvious, but it is often considered from the wrong angle. Usually, from the club point of view, it is just a matter of filling the calendar, but let's look at it from the speaker's point of view. If he is a local man he will probably come anyway, but remember that one reason for doing a talk for you is to gain converts to his own particular interest.

It is no great fun to do a round trip of over 300 miles and then find yourself talking to six people in the bar of a pub, with the general public present wondering what is going on (as I have found). Do not expect a speaker to travel long distances if you cannot provide a reasonably sized group. If you really want that talk then perhaps you could think of getting together with one or two local clubs and making it a joint meeting.

## The booking

You have an idea that you might be able to get Jim Riddle to come and give you a talk so you send a letter saying: Dear Jim, would you come and give a talk to the Farflung Radio Club, yours etc. You then wait a week or so and are disappointed to get a letter turning you down.

The main reason your request was refused is probably because you did not tell the person enough information on which to make a decision. What could you have told him that might have tipped the scales in your favour? What night your club meets and the start and finish times of the meeting? Remember he needs to know how much travelling time is involved and some idea of the time he is going to get home. Always offer some definite dates to choose from because he will not want to get into correspondence sorting them out.

Tell him (honestly) the number of people who are likely to attend and if it is a joint effort with another club. Low numbers will probably not put him off coming but they could help to sort out how many hand-outs he needs to get duplicated. Always give a telephone number where you can be contacted and an alternative one if possible, as he may need some more information.

## Other details

Let's assume that you have arranged the date and time and that the booking is accepted; what next? This part of the job is usually overlooked completely by most clubs and yet is most important. Write and confirm the details and ask if the speaker has any special requirements to help give the talk.

If the talk is of a technical nature he will probably ask for a blackboard and chalk. Some clubs offer a 'flip chart' and pens but this is not usually so convenient because if you want to change part of a

drawing you have to start from the top and redraw the lot. Mention any other equipment that may be available, eg an overhead projector, tape recorder or public address system. It may save him the job of carting his own gear around.

Most important of all, arrange the payment of expenses and check what the amount is likely to be. The cost of a 200 or 300 mile round trip can be surprisingly expensive and, whilst few people charge the AA rate of around 30p a mile, do not expect them to end up out of pocket.

## Getting there

You should also send a sketch map of the area showing how to get to the club and details of a frequency that will be monitored for talk-in. Please do not use a repeater unless it is really the only way, as most speakers are running over the details of the talk while they drive and monitoring the chatter on a repeater for an hour or so is not conducive to clear thinking. If possible, arrange to have someone meet your speaker at the nearest exit from the motorway, or some other convenient spot, and guide him to the club.

## Most important

This step in the sequence should never be forgotten, but usually is. A few days before the meeting telephone your speaker and check that everything is still OK for the big night and confirm the talk-in details, etc. This is really a matter of common courtesy and consideration, so please don't forget it.

## At the club

Make sure there is a parking space available for him and have someone standing by to give a helping hand with any equipment he may have with him. Show him the way to the loo, because if he has travelled some way he will need to use it to make space for the pint that you are going to buy for him!

Tell him if you want an interval in the talk, that way he can plan the break at a convenient spot instead of having the president suddenly say, 'Right lads, time for the beer break'. Do not be like the twit in our introduction; make sure the person who will introduce the speaker knows who he is and why he is there. Read the information from a card if you must, but do get it right.

## CLUB TALK

### Closing down

At the end of the talk it is customary to thank the speaker for an interesting evening. Some time during the talk make a note of a point which you can refer to whilst thanking the speaker (it is always nice to know that someone was listening!), but do not repeat half the talk. The speaker will usually be available to discuss the subject with members and, if he is, then tell them so. Do *not* break the flow of the evening by reading out reams of notices. These should have been drawn attention to at the start of the evening preferably before the guest speaker arrived.

### Talk-out

You helpfully provided talk-in, but please remember that your speaker does not know the way to get out of town at the end of the evening. Many is the time I have circumnavigated a town looking for the way out, and in most places they seem to remove the signs after 9pm.

The classic one is when you follow such signs as you can find and eventually arrive at a 'T' junction with no signs at all. Inspiration is not to be relied on at such times, and I always seem to go the wrong way. You helped the man to get to the club, now help him to get home with some talk-out.

### Locking up

Now all you have to do is tidy up the clubroom and go home knowing that you have had a great evening. You may not need to go through all these ideas for every speaker but please keep them in mind. They make life simpler for you and your speaker and contribute to a good reputation for your club.

'That bloke knew what he was talking about tonight, Fred.'

'Yeah, got a bit deep for me at times, George.'

'Us old-timers have got to keep up with things, Fred – just got time to get a drink if we hurry – who's on next week?'

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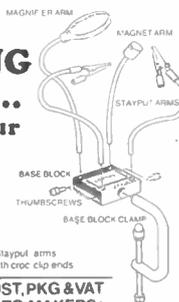
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# BACK TO BASICS

## THE FINAL INSTALMENT

Bill Mantovani G4ZVB offers a few tips on how to cope with the pressure of the big day:  
**SITTING THE RAE**

Well, this is it. After months of studying for the Radio Amateurs' Exam it's finally time to actually sit down and take it. The December exam date is Monday 2nd and hopefully most of you will have rushed out and bought your copies of *Amateur Radio* in time to read this final instalment of *Back to Basics* including the useful hints and tips I am about to give you.

Those of you who are intending to sit the May exam (on Monday 12th) have somewhat more time in hand. This should be spent tackling sample papers (R Petri G8CCJ has been providing you with a plentiful supply in these pages over the months), so that you can go into the exam room with a high degree of confidence.

### Information recap

Before going any further, though, some information at this point for those of you who may be reading this for the first time. Right at the beginning of this series I explained how and where to enrol for the RAE and a brief recap of this information will not go amiss, for I'm sure a number of newcomers will have been attracted to the hobby since then. Whether you intend to prepare yourself for the RAE by studying at home using the various text books available and/or correspondence courses, or if you decide to attend local evening classes, it will always be necessary for you to contact your local college to see if you can sit the RAE exam there. Not all colleges hold RAE classes, but those that do will allow you to sit the exam there even if you haven't enrolled for the RAE course at that college.

Not everyone has a college near them where they can sit the exam, but any local further education establishment should be able to provide you with the necessary information as to which college or institute in the area does, so that you can make the appropriate application. If you know of enough prospective candidates for the RAE it might be possible to persuade a college that doesn't hold RAE classes to do so, though starting a course will not normally be considered if there are less than 12 candidates (to attend the course that is, not to sit the exam only).

If after making all of the above enquiries you draw a blank, don't give up. The Radio Society of Great Britain (RSGB) can usually be of help as a source

of information, and in the past the RSGB has itself run centres at which the Radio Amateurs' Examination may be sat. They have done so again this year for the December exam, with one centre in London and one in Derby, but as there are now many other centres throughout the country at which the RAE can be sat, there will probably be no more RSGB exam centres after this.

A full list of centres where the RAE may be taken is available from the RSGB, Membership Services Dept, Lambda House, Cranbourne Road, Potters Bar, Herts EN6 3JW, on the receipt of a large SAE.

It is obviously now too late to make an application to sit the December exam, but just the right time to start enquiries if you wish to sit it in May. RAE centres have to make applications on behalf of their candidates to the City and Guilds before the middle of March '86 for the May exam, and prospective candidates have themselves to apply to the centres well in advance to ensure they have a place. So, now is the time to start thinking about it and early January, when the colleges go back after the Christmas break, is the time to act. A fee will be payable to the centre for sitting the exam.

### Be confident

Back to the present though, and if the RAE date seems to be looming closer and closer, then read on. The Radio Amateurs' Exam, like any other, is not a difficult one to pass if you have done your homework. Few could expect anything other than a fail if they haven't put sufficient effort in. There are a good many people who in fact say that the RAE became far too easy when the C&G introduced multiple choice questions, a point that is not up for discussion here but one which may help to boost your confidence.

Confidence really is the keyword to passing this exam because even if you are very good at your subject but go to pieces at the very thought of exams (and a great many suffer from this problem), you must believe that the RAE really isn't that daunting at all. Many licensed amateurs will in fact readily admit that even though it lasts for only a few minutes, and they were well proficient at sending and receiving in excess of the 12 words per minute minimum, the Morse

test has for them been a far more nerve-racking experience than any RAE sitting could ever be.

### Good preparation

The best way of being confident about sitting the RAE is not only to know your subject but also to have some idea of what to expect when you go into the examination room, to be familiar with the format of the exam and the exam papers, and to know how to tackle the questions in front of you.

The quiet atmosphere of the examination room itself makes some candidates nervous, others are fine until they turn over the question paper and see an unfamiliar layout. These and other factors can quite easily cause someone who really does know their subject to fail.

Don't forget, rushing the exam can be just as disastrous because it is all too easy to misread a question and thus tick the wrong answer!

In the days leading up to the exam, do make sure that you are familiar with the various radio circuit symbols used in circuit diagrams, the standard type of circuits, such as common-base arrangements, Class B push-pull output circuits, basic oscillator circuits and the basic block diagrams that were covered during your studies.

Study also all calculations and formulae and learn how to manipulate those formulae into different configurations for working out other component values. For instance, with Ohm's Law,  $V=IR$  can be manipulated to show that  $R=V/I$  and  $I=V/R$ . Doing this studying beforehand will help you to quickly recognise what might otherwise be unfamiliar formulae on the exam paper, and so saves time.

### Tolerance margin

Also, when working out calculations, bear in mind that components do have a tolerance margin, so expect that some of the answers may have been rounded off to the nearest whole figure rather than to, say, the two or more places of decimal that your calculation has resulted in. The use of a calculator is allowed, although I shouldn't be surprised if you are stopped from taking a programmable one into the exam room!

Some of the more common circuit symbols are given in *Table 1* whilst *Table 2* lists a selection of the formulae that you need to remember.

# BACK TO BASICS

As the exam date draws nearer, you should start to measure for yourself how well you might do by attempting some sample RAE questions. The C&G can supply sample papers, or you can tackle those in various RSGB publications such as the *RAE Manual*, *How to Pass the RAE* etc, or of course work through the sample questions that have followed *Back to Basics* in these pages over the months.

If you do not have, or are unable to get hold of, the relevant back issues of *Amateur Radio*, then you can always send off for the *Radio Amateurs' Questions and Answers Reference Manual*, advertised herein. Doing mock exams at home like this is a very good way of working out for yourself how ready you are to sit the exam proper, and which areas, if any, you need to brush up on. This also familiarises you with what to expect when you first open the actual exam paper.

## 'This is it'

The more you can do to reduce that feeling of 'this is it' when you eventually walk into that examination room the better. Being nervous, butterflies in the tummy, etc, are no help to the concentration needed to answer the question.

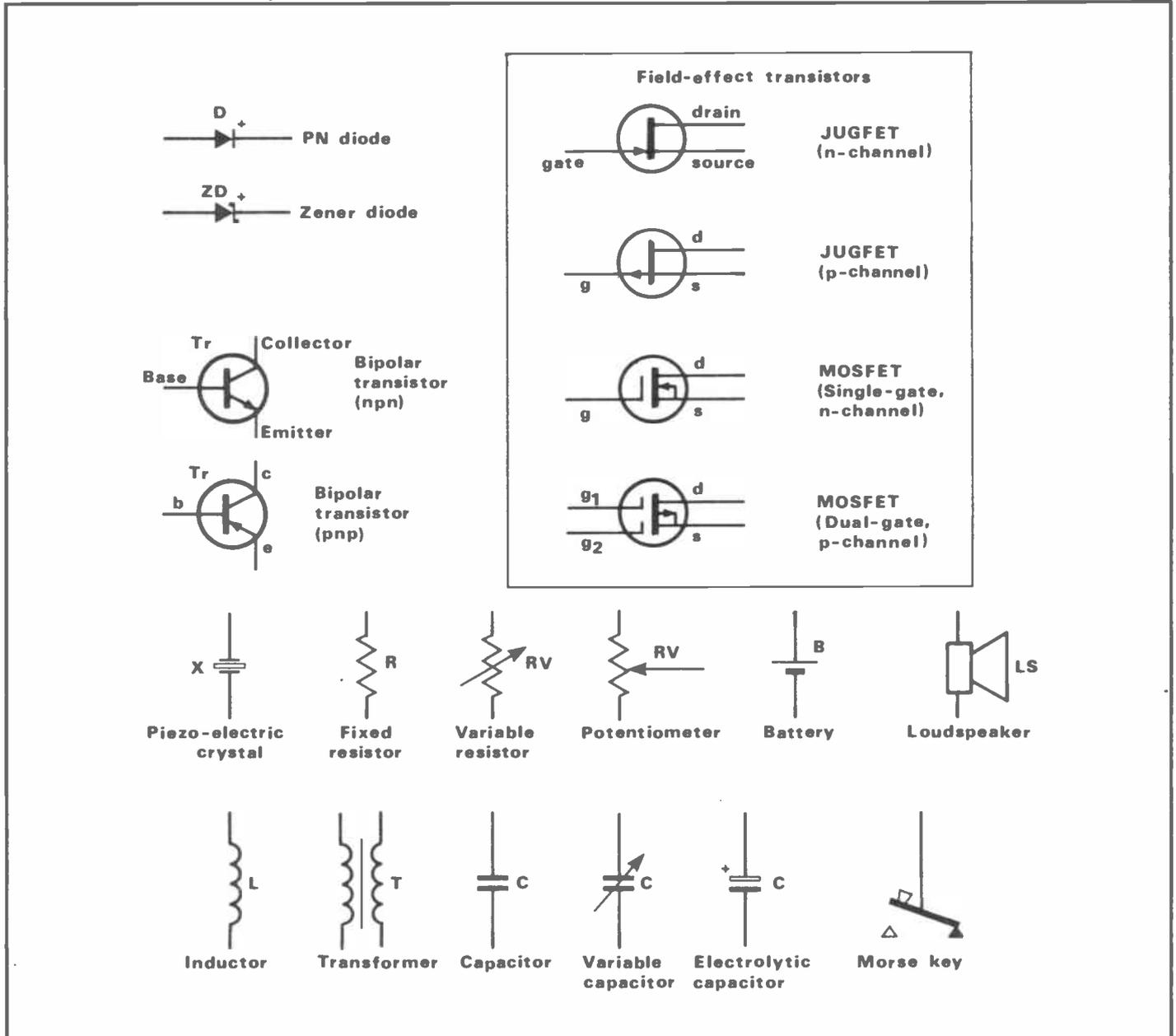
Find out well in advance in which room the exam is being held and arrive there a good ten to fifteen minutes before the examination is due to commence. Make sure you have remembered to take your calculator along with you. Nothing else will really be required except possibly a rubber, because any rough work or calculations can be done in the question book which must be handed in. You are not allowed to keep the question book, the City and Guilds examination board requiring that these must always be handed in at the end of the examination and returned to them. A pencil for marking the answer sheet will be provided.

## Take a deep breath

Now, having said all of that, there are few amateurs who will deny that they didn't feel at least a trifle nervous as the exam paper was handed to them and they were told that they 'could start'. This is only natural, so the best thing to do after being given the paper is to sit back, take a deep breath, simply open the paper and carefully read it. You need to fill in certain items on the answer sheet, such as your name, centre number and candidate's number, etc (you will have been advised of the latter two by the college authorities). The examination regulations will be read out to you by the person supervising the examination (the invigilator) and they will answer any queries for you.

Filling in your answer on the answer sheet is quite straightforward. For each question given you need to clearly indicate which of the four possible answers you think is the correct one by

**Table 1** Common radio circuit symbols



## SUMMARY OF FORMULAE FOR THE RAE

Ohm's Law	$V=IR, \quad R=\frac{V}{I}, \quad I=\frac{V}{R}$
Power	$W=V \times I, \quad W=I^2 R, \quad W=\frac{V^2}{R}$
Resistors in series	$R=R_1 + R_2 + R_3 + \dots$
Resistors in parallel	$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \dots$
Capacitors in series	$\frac{1}{C} = \frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3} + \dots$
Capacitors in parallel	$C=C_1 + C_2 + C_3 + \dots$
Resonance	$f = \frac{1}{2\pi\sqrt{LC}}$
Reactance	$X_L = 2\pi fL, \quad X_C = \frac{1}{2\pi fC}$
Charge	$Q=CV, \quad \text{hence } C=\frac{Q}{V}, \quad V=\frac{Q}{C}$
Wavelength (metres)	$= \frac{300}{f(\text{MHz})}$
rms value (for a sine wave)	$= 0.707 \times \text{peak value}$

**Table 2**

putting a mark in the appropriate box using the pencil provided. The instructions for this are given at the top of the answer sheet and there are also instructions as to what to do if you make a mistake. So, filling in the answers couldn't be easier. Working down the answer sheet, you simply fill in either box a, b, c or d for each question to indicate which is the right answer, and then when the sheets are returned to the C&G they are scanned by computer and the marks awarded accordingly. All quite straightforward.

Make sure that all of the boxes at the top of the sheet have been filled in, especially the top right-hand one which asks for your candidate number, otherwise the computer will not know whose answer sheet it is. As with any examination, when you have finished do go back over the sheet and check your work; even the simplest of slips could result in a lost mark. One of the more common errors is for a candidate to leave a question until later, but to forget to move one line along the answer sheet, so do take care and check right at the end that you have filled in the correct line for the appropriate question number.

In the exam you tackle the RAE in two parts. Paper 1 (765-1-01) tests your knowledge of the licensing conditions and transmitter interference and consists of 35 multiple choice questions. One hour is allowed for this paper. There is then a break of 15 minutes before the Paper 2 (765-1-02) is attempted. This paper contains multiple choice questions on operating practices, procedures and theory and takes 1 hour 30 minutes.

Table 3 shows how the questions will be apportioned from the May '86 exam onwards. Those taking the RAE in December '85 are working to the old syllabus and will find that they have 60 questions to answer in Paper 2 in 1 hour 45 minutes. Candidates must take both papers on their first entry, although as the two papers are marked separately it is possible to obtain a pass in one but not the other. If this happens then you do not have to sit both papers again, only the one that was failed.

### Why multiple choice questions?

The introduction of multiple choice questions for the RAE has certainly made life easier for both the examinee and the examiner. You may often hear the old argument voiced that it is now far easier to obtain a pass slip than in the days of the written exam, and that even ticking off the answer sheet at random can bring a pass result! The latter you can decide for yourselves after you have sat the exam, but I'm sure that you will agree it is not quite *that* easy.

The truth of the matter is that the odds of the above happening are in the order of a few million to one against, so no you cannot pass the RAE on guesswork alone, no matter what people argue. Having a guess at the odd question and getting it right is quite a different thing altogether.

Most of you will be familiar with the format of a multiple choice question, but if not turn for a moment to the *Questions and Answers* feature in this magazine. There you will see that for each question given there are four answers listed, three

of which are wrong and only one of which is the correct one. This format has done away with certain anomalies that exist with written exams, namely that now you either submit the right answer or the wrong answer, there is no in between. With a written exam your answer could be taken as being adequate by one examiner but it might not satisfy another. Thus, the multiple choice format has equalled things up for everyone, and made the examiner's job easier and more consistent.

### Distractors

Let us now look at a typical RAE question. The following has been taken from a City and Guilds sample paper.

The amateur licence states that the licensee shall test his transmissions for radiation of harmonics and other spurious emissions and record such tests in the log:

- a. Once a month
- b. Once every three months
- c. At the request of a Home Office official
- d. From time to time.

Despite the fact that answers a, b and c are all feasible, if you have done your homework properly you would know that d, from time to time, is the correct answer. It is just this sort of question which will sort out those who know the answers from those who guess. The question itself is known as the *stem*, the four answers are the *options*, with the correct one being the *key* and the three incorrect answers being called *distractors*. Sometimes one or more of the distractors will be readily recognisable, but always think carefully before filling in your answer.

Before any question that you have to answer finds its way onto the exam paper proper it will have been checked to see if it is too hard, too easy or possibly even confusing. This is done by inviting a selection of people to pre-test all likely questions and analysing the answers. A 'bank' is thus built up of suitable questions from which it is possible to build up papers of almost uniform standard for each examination.

The checking doesn't stop there though. After all of the answer sheets have been collected in, a sample selection is initially marked and the results for each answer checked to see if they compare with the expected result as determined by the pre-test. This brings to light any question which consistently produces an unexpected result and that question would then be disregarded. Although all of the marking is done automatically, a sample of those marked answer sheets is also checked manually just to make sure. So you see, there is more to the multiple choice format than meets the eye.

### Working through the exam

You have been given the go-ahead to start the first paper, what now? Well, the most important piece of advice that anyone can give you at this point is quite simply *read the questions carefully!* All

# BACK TO BASICS

too often vital marks are thrown away by candidates who misread questions. OK, so you may be nervous, but a lost mark is no good to anyone.

One of the more common mistakes made often occurs when you have been looking at or discussing a particular topic just prior to the exam. With it still fresh in your mind you look at the question sheet and come across a question on that very subject and quickly mark in the answer without reading it carefully. Before you know it you have thrown away another mark!

If you take the time to read both the question and the answers carefully you lessen the risk of falling for one of the distractors, especially if you really do know the answer. This is also another reason why you should always go back and check your work after reaching the end of the exam paper.

Another piece of useful advice is not to spend too long on a particular question. If you come across a question that you do not understand, or if you are unsure of the answer, then simply leave it until later and carry on to the next one. If you work through the exam paper using this approach you will probably find that you answer about half (or more) of the questions the first time through. You can then go back to the beginning and tackle the unanswered questions. This time through you will probably answer half of those remaining questions, and so on.

Don't forget, you do not have to have given an answer for every single question on the sheet to achieve a pass, but it is not a good idea to leave even a single question unanswered. If you get to a point where you are left with one or two questions that you just do not know the answer to, then it is worth having a sensible guess at them. As I mentioned earlier, there is nothing wrong with having a guess at the occasional question. Anyway, if you have put in the required effort for studying for the RAE, your guess is hardly likely to be a blind one, is it? Also, it may sometimes be the case that answering a later question results in a clue to the answer for an earlier one.

To summarise, when you start the exam work through the paper for the first time marking in the known answers. Then work through it a second time and see if you can mark any more answers. Repeat the process until you have marked all of the answers that you know, have a guess at the last few, go back and check the whole paper and, only when you are satisfied, hand it in. You are not competing against other candidates in the room, so if someone finishes before the allocated time don't let it concern you. They do as they like; you just make sure that you work at your own pace.

## Have a little patience

Now comes the really difficult bit – the waiting! Having sat the exam it can be a few weeks before the results are released, so above all you now need a lot

of patience. If you are confident of having done well you can get on with learning the Morse code (if you would like a class A licence, which I would always recommend that you aim for), but if you have any doubts then the best thing you can do is to carry on with RAE revision until you know if you have passed or failed.

Continued revision does no one any harm at all but you will be a lot more confident the next time you walk into the exam room if you do have to resit all or part of the RAE. Some people think that once they have sat the exam they can forget all about it until the results come out, then when they find that they have failed they try to cram everything in at once. This method is neither recommended nor guaranteed to work.

When the examination results are released, candidates are advised of their performance using the four following grades: distinction, credit, pass and fail (referred). Certificates indicating these grades are awarded to those candidates who have achieved a pass or higher in both papers.

## That's it

Well, that's about all on sitting the Radio Amateurs' Exam. This also brings to a close the *Back to Basics* series. *Amateur Radio* has done its bit in steering you towards that RAE pass; the rest is up to you. I hope that this month I have been able to prove to you that sitting the exam really isn't as formidable as it may seem. Having done it you will wonder what all of the fuss was about.

I would just like to finish by reiterating one or two hints I have given you during the season. A number of the RAE questions are numerical ones using the formulae listed in *Table 2*. They will involve simple calculations, such as working out resistance, capacitance, etc and in some cases the answer may even be obvious without having to use the appropriate formula. All of this involves very little effort on your part, except for remembering which formula to use, so do make sure that you are familiar with them otherwise you may well be throwing easy marks away. Get used to converting from practical units (ie pF) to the base unit (in this case Farad) with the use of factors such as  $10^{12}$ , etc (see *Table 4*).

**Table 3**

RAE QUESTIONS FROM MAY 1986	
Subject	No of questions
<b>Paper 1 (1 hour)</b>	
Licensing conditions	20
Transmitter interference	15
<b>Paper 2 (1 hour 30 min)</b>	
Operating procedures	10
Electrical theory	6
Solid-state devices	7
Receivers	8
Transmitters	8
Propagation and antennas	8
Measurement	8

Many candidates admit to not being very technical and so make the big mistake of spending too much of their time studying the theory and not enough time on learning the licensing conditions. This often results in them failing the first paper. Also, the new syllabus for '86 onwards sees a slight reduction in the electrical theory section and an increase in the emphasis placed on practical applications. With more attention now being given to operating practices and associated topics, do make sure that you study *all* of the topics in the syllabus adequately.

Learning out of a text book is one thing, but it is far easier to remember something if it is done in practice. Therefore, I would not hesitate to remind you that additional help in preparing for the RAE can be obtained by joining your local amateur radio club and going along to the meetings. By doing so you will be able to talk to other amateurs about topics that you may be unsure of, and you will also have the opportunity of seeing how a station is operated as most clubs have their own equipment.

Your local radio club may even hold its own RAE classes, or will certainly be able to tell you which college is doing so in the area. It may, like my own, have its own library of amateur radio books and magazines, and you will always find someone there who is ready to discuss any problems you may have. In short, joining your local club should be one of your priorities.

## We hope we've helped

So, there you have it. I certainly hope that you have enjoyed reading *Back to Basics* as much as I have writing it. If the correspondence that I have received over the months is anything to go by then I can tell you that I know some of you have found the series a great help.

Amateur radio is an exciting hobby wherever your interests lie within it, and you certainly don't have to be of a particular age to take it up. Both young and old regularly sit and pass the RAE, so if you haven't got around to it yet make up your mind now to go in for it. When you eventually do get that G licence you will at last understand how much of a thrill it is to make your first contact. Good luck with the RAE and I hope to meet some of you on the air in the future. 73s, G4ZVB.

**Table 4**

Abbreviations for multiples and sub-multiples		
G	giga	$10^9$
M	mega	$10^6$
k	kilo	$10^3$
c	centi	$10^{-2}$
m	milli	$10^{-3}$
$\mu$	micro	$10^{-6}$
n	nano	$10^{-9}$
p	pico	$10^{-12}$

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# QUESTIONS & ANSWERS

RAE PRACTICE DEvised BY R.E.G. PETRI G8CCJ

## LICENSING CONDITIONS

1. To become a radio amateur you will need to:
  - a) be over 14 years of age
  - b) have attended a course at a local college
  - c) be a British national
  - d) hold a current UK passport
2. A person passed the Morse test in April 1984 and received credit passes in both papers of the City and Guilds Radio Amateurs Exam in July 1984, but he doesn't intend to apply for a licence before 1 January 1985. What class of licence will he be entitled to apply for?
  - a) Class A
  - b) Class B only
  - c) Class C
  - d) None, because the RAE certificate is only valid for 28 days unless a form P18 is sent to the local postmaster immediately upon receipt of the certificate.
3. The Radio Amateurs Examination is conducted by the:
  - a) City & Guilds of London Institute
  - b) Department of Trade and Industry
  - c) Ministry of Post and Telecoms
  - d) Post Office Overseas Radio Division
4. The regulatory authority for amateur radio in the UK is the:
  - a) Post Office
  - b) headquarters of British Telecom
  - c) RNLI
  - d) Department of Trade and Industry
5. Before taking the amateur Morse test, the candidate should be capable of sending and receiving at a speed of:
  - a) 40 wpm
  - b) 20 wpm
  - c) 12 wpm
  - d) 10 wpm
6. Which one of the following documents is not required when applying for an amateur licence?
  - a) Pass slip for the Radio Amateur Examination
  - b) The licence fee
  - c) Licence application form
  - d) Birth certificate to prove British nationality
7. Every applicant for an amateur licence A must:
  - a) produce a British passport
  - b) produce proof of British nationality
  - c) hold credit passes in both papers of the RAE
  - d) have passed the amateur Morse test within the 12 months preceding the application
8. The amateur must not establish his station:
  - a) within a 0.5km radius of any of HM prisons
  - b) within a 2km radius of any aerodrome operated by the Civil Aviation Authority
  - c) within a 0.5km radius of any Ministry of Defence radar station
  - d) on the sea or within any estuary, dock or harbour
9. Which one of the following call signs should I use when operating as a pedestrian from a hilltop on the outskirts of Edinburgh?
  - a) G8CCJ
  - b) G8CCJ/M
  - c) GM8CCJ/P
  - d) G8CCJ/A
10. Whilst motoring in Wales I find that I am able to access one of the English repeaters. Which one of the following call signs should I use?
  - a) GW8CCJ/M
  - b) G8WCCJ/M
  - c) GM8CCJ/W
  - d) G8MCCJ/W
11. Notice of variation of the terms of the amateur licence may be by means of a general notice, published in the:
  - a) Punch and Country Life magazines
  - b) London and Manchester Gazettes
  - c) London, Edinburgh and Belfast Gazettes
  - d) Financial Times, published in Manchester and London
12. 'The United Kingdom' shall mean the United Kingdom of:
  - a) Great Britain and the former colonies
  - b) England, Scotland and Wales
  - c) The British Empire as it stood on VE day
  - d) Great Britain, Northern Ireland, the Isle of Man and the Channel Isles
13. The expression 'The Secretary of State' shall mean the:
  - a) Department of Trade and Industry
  - b) Secretary of State for Trade and Industry
  - c) Secretary of State for the Home Department
  - d) Prime Minister
14. Remarks about matters of a personal nature shall:
  - a) be preceded by the station's call sign using the suffix /PC to indicate a personal communication
  - b) not include messages about business affairs
  - c) not be transmitted during peak short wave listening hours
  - d) include the station's address
15. The amateur licence is:
  - a) transferable
  - b) not transferable
  - c) transferable only to other members of the licence holder's family
  - d) available on easy terms, ie, 12 monthly payments to the Post Office.
16. When the licence has expired or been revoked, it must be:
  - a) destroyed
  - b) marked *expired* in red, and returned to the Post Office
  - c) returned to the City & Guilds of London Institute
  - d) returned to the Secretary of State
17. If the amateur station is situated within 0.80km of the boundary of any aerodrome, the height of the antenna, or any mast supporting it, must not exceed:
  - a) 30m agl
  - b) 15.24m agl
  - c) 30m asl
  - d) 15.8m asl
18. The 'Standard Frequency Service' is:
  - a) intended for reception by commercial stations only
  - b) intended for reception by amateur stations only
  - c) not intended for amateur reception
  - d) intended for general reception
19. The receiver at an amateur station must be capable of receiving:
  - a) standard frequency transmissions
  - b) shipping forecasts and international distress frequencies

- c) all local repeater frequencies  
d) all frequencies and classes of emission in current use at the station for the purpose of sending
20. Which of the following represents an infringement of licensing conditions?  
a) Sending CQ calls from a privately owned cruiser in the Thames estuary  
b) Sending CQ calls from a heavy goods vehicle within a 2km radius of any dockyard  
c) Using a mobile 2 metre band antenna greater than 0.9m in length  
d) Both a) and b) above
21. At all reasonable times, a person acting under the authority of the Secretary of State may inspect the:  
a) station and antennas only  
b) station, antennas and log only  
c) licence and log only  
d) station, licence and log
22. A person acting under the authority of the Secretary of State can demand that the station closes down:  
a) only at a reasonable time  
b) at any time  
c) only by serving a summons on the licence holder  
d) only when accompanied by a uniformed police officer
23. In the station log it is necessary, among other things, to record:  
a) the date  
b) the call signs of stations with whom you are in contact  
c) the weather condition classification, ie, G1 – Good, F1 – Fair and B1 – Bad  
d) both a) and b) above
24. You receive a station using the call GJ8CCJ/M at your temporary location somewhere on the south coast of England. Which of the following facts are true?  
a) The station is operating mobile from Jersey  
b) The station is operating portable from the Isle of Wight  
c) The station is operating maritime mobile inside the three mile territorial waters of the Isle of Man  
d) The call is a hoax, because the Channel Isles are too far away for VHF propagation
25. At temporary premises, what suffix should be added to the call sign?  
a) /M  
b) /T  
c) /P  
d) /A
26. The maximum RF power supplied to the antenna when using emission class F3E on the 2 metre VHF band is:  
a) 26dBW  
b) 20dBW  
c) 16dBW  
d) 10dBW
27. A certain class of emission is designated by the symbols 'J3E'. What is it?  
a) Double sideband, full carrier  
b) Independent sideband, full carrier  
c) Single sideband, suppressed carrier  
d) Single sideband, full carrier
28. What method of frequency control should be employed at the amateur station?  
a) Any method  
b) A surface acoustic wave oscillator  
c) A free running time-base oscillator  
d) A satisfactory method
29. Regarding frequency checking equipment, within certain outline requirements stated by the DTI, the licensee:  
a) must maintain a frequency tolerance of 1 part in  $10^{10}$   
b) must maintain a frequency tolerance of 1 part in  $10^6$   
c) must have a high accuracy frequency counter at hand at all times  
d) is free to decide how he will comply with the licence regulations
30. When should the amateur transmitting station be tested for interference, and what record should be kept?  
a) Twice yearly, the results sent to the DTI  
b) Annually, the results sent to the Home Office for recording  
c) Prior to each period of operating and recorded in the station log  
d) From time to time, with details recorded in the station log
31. All apparatus in the station must be:  
a) designed to FCC and EEC specifications  
b) tested at regular monthly intervals for interference  
c) designed, constructed, maintained and used, so that the station does not cause any undue interference with any wireless telegraphy  
d) tested at yearly intervals by a person acting under the authority of the Secretary of State and issued with a certificate of compliance
32. A frequency modulated telephony transmitter operating in the 70cm band supplies a power of 1 watt to its antenna. The antenna gain is 10dBd. What is the effective radiated power, ERP of the transmission?  
a) 100W  
b) 10W  
c) 1.0W  
d) 0.1W
33. In the 18 and 20MHz bands, the permitted mode of operation is:  
a) Morse, A1A only  
b) machine telegraphy  
c) frequency shift keying  
d) phase shift keying
34. Which of the amateur bands listed below may be used in the event of a natural disaster by non amateur stations in the disaster area?  
a) 3.5, 7.0 and 10.1MHz  
b) 14.0, 18.068 and 21.0MHz  
c) 24.890 and 144MHz  
d) All bands listed in a, b and c above

That's the lot for this month. Don't be fooled into thinking that the first paper of the RAE is a walkover as the examiner can fish some pretty obscure questions out of the bag, and you must remember that for the 1986 examinations 20 of the 35 questions in the first paper are on licensing conditions, the other 15 being on transmitter interference. Although some of the questions are obviously common sense, you will need to read the free DTI handout, *How to Become a Radio Amateur*, from cover to cover.

It is advisable to get a group of fellow students together, preferably out of class time and question each other relentlessly on licensing

conditions; even a degree in electronic engineering won't help you very much if you haven't put the necessary work into this area.

Do not think you'll be all right on the night. I've known quite a few students who've really worried about the second paper, which is commonly regarded as the stumbling block, and paid insufficient attention to the first, usually reckoned to be the easier. You've guessed it – credit pass in part 2 and a big disappointment in part 1.

Anyway, by the time you read this article some of you will be preparing for the December examination, so I'll take this opportunity to wish you all good luck.

# Q & A

Have you done enough work to get your ticket? Check your answers and judge for yourself.

## ANSWERS

1 - a: 2 - a: 3 - a: 4 - d: 5 - c: 6 - d: 7 - d: 8 - d: 9 - c: 10 - a: 11 - c: 12 - d: 13 - b: 14 - b: 15 - b: 16 - d: 17 - b: 18 - d: 19 - d: 20 - a: 21 - d: 22 - b: 23 - d: 24 - a: 25 - d: 26 - b: 27 - c: 28 - d: 29 - d: 30 - d: 31 - c: 32 - b: 33 - a: 34 - d

## THE RADIO AMATEURS' QUESTIONS & ANSWERS REFERENCE MANUAL

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.

The book, *The Radio Amateurs' Q & A Reference Manual (Second Edition)*, is available at £5.95 plus £1 P&P (UK) from: WP Publications, 11 Wayville Rd, Dartford, Kent DA1 1RL.

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4 10W TV Transceiver	(As 2 above plus 70FM10 + BDX35)	100.00
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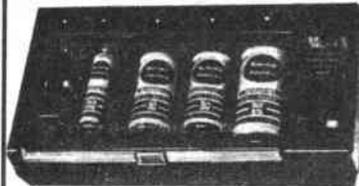
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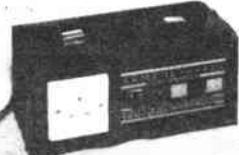
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## News and comment from Glen Ross G8MWR

### Pulling the birds

In this case the bird is the latest Oscar satellite, which was expected to go up some time around the end of November but was put forward a month or so and actually flew at 1700GMT on Wednesday 30 October. The launch went without trouble and another orbiting amateur radio station was up and running, this time manned by German amateurs. The satellite was clearly visible in the sky in the north-west at around 1730 that evening by several observers in the Midlands and London area.

One of the nice things about the mission was the new system of operating which bears some resemblance to a repeater system running crossband. The German operators listened on either 437.125; .225; .275; .325 or .375 for signals on the uplink and transmitted on 145.450; .475; .550 or .575.

It was believed that the operation would be on a simple 'pairing' basis unless the interference got too bad, in which case they would use a frequency hopping technique on receive so as to spread the QRM. You simply picked a frequency and took your chance of a contact under those conditions.

### Automatic

When the operators were not available a second technique was used. The transmitter was programmed to send an automatic CQ and then, for a period of one minute, any calls heard were recorded. An improvement has been made on the previous hand-held type of operation. The equipment used was adapted from normal commercial (PMR) type equipment, made by the Bosch company, which ran 10 watts to the aerial and had a receiver of adequate sensitivity.

An extremely sensitive receiver could in fact prove to be an embarrassment when used under space conditions. You can see an awful lot of the world from up there with a large percentage of the amateur population throwing signals at you; and they are all in line of sight. The problems from intermod and blocking could be very nasty indeed under those conditions. Perhaps we should be grateful for the FM capture effect which will at least help to reduce some of the problems.

### More space

Oscar 10 is still performing well, and there were some small changes to its operating schedule in September to give more battery charging time. Recent activity heard has included the first signals from 4S7EA in Sri Lanka.

In the UoSAT bulletin it is reported that the new Russian RS-9 is behind schedule and it is hoped to launch it at the same time as RS-10, which is likely to be in January.

### Beacons

The actual locator for the new six metre beacon, GB3RMK, has been clarified as XR39a, which is what it has been sending. The problem arose because the QTH that it gives is not accurate: it is actually located at Avoch not Rosemarkie.

GB3SUT is likely to be operational shortly using a pair of eight element J-beams and re-established on its original site. There is still no sign of GB3REB coming on in the Medway towns area. SK2VHF is off the air for repairs but SK1VHF is still doing a good job. In Finland OH6VHF has been off the air for some time and there is no indication as to when it may reappear.

### Get well soon

Jach Hum G5UM, the well-known and respected gentleman who issues the RSGB VHF awards, has suffered severe ill health lately which has made him temporarily give up the day to day running of the award scheme. I am sure you will all wish him well and thank him for the excellent and friendly service we have all received from him. Good luck, Jack.

### Open sesame!

And it really did. The tropo opening in October was one of the biggest in memory. Reports have been flooding in from all over the country listing the amount of DX that was available on all bands up to at least 13cms. From Scotland to Spain and from Wales to Russia seems to sum up the vast possibilities that were available.

It was noticeable that while most people were flogging themselves to death trying to work the stuff on two metres, the better prepared were on

seventy or even twenty-three where they were able to work more or less the same countries and in a greater degree of comfort. Indeed I was even able to have a ragchew on 23cms with EA1BLA (in VD square) who was calling CQ and getting no takers.

HB9AMH was putting in a tremendous signal on 23cms and is known to have been worked by stations in the North of England who were running only one watt output.

### Maidenhead revisited

During the opening I worked some 200 stations on three bands. I was only given the Maidenhead locator by three stations and one of these gave me both the old and new variety. Surely this is sufficient indication as to the general dislike of the new system? At the recent Midland VHF convention I asked many people for their views on the matter and the general feeling was, 'go back to QRA'.

In the subsequent open forum a vote was taken on the subject and went in favour of Maidenhead. I feel this may well have been due to the fact that the panel were so obviously in favour of Maidenhead we did not want to disappoint them!

A decision has to be made sooner or later; we cannot support two systems. The fact that QRA is not a world-wide system is of no great consequence to the VHF operator, and the new system does not seem to have found any favour at all on the HF bands, but the fact that Maidenhead gives reduced accuracy when calculating distances is. (This is due to the smallest squares in Maidenhead being larger than those in QRA).

The point has been made that it is easier for a computer to use Maidenhead but mine seems to have no trouble using QRA, Maidenhead or even automatically sorting them out and using mixed data with, of course, a small reduction in accuracy.

### The ultimate

I have heard many howlers on the bands over the years but perhaps the greatest was to hear a station calling India Oscar Eight Italy Alpha Kilo. Could it have been a station in IO-81-ak I wonder?

### Six metres

There is still no news of the opening of this band to general activity although speculation is rife. You may well get the news in early December when the RSGB holds the AGM. They like to have a special announcement for the occasion, last year it was class B Morse, and six metres could well be the big news for this year's event.

Activity continues at a steady level and the Gibraltar beacon was still being received via sporadic-E well into September. There is also a possibility of the band being made available to Eire stations in the new year. Things may be easier for them as they are unlikely to have any Continental TVI problems, which is the main stumbling block as far as we are concerned.

## ON THE BEAM

### Band plan

A provisional band plan has been drawn up for six metres. The area from 50.02 to 50.08 is set aside for beacons, 50.11 is the world-wide DX calling frequency with most activity centred around 50.20. Meteor scatter frequencies are 50.3 for CW and 50.35 for SSB, plus and minus the usual offsets that are used in this type of working. 50.4 to 50.5 is designated all mode and there is not a repeater in sight, although I will lay even money that there are proposals for them being hatched all over the place. At the moment this plan is provisional and any comments should be sent to G3ZNU.

### Crossbanding

Three months after the rest of the amateur world knew about it the RSGB are pleased to announce that crossbanding between class B operators on VHF and our brethren on the HF bands is now legal! Being in the forefront of discussion obviously seems to slow down how fast you hear about things.

The delay seems to have been occasioned by discussion, not so much about whether it was legal, but rather on the niceties of how it would be operated. This comes down to having to announce the frequency of the station you are crossbanding with at the end of each over or at 15 minute intervals. Surprisingly, this is exactly what we have all done for years when crossbanding, say, from two to seventy.

### The Belgian affair

This is really an on-off job, the authorities giving a fair imitation of a yo-yo. The idea of killing virtually all VHF and microwave allocations has been dropped, but yet another new set of proposals has been advanced.

On two metres a power output of 50 watts and on seventy the loss of all frequencies below 434 to the Syledis system, with a power limit of 50 watts on the rest of the band.

1245 to 1300MHz is to be reduced to 1296 to 1300MHz with a power output of only one watt. The band from 2300 to 2450 is being reduced to 2400 to 2450 with a power limit of one watt. The band from 5650 to 5850MHz is being abolished and at the moment there are no plans available for any of the higher bands.

This is a very worrying situation, particularly the loss to Syledis. What it means, in-effect, is that ON will no longer be a major contributor to UHF DX if these proposals go through. Remember that although it is unlikely it could happen here - use it or lose it.

### Planning permission

Due to the great interest in satellite TV of the entertainment kind, the Department of the Environment is considering giving blanket planning permission for dishes up to 90cms in diameter to be mounted on houses without getting individual permission. Could you tell the difference between such a dish used for

TV or the same thing on 13cms or whatever?

When TV was enjoying its first growth explosion back in the sixties, many local councils got fed up with receiving thousands of planning applications for aerials every week and simply gave blanket permission for aerials to be attached to the structure of the house. They meant TV aerials of course, but most of them did not specify that.

In many areas this means that if you want to fix a pole and aerials to your gable end or back wall you may well not need permission. If you want a free standing pole or tower that could be a different matter.

Always ask for permission for a mast, never a tower. A tower brings up visions of an Electricity Board pylon, and you are off to a bad start.

### Close down

Let me remind you that there is a microwave workshop at the University of Sheffield, Mappin Street, starting at 10am on Saturday 30 November. You will be made most welcome at this informal event and I look forward to meeting you there.

Information on the awards will have to be held over until next month, but we have issued the first 23cm award. The next issue sees the usual review of the metre man's year. Please send your comments to me at 81 Ringwood Highway, Coventry or on Prestel 203616941.



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# SECONDHAND EQUIPMENT GUIDE

by Hugh Allison G3XSE

## Repairs

For starters, I had an unusual repair a few days back: an Atlas 350 with an erratic digital display. A quick hit with a scope and counter revealed that the display crystal standard was free running, ie, not locked to the crystal. The scope display of the oscillator was quite interesting, a sort of square wave with the frequency going from 1 to 2MHz and back again every second or so. Knowing that the owner was a competent man and had had a go himself, it took me a minute or two to work it all out.

The crystal oscillator was a 'digital' IC, type 4049, which had genuinely blown in use and the owner had replaced it. Unfortunately, there are two types of 4049 produced, buffered and unbuffered. RCA kindly mark their unbuffered variant UB, although other suppliers' letters may vary. I suggest that you obtain the exact data sheet and make sure it only has a couple of transistors in it per gate if being used as a 'linear' device. The problem is that the buffered variant has so much gain in it it hoots away all by itself if the input is given the slightest smell of its output. Replacing it with a 4049 UB cured the problem.

Talking of the 350, I couldn't resist giving it a quick airing. Atlas rigs used superb crystal filters, and the CW filter fitted to this variant was a delight. Incidentally, quite a lot of these rigs were fitted into ocean going ships since they were one of the first 'go anywhere' rigs, frequency wise.

An auxillary crystal switch allows operation over 500Hz of any chosen HF chunk, and several very tasty examples of this fine, all solid-state, high power HF rig have recently been seen at boat auctions and marina sales etc. Although normally selling at £200-£300 on the amateur market, the one I repaired had been picked up, I was proudly informed by its new owner, for £40 at a boat show.

## AVOMeters

Most amateurs have heard of AVOs, the industry standard for many years and still going strong. All the volts and current ranges you normally need: ac, dc, plus ohms, etc. The early ones, AVO 7s etc, were a bit low on ohms per volt and can give misleading results on high impedance circuits, but are of use with only a little common sense and reliability is excellent.

You could probably bang a nail into a brick wall with any AVO without damage to the movement, although I wouldn't recommend it. The cut out is quick,

normally preventing damage to the movement, although I have seen them defeated by connecting the meter across the mains whilst on the ohms range.

The normal failures of these are out of balance movements, which is the cause of the zero point moving between laying down and upright use. What has happened is that the balance weight, normally a few turns of wire, has come unglued from the movement. It should be opposing the weight of the needle, and is on a tab on the movement on the opposite side of the pivot point to the needle. If your AVO suddenly misbehaves, open it up exceedingly carefully, find the weight and stick it back on again. If it is lost, I'm ashamed to admit that I use solder on the tab to re-balance. The heat from the iron is probably bad news, but it's quick and permanent.

At a recent rally your scribe bought half a cubic yard of abused AVOs for a fiver. It looked a good bet since half had damaged cases and half had damaged movements. I never knew that there were so many different cases used! Some had six screws securing front to back, some eight, and the battery compartments were all different.

However, the story has a happy ending since the majority of the 'damaged' movements had small bits of swarf down the movement, which were quickly cleaned with a screwdriver and restored to normal operation.

Secondhand prices vary with condition, but are high due to their reliability. As a guide 7s should sell for £15 to £20, 8s for £20 to £35 and 9s for £30 to £50.

Some of the early examples used batteries which are now difficult to obtain. I, personally, wouldn't be too deterred from one with, say, a U2 battery in the compartment held in by two wires soldered to it. The batteries go on for a long time: mine has had only one change in eleven years, and it gets used a lot.

## The rallies

Telford, wow! A row of flea market tables as far as the eye could see. Your scribe went with a full wallet and an empty van and came home with a big smile, an empty wallet and a full van! Bargain of the day was a box of five duff 934MHz CB rigs for a quid. One commercial stall had a pile of those naughty cordless telephone boosters I alerted regular readers to a month or two back. Although the price has gone up to a tenner, probably as a result of my article, the whole table full went in a massive scrum within twenty minutes.

Your scribe found the Cambridge rally the biggest disappointment of the year. For a start it was a pound each to get in (and to get out of the car park adjacent to the hall it cost 50p). Quite a few amateurs I met outside obviously thought a quid was too much as they went back home again without going in. Bargains were thin on the ground. Your scribe took home a fullish wallet and an almost empty van from this one.

## Disclaimers

Personally I would have been very reluctant to use the bring-and-buy at this rally. There were disclaimers about both the organising company and the club refusing to take responsibility for items taken on the stall, which is fairly normal, but an intending purchaser had to carry the item of his choice from the point of display to the cash desk himself, making it far too easy for it to disappear without payment. Most rallies have a salesman who takes your money from you at the point of display, ie, there's no carrying of goods around by people who haven't yet paid for them.

The amateur radio car boot sale at Old Warden (near Biggleswade) must rate as the amateur radio selling event of the year. If you can get to it next year, do yourself a favour and go. There were 'car boots' too numerous to count, but I'd guess at well over a hundred, and it was all well organised. Not only was it just twenty pence to get in, but this was deducted from the admission charge of the adjacent aircraft museum if you wished to visit it.

## Aeropark

A few amateurs were good enough to fly in (the aircraft could be parked just over a fence from the participating cars), and your scribe had seriously considered it. However, I'm glad I didn't since I could never have got all the junk I bought in the plane!

Among the more unusual bargains a non-working hand-held radar speed trap (one dry joint, now works a treat, though I don't know what I'll ever use it for!) proved an irresistible bargain for £3.50. Wide spaced variable capacitors, normally impossible to get when you need them, were all over the place, and your scribe bought a boxful at 50p each.

Plenty of good, cheap receivers, loads of reasonably priced rigs, and the whole event was excellent. No traders as such, just amateurs selling to amateurs at fair prices. A thoroughly enjoyable day out, full marks to whoever organised it.

# BATTERIES

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## FOR SALE

- Exchange FRG7 AM, USB, LSB, CW, for Dragon or Commodore computer or WHY. David Hawkins. Tel: 01-743 7077.
- Yaesu FRDX400 HF receiver with fitted 2m converter, £75. Azden PCS3000 2 metre FM mobile rig, 5/25 watts output, 8 memories & band scanning, £80. Mizuho SB2X 2m SSB/CW portable rig, 144.00 to 144.600 coverage + spare socket for another 200kHz band. Inc nicads £80. Commodore 1541 disc drive £100. Commodore 1520 printer/plotter, £35. Paul GM1GUJ. Tel: (041 637) 0808, after 6pm.
- Heathkit HW100 Tx-Rx PSU 80-10m, new PA + driver valves, fitted recently, manual, VGO. Ideal for new class A licensee, many well spent hours until you can afford a modern rig, £130. G4VZF QTHr. Tel: Brentwood (0277) 354822.
- Yaesu FT480R. Tonna F 9ft beam, 2m 5/8 collinear. Alinco EMR400 rotator. MAA 144V pre-amp. 1/2 mobile whip, £350. Tel: Hemel Hempstead (0442) 65324.
- Dragon 32K vgc, data rec J/S all leads, dust cover, over £800 of software, ie RTTY, CW, QRA, games, education, etc. A real bargain. Reason for sale have got new computer. The first £180 and it's all yours. Tel: Leigh (0942) 675445.
- Hitachi stereo radio cassette recorder, four wave band, large portable and boxed, very good condition. Would exchange for decent communications receiver, 0.30MHz. Tel: 01-207 0706 or 01-207 2326.
- Trio ham band receiver 310, fitted 160m, 30m and old bands. Much improved over original set. Separate oscillator coils all bands. Separate RF IF gain controls. Switchable coupling front end. Switchable ant, audio filter, variable. Stabilised osc, extra smoothing. Honest strength meter. Calibrator not fitted. Nice condition. Handbook with circuit. Coupling sockets for transceiving with TX310 or 88. Buyer collects, £95 cash. Daylight hours. Walker, 35/37 Brighthouse and Denholme Road, opposite Raggalds Inn, Queensbury, Bradford BD13 1NA.
- Trio 4000A dual bander plus dual band antenna duplexer. Just out of warranty, never used, mobile brand new condition, boxed, would deliver reasonable distance Manchester but would prefer buyer see, operate and collect, £375. G4FKZ. Tel: (061) 624 2808.
- Sony world zone, battery, mains, portable 32 band Rx. Freq range FM 87.5-108MHz, LW 150-400kHz, MW 530-1605kHz, SW 1.6-30MHz. SW range freq displayed by LED digital readout, internal quartz crystal clock. C Woodard, Griffin House, School Road, Neatishead, Norwich, Norfolk NR12 8XW. Tel: Horning 630880.
- FT102 and SP102. As new, boxed, exchange for FT757 etc. Tel: Dave. Rotherham 67471.
- Trio TR7730 2m FM 25 watts mobile rig, 144/148MHz, scan from mic, 5 memories, boxed, in very good condition, £170 or p/x against a TR9000 or TR9130, in good condition. Tel: Luton (0582) 454055, ask for Bob.
- IC271E complete with muTek front end and original packing, £575 or very near offer. Reason for sale going HF. G6JNS, Peter Crosland. Tel: (0905) 620041 any time.
- Morse code tapes. RSGB stage one, up to five words a minute. ARRL two tapes, five to thirteen words a minute, complete with instruction book, £10.00 inc postage. A G'Beer, 31 Hawe Lane, Sturry, Canterbury, Kent CT2 0LL. Tel: (0227) 711261.
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- fitted. Very good condition. Ideal for RAE student or SWL, £50 ono. Maxcom 7E portable hand-held CB radio, 40 channels, 4 or 2W output, + nicads, charger, carrying case, mobile aerial, (mag mount). Very good condition, £40 ono. G1OFL. Tel: Gravesend (0474) 326036.
- AOR2001 scanning communications receiver 25-550MHz AM/VHF. Also accessories, ac adaptor, 12/14 volt dc lead, telescopic aerial, mint condition, £300. Tel: (051 486) 4529.
- General purpose 8 ohm elliptical speakers 6in x 4in, £1.00 each. Ham International multimode II, linear L92S 27MHz, £140 ono. Harrier CBX and SWR power meter, £45 ono. Tel: (0694) 722131, Emilio GOCYQ.
- Appalling thing full of funny glass objects. Alleged to be Fantavox communications receiver. 550kHz to 30MHz. Wobbly BFO, ludicrous bandwidth, indescribable S-meter. Purchased in weak moment. Some compulsive fiddler please take it off my hands for £20. Buyer collects. Roy Bailey G6WLE. Tel: (048839) 441 (Berkshire).
- Yaesu FRG7000 comm receiver, 0.25MHz-30MHz digital display, plus Yaesu FRT7700 ATU, and Yaesu YH55 phones, manual exc condition, £190. Buyer collects. Tel: (0792) 864994.
- FT207R two metre hand-held, charger case, £120. TR-3200 70cm mobile-portable, nicads, charger, case, £110. TR-2200G two metre mobile portable charger, case, £65. TR-7100 two metre xtal mobile, £60. SMC station scope, mint, £80. Eddystone S640 HF Rx, £40. PF70 three channel not converted, £20. Buyer collects or pays carriage. Tel: John, Waterlooville (0705) 261399.
- Yaesu FTI with all options including FM and recently fitted upgraded PLL unit, FC902 ATU and SP101 loudspeaker unit. Also telereader RTTY decoder and power supply. All in excellent condition. Offers please, around £1100 the lot. Spread payment arranged if required. Dan Arbib, 34c Gloucester Walk, London W8 4HY. Tel: 01-937 6124.
- Marconi Atlanta 'C' Rx, covers 15kHz to 28MHz, all modes. Modified for UK mains and complete with original manual. Perfect working order, works well on broadcast and amateur bands, £60 plus postage (it's very heavy!) or swap for lighter Rx, 2m Rx/Tx (Totsuko, Liner 2, etc) or Morse tutor, or WHY? Please write to: Jon G1PGH, 67 East Street, Selsey, West Sussex PO20 0BT. Tel: (Selsey) 605779 (after 6pm please).
- Creed 444 teleprinter with silencer cover, £40. PAG TU, £50. Plenty of spare paper, could deliver within limited radius. Tel: Ubbeston 403, evenings.
- Barlow Wadley Mk2 XCD30 crystal controlled receiver, .15K-30MHz portable or 9V pp, AM-USB-LSB, FRV7700 VHF converter, model C 140-150, 150-160, 160-170, or swap for CB, AM, USB, LSB, FM. Tel: (0947) 604716.
- Hi-band Pye Cambridge, ideal for two metres, plus part of another for spares, £14. Transmitter chassis with 2m and 4m on board, just requires PSU, £10. RTTY tones gen board, £5. Bags of resistors, 30p per bag or four bags, £1. EPROMs ex-equipment 2708, 3 in a bag, £1. Morse code oscillators, 40p, plus lots more. G Martorano, 81 Sapcote Drive, Melton Mowbray, Leics. Tel: (0664) 500228.
- Icom IC-290D 25W multimode, little used, £380 ono. Also FRG7 with 2m converter, £100. Buyer collects. Tel: (0305) 782151 (Dorset).
- 2 - 12ft 2 inch dia aluminium poles suitable for aerial mast, £2 each. Condenser analyser and resistance bridge, mains operation, old but working, £3, buyer collects. 4 Ham Road, Worthing, Sussex BN11 2QX.
- One Codan PR40 preselector, 9 volts dc, £6 and one LAR omni-match, £30.00. One Welz matching network AC35M antenna tuning unit, for use up to two hundred watts. For amateur use only, £33.00.

- Tel: Wood Clochan 378.
- NATO 2000, £130 ovno. Ham multimode 2, offers. Hygain5, offers. All sets have been checked, going abroad. Tel: (0283) 221870.
- Sony ICF2001 portable, 150kHz to 29,999, (2,000 to 10m), AM/SSB/CW, FM 87.5-108MHz. Full SW coverage, digital display, PLL synthesised, amateur bands. Spare antenna, instruction plus service manual, £85. Tel: Bury St Edmunds (0284) 60984.
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- FT101B with G3LLL double balanced first mixer module fitted. New PAs and driver, spare PAs. Yaesu YC601 digital display. Kenwood LF-30A low-pass filter, homebrew ATU with 30W dummy load. Vertical antenna 10, 20, 40 metres. £400 no split, might exchange for 2 metre multimode station in good condition. Central Scotland area preferred so buyer can test and try. Jenkins, 30 Cumbrae Drive, Falkirk FK1 4AH. GM1POU. Tel: Falkirk (0324) 26210.
- Unwanted gift WPO universal Morse memory 120 sec, brand new, cost £52 sell £46. No offers. P Darcy, 254 James Greenway, Lichfield, Staffs WS13 7JZ.
- Clearing out my hobby workshop, space needed, bags of components, etc new and unused. I wish to clear everything as quickly as possible. Standard crocodile clips 1 1/2ins long, 10 for £2, a satellite TV antenna DIY manual, how to build an antenna from cheap everyday materials, manual £4.50, 3-tone buzzers, 12v but will work on 9v to 24v fixed to small PCB 3ins x 1 1/2ins with other components, I have about 10 of these £2 each, I have a giant bag of resistors/capacitors mixed, I will sell a bag 3lbs for £7.50, some small bags of electro capacitors with some resistors and some transistors, about 100 items £2.50, wire wound pots, mixed sizes 5K, 15K, 25K, etc. 25 in bag for £8, PVC insulation tape, up to 30mm wide, various colours, mixed, a 2lb bag for just £3, a lot of insulation tape on cardboard reels 8ins x 3/4in x 20yds in red, white, blue, 80p per reel. Self-tapping screws 1/2in and shorter, mixed 100 approx £1. I have 7 Sharp mains power packs 9V (regulated) at 500mA with internal trimming adjusts from 8.7V to 14V approx, input cable 2m, output cable 1 1/2m, £5 each, 8 pin IC sockets, made in USA Texas, 10 for £1, 14 pin IC sockets, Texas, 10 for £1.60, BC108 transistors, 10 for £1, UA741 ICs, 10 for £1.60, NE555 ICs, 10 for £1.80, diodes 1N4148, 10 for 40p, red LEDs Til 209s, 10 for £1.30. Radio valves still boxed but I only have one of each type, ECL82 70p, EZ80 60p, UCM81 75p, UABC80 65p, UCC85 70p, UL84 £1, UY85 60p. Plans for building matchbox-size transmitter, transmits on FM, radio plans £1. Diamond dressing tool for cleaning grinding wheels, ideal for hobby bench type grinders £8.50. Everything must go but no dealers please, cheques returned if items sold. Everything by post only. D Martin, 6 Downland Garden, Epsom, Surrey KT18 5SJ.
- Superstar 360FM, would make a very high class 10M multimode Tx/Rx. I have heard reports that this rig makes one of the finest 10M mobile sets around. Power output approx AM/FM 2.4, 8 watts, SSB 4.8, 12 watts, £125. Tel: (04427) 8570 after 5pm please, ask for Nick.
- Sony ICF7600D receiver, £100. Clark, Hythe, Kent. Tel: (0303) 68132.
- Eddystone 840C, mint condition with Codan PR30 ATU. £50 ono. P Theobald, 4 Bisley Close, Park North, Swindon, Wilts SN3 2JZ. Tel: (0793) 611103.
- AR2001 scanner 25-550MHz, no gaps £240. Trio R1000 general coverage receiver £140. Tel: Mark (0628) 781075 (Maidenhead) after 6pm, all day weekends.

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■ Microwave modules 2m linear amp - MML 144/100-S, £95. Jaybeam 70cm multibeam MBM48/70, £18. 10 metres of Andrews LDF4-50 cable, and 2 Andrews L44W plugs, all new and unused, £30. Tel: (0926) 498388.

■ FC102 ATU complete with remote switching unit and warranty, mint condition, current price £191, offered at £145. SEM Transmatch acceptable in px. Reason for sale - multiple antennas not Required. Also Taxan VDU 12in green screen, virtually new £45. John G4WLD. Tel: (01) 857 8096.

■ Cobra 148 GTL DX USB, LSB, AM, FM, CW, good condition, boxed, £100.00. Also 11m 3 element beam, never used, still boxed, £25.00. Tel: Bristol (0272) 605705 after 6pm.

■ G5RV type aerial, half size, 40-10m, new and unused, still in packing, not wanted, £7.50. Tel: Hetton (0783) 267125, Tyne & Wear.

■ Transistor, Norwegian Rx 1.5MHz to 22MHz with new batteries, £10. Class D wavemeter mains, £5. Codar PR40, £5. Ex-army Morse key, £2. Auto transformer heavy duty, 115 volts out, American make, £5. Sun gun battery charger, 12 volts at 2.5 amps, type sold to trade only, £5. Buyers collect. Chubb, 32 Kelvedon Road, Fulham, London.

■ Eddystone EC10 550kHz to 30.0MHz, £30. Eddystone 840A 480kHz to 30.0MHz, £40. Both working order. A Freeman, 43 Deodar Rd, Putney, London SW15 2NP. Tel: (01) 789 2878.

■ All Trio/Kenwood components and accessories including service manuals, FM boards 430s, battery packs for TH21E and chargers. SSB, AM CW filters. For more details please ring Rodney. Tel: Farnborough, Kent 58825.

■ IC271E, fitted muTek front end, superb Icom 2 metre multi, £575. Densai base mic, used once, unwanted gift, £45. Bremi 5A-7A PSU, £15. Free Adonis AP-1 mic pre-amp with IC271E, use any mic. G61AT. QThr. Tel: Luton (0582) 23750.

■ IC271E in excellent condition with muTek board in original packing, £475. TW4000A in good condition with original packing £365. Kenpro KP200 memory keyer, £110. Tel: G6JNS, (0905) 620041 anytime.

■ Chaser MC3000 26.515 27.855 AM, £30, Midland 100M 26.965, 27.855, needs attention, but boxed, good condition, £8, both ideal conv 10 metres. Sirtel CBE2005 amplified roger beep base mike, boxed vgc, £15. All items ono. Solartron digital voltmeter LM14 0.2.2 cost approx £400, offers. Scientific NMR ESR power supply, offers. Sell or swap 2 metre equipment comm rec HF Tx antennas or WHY. G1RLA Rory. Tel: Chipping Norton (0608) 3558.

■ Objective lens 60mm, focal lens 910mm, tracking facility eye pieces, 2X barlow lens, star diagonal prism, filters, fully adjustable wooden tripod, sighting scope, manual and accessories. Exchange for 2m rig. Please tel: (0702) 201615.

■ DX302 digital 0-30MHz receiver pre-amp antenna. £200, Gemscan computer digital scanner 60-519MHz recorder antenna, £205, 10m tran/c repeater PSU powered antenna. £95, 2m Datong converter to 10m, £28. All items perfect, moving QTH, contact anytime. Extras free to complete entire sale. Tony Bailey, 40 Wellington Way, Salisbury, Wilts. Tel: (0722) 22646.

■ Logan Organ Two manual pedal draw bar voices. Two speed rotary speaker auto rhythm walking bass arpeggio memory unit. Excellent condition, £425 or exchange HF Tx/Rx. Tel: G1LUG, Coventry 450476.

■ Ham International jumbo base station transceiver. FM/AM/SSB, 10kHz shift, vgc, boxed, manual, easily modifiable to 10m, £130. Tel: (04605) 4583, ask for Michael.

■ Yaesu FRG7000 HF receiver, 0-30MHz, LED readout, clock, timer, set 1-2. The best Yaesu produced, excellent condition, £195.00. Poss px marine VHF transceiver. Tel: (07374) 2250 (Redhill).

■ Scarab MPU1 RTTY system plus Spectrum RTTY interface and program RTTY/3. This system is factory built and ready to plug into your Sinclair Spectrum. £65 ono. Tel: Les G4JNW, Scarborough (0723) 366360.

■ 25-550 general coverage VHF/UHF scanner receiver unmarked. Excellent condition, original packing and manual, £260. Buyer collects. Cash only, no offers. L Haworth, 11 Joffre Ave, Castleford, West Yorks WF10 5AZ. Tel: Castleford 516904 (2-5).

■ FT790R 70cms multimode. Case, strap, Nicads, charger, rubber helical and mobile 3 x 3/4. £270. Tel: (0622) 672116, pm and weekends.

■ KP202 2m hand-held, 5 crystallised channels, 2W output with duck antenna, £40. Tel: 01-805 1306, London.

■ CB transceiver Storker 9DX, FM, AM, LSB, USB, good condition, £95. Tel: 01-207 0706 or 01-207 2326.

■ R1155A modified £30, R1155L unmodified, super condition £65. TCS12 Tx/Rx ex-USN, will separate Tx and Rx, £30 each. HB PSU £20. CR100, good, £40. HF DF Rx (DFP3) early 40s, £50. HRO Mx £45, BC348R mint with dynamotor, offers. BC342 similar condx offers. HF156 army man pack HF CW/AM complete, £35; ac PSU if required. TR1196 Rx, only, £20. W1191 wavemeter ex-RAF, £10. RAI early USA a/c receiver, £25. Lafayette HA63 Rx, £25. EC10 Rx £45. Heath SB102 Tx/Rx with PSU, £155. Heath monitorscope SB610, £35. Both high grade condx. Redfon Safari HF SSB late commercial mobile. FRG7 Rx as new, £135. PSUs, valves, collectors items, etc. A H Cain G3DVF, 18 Oaky Balks, Alnwick, Northumberland NE66 2QE. Tel: 602487.

■ Two new 19 set meters (boxed), T1430 transmitter, 'bashed-about', offers, buyer collects. Tel: Medway 253056.

■ Airspaced coil of 1/4in copper tubing, 4 1/2in long, 3 1/2in diameter, £3. Five pointer knobs for AR88D receiver, £3. Six volts synchronous vibrator Yin pin for early power pack, £3, other types available. Ex-WD whip aerial base no 10, Mk2, £3. Ross mains unit 240V to dc 3, 4.5, 6, 7.5, 9, 12V at 500mA, universal plug, polarity, £6. Headset adaptor MC385C high to low impedance, £3. Radiospares 50W auto-transformer, tapped mains to 115V, £5. Multi-cable 51ft, 3/16in dia, 18 strand in 22 gau (3 screened) coded, £5. Balloon neoprene USA 1945 mfrg, £4. Transformer 600Ω 5000Ω, small, £3. Gardner LF choke 20H, 100mA, 318Ω, £3. Valves. 6EW6, £1. 150B2 voltage regulator, new, £2. Converter to receive 160m on 80m or 40m tuning. 5.5MHz xtal, ECH81 2 stab oils, £5. Edwards G3MBL, 32 Heldhaw Road, Bury St Edmunds, Suffolk IP32 7ES. Tel: (0284) 60984.

■ KDK2025 2m FM 144-146MHz, will Rx up to 150MHz. Scans thru' 10 memories or all or part of band. 3 watts or 25 watts. Lack of use forces sale, vgc. Also Adonis MM202S mobile safety mic, wired KDK (nice audio) both make ideal set up for 2m. Offers around £135. Please tel: 01-247 6097 daytime, thank you.

■ Eddystone ED12 in good order with manual, £100. Can be seen any evening. S R Butler, Flat 6, 21 Upton Park, Slough, Berks.

■ Eddystone 840C general coverage receiver. In first class condition with some spares and original manual, £40.00 ono. J C Culling G8NLW, 7 Badger Close, Mulbarton, Norwich. Tel: (0508) 78020.

■ Pye W15U Westminster for sale. Fitted pre-amp and SU8 xtal. 10 channels, good working order £40, carr extra. S Yorks signal generator VHF to UHF AM and FM complete with handbook, £50. Blue solid pack Burndepth hand-held batts, suit B471, 3 for £30. All items plus carr. Signal gen is by Marconi. Tel: (0302) 835280.

■ Do you build? Have one each USA Collins TCS and Bendix TA-12 transmitters for sale. Full of high quality components, coils, roller-coasters. variable capacitors, relays, meter, tubes, etc. Weighs a lot so buyer collects, £20 each. Also Bendix standing wave indicator, rare 4158 model, less external sensing head, hence only £15. Also rough externally BC348 rcvr, needs power pack, £15. Nev Kirk G3JDK, 54 Allendale Rd, Rotherham, Yorks. Tel: Wickersley 541606 any time.

■ FC700 ATU in mint condition, 100W dummy load and power meter, all built in. Will sell for £60, or will preferably swap for FC902, plus £60 cash. Maurice Hughes, 128 Ravenswood Rise, Dedridge, Livingston, West Lothian EH54 6PQ, Scotland. Tel: Midcalder 880345.

■ National HRO com Rx, 9 coils, p/pack, £45. Hallicrafters SX23, £15. S27 (S36) VHF com Rx, £28. Trophy six c1938 com Rx, £20. Tobe 1930's ham bands kit set, £22. 1930 Celestion radiogram, superb mahogany cabinet on legs, £45. Rogers-Majestic 9 valve radiogram, American colonial style cabinet, £16. 1932 standard (KB) mains radio, £30. 1931 KB mains, £20. HMV 470 Lowboy Superhet Seven 1932. Philips 2 valve mains, 1929. McMichael 1932. TRF mains. McMichael 1934 Superhet 135

mains, AVO Seven with shunts, £24. Realistic VHF/UHF professional scanning Rx mains battery, mobile bracket, antenna, £32. German 1930s military comm Rx mains/battery. Any exchanges considered, interested in early wireless, crystal sets, catalogues, books, valves, tinplate trains, toys, early gramophones. Jim Taylor, 5 Luther Road, Winton, Bournemouth. Tel: 510400.

■ IC02E with spare battery pack, soft leather case original packing. Contact Keith GW4NBY, evenings and weekends only on (0656) 56576. £220 ono.

■ EPROMs for CB conversions, including Veroboard layout and fitting instructions, £5. EPROMs Brown for BBC computers, 8K - £6, 16K - £8. Send your program on EPROM tape or disc. For more details send SAE to Chris Womack, 4 Mill Close, Ackworth, Pontefract, Yorkshire WF7 7PU. Tel: (0977) 611395, after 6pm.

■ Trio dual band rig TW4000A, one year old 2m/70cm, like new, will sell for £400, no offers, no time wasters. D J Plant, 15 Heathcombe Rd, Bridgwater, Som TA6 7PD. Tel: (0278) 423288.

■ Trio TR2400 hand portable FM transceiver, CW, spare Nicads, car charger, remote mike, also 7/8 mobile whip if required. All items boxed and vgc, £165. G0DBX. Tel: (0507) 604419, evenings.

■ Tristar 747 multimode, part modified, goes up to 28.75MHz. Asking £56 inc post. Valves, 6146B and QQV06-40 (x2, £6 and £17. All inc post. G4XIV not QThr. Tel: (0904) 792208, weekends only. Tony.

■ Trio TR9130 boxed, superb condition, £350, PS430 boxed unused, £70, Channel Master antenna rotator automatic, £35, low loss coaxial feed met six element crossed 2 metre yagi free if all items purchased. All items to be demonstrated. Delivery can be arranged. Tel: (021) 355 6464.

■ Yaesu FRG9600 VHF/UHF receiver 60/905MHz as new in box with Yaesu power pack, 20 months main agent guarantee, £350. Donald, 25 Setley Gardens, Bournemouth. Tel: (0202) 520020.

■ Ham Concorde II 26.515 to 28.305, FM, AM, USB, LSB, CW & 7 amp PSU & Bremi 0-100MHz frequency counter. Antenna switch with dummy load & Ham mike & instrs. All excellent condn. Suitable conversion to 2m, offers around £80. Clayton, The Rectory, Barningham, Richmond, North Yorks DL11 7DW. Tel: Teesdale 21217.

## WANTED

■ FT290 or similar 2 metre multimode plus small linear or rotator in exchange for 12ft double ended sailing boat in as new condition, combi trailer included, value approx, £300. Tel: Tony, Norwich 405531.

■ T1154 RAF transmitter. High price for clean model, but anything considered. Marconi aircraft Rx 118M. VHF Marine R/T. Racial LF converter. Manual for Redfon Safari HF SSB Mobile R/T. A H Cain G3DVF, 18 Oaky Balks, Alnwick, Northumberland NE66 2QE. Tel: 602487.

■ Linear 1W to 10W for 144MHz FM. Brian Navier G1PRO, 12 Brooklyn Avenue, Brooklyn Street, Beverley Road, Hull HU5 1ND. Tel: (0482) 441170.

■ Marconi 1017 Rx. Also, for use as spares, AT5 Codar Txs and Heath RA1 Rxs. Full details and price to Marris, 35 Kingswood House, Farnham Road, Slough, Berks SL2 1DA.

■ Make someone happy, mainly me! Just phone to say that you have a Yaesu YK-901 keyboard for sale and collect a life-long friend. I'm awaiting your call. Tel: Colchester 394336 (Essex).

■ Newly licensed amateur, anxious to get operational, requires cheap 2m rig. Can collect some areas. Hand-held, mobile, or base equipment in need of repair etc. Bob G1RRV, 5 Moor Lane, St Budeaux, Plymouth, Devon.

■ AR88 signal strength meter, metal trims, badge, valves, any Heathkit equipment (inexpensive) will exchange or sell KW160 Top Band Tx in good condx with manual and Sharp portable SW Rx with digital display. G4VNG. Tel: (0733) 231639.

■ Yaesu YO91 scope and accessories for FT107M inc t/verter modules 4m, 6m, 70cms and suitable desk mics. Noz Bryan, 75 Edgehill St, Reading, Berks. Tel: (0734) 596485 after 9pm or w/ends.

■ An MFJ Enterprises (American) company Model No MFJ1020 indoor tuned active antenna. Also one LCD clock, the MFJ107, in very good condition. Also 80 foot lamp stranded twin wire, and a hand-held scanner at a cheap price. Tel: Wood, Clochan 378.

## FREE CLASSIFIED ADS

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- Trio JR599. Must be mint condition. State price and age, include carriage, custom special required. L D Ireland, 16 Cathebedron Road, Carnhell Green, Camborne, Cornwall TR14 0NA. Tel: Praze 831236 or 831149.
- Very recent copy *World Radio TV Handbook*, good cond. Swap for four copies *Radio TV Servicing Manual*, 65-69 vgc. Also any HF vert ant. Must be cheap and working, or swap for brass key, WHY. Also any *Amateur Radio* mags. Tel: (01) 200 3825.
- Eddystone 770R VHF Rx or similar wanted. Exchange Eddystone 640S/Hallicrafter SX24 plus a PCR. GWO. Mr H V Overy, 8 Albertus Drive, Hayle, Cornwall TR27 4QY.
- Two element HF Tribander (I will also buy your rotator if you won't split the two). Andy G0CCX QThr as G1ICE. Tel: (0273) 516517.
- Heathkit RA1 RXs and Codar AT5 TxS wanted for spare parts. So turn out your old ones and send details and price to Marris, 35 Kingswood House, Farnham Road, Slough, Berks SL2 1DA.
- Trio JR599 receiver, must be in mint condition, price required including carriage. L D Ireland, 16 Cathebedron Road, Carnhell Green, Camborne, Cornwall TR14 0NA. Tel: Praze 831236 or 831149.
- A valve for old Philips receiver no APP4B. An Eddystone 888A receiver in good working order. Richard Glennon, Clonmore Fahy, Tullamore, Co Offaly, Eire.
- Eddystone EA12 Rx, Eddystone 940 Rx. Mr J P Wright, 12 Norn, Basingstoke, Hants RG21 2MD. Tel: (0256) 468649.
- MII Cobra 148, GTL DX. Must be in first class

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- Hammerlund Super-Pro SP200 receiver manual and/or circuit diagrams wanted or any details of power supply. Buy or borrow for copy all expenses paid. B Woolley, 27 Bute Drive, Perth PH1 3BG. Tel: (0738) 31864.
- Multi channel 70cm rig, anything considered, ex commercial or home built, reasonable price. For sale Pye PFI receiver, £4.00. Tel: Newhaven (0273) 516801. G8RHU.
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- VHF-UHF scanner, also SSTV or FAX Rx, have to exchange Eddystone S640. Cobra 148 GTL DX ferroglyph series 7. plus lots of other radio gear. Bill Hall, 1 Crookhill Tre, Ryton, Tyne & Wear NE40 3ER. Tel: Tyneside 41327.
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- Exchange or swap Commtel 934 two beams with a rotator, excellent condition for FRG7700 or any similar receiver or good receiver with a Trio IC2E carrot detuner, must have digital readout. All letters will be replied to or call, day or night. Mr M Tanscoy, 10 Telscobe Drive, Holme Wood, Bradford.
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- Handbook or service sheets for Hallicrafter S38D Rx. To purchase or borrow. Contact Fairgrieve, 8 Aird Point, Isle of Lewis PA86 0EU. Tel: Garrabost (0851) 870710.
- Heath HW100 transceiver with HP23 ac power unit and manual. Phone initially with details and price required. Tel: Stephenson (0272) 642101 (Bristol).
- Icom or Trio receiver, multimode, 2 metre, in good working order. Tel: 01-340 3948, John Scott.
- Icom IC451E, please someone sell me one! Will consider HF rig with transverter to 70cms instead of IC451 or even an FT790 if cheap. Also wanted muTek 70cms masthead pre-amp, WHY. Julian Tether G6LOH. Tel: (0295) 768152.
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- Lowe SRX 30D Rx, with FM mod, or similar general coverage receiver for SWL. Also require vol one of Faraday's Experimental Researches in Electricity. Alan Williams G3KSU QThr. Tel: Ryde (0983) 65551.
- Heathkit GDM Model GD-1U gwo. A R Brackenhorough, 41 Poets Corner, Margate, Kent CT9 1TR. Tel: (0843) 225445.
- Morse keys, bugs, keyers and any other type of Morse equipment for private collection. Send photo and/or details etc to Fred, PO Box 130, Manly 4179, Queensland, Australia.
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## Amateur RADIO

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AF127	0.38	BC169C	0.12	BC547	0.12	BDX18	1.60	BF422	0.20	BU105	1.20	E1222	0.32
AF159	0.40	BC170	0.16	BC548	0.18	BDX32	1.48	BF450	0.38	BU105/02	1.55	E5024	0.30
AF178	2.28	BC170B	0.16	BC549	0.10	BF157	0.32	BF457	0.36	BU108	0.90	GE1872	0.80
AF239	0.50	BC171	0.10	BC550	0.10	BF117	0.50	BF458	0.37	BU112AE	1.75	GE1872	0.80
AF279S	1.40	BC171	0.14	BC550C	0.10	BF119	0.82	BF459	0.35	BU126	1.40	MEU21	0.62
AL100	5.40	A or B	0.08	BC557A	0.10	BF120	0.38	FR51	0.36	BU133	1.40	MJ400	1.45
AL102	4.40	BC172	0.16	BC558	0.10	BF125	0.42	FR61	0.32	BU204	1.30	MJ2955	1.80
AS980	5.20	A or B	0.12	BCX34	0.29	BF127	0.44	FR90	0.86	BU205	1.30	MJ3000	1.80
AU110	2.80	BC177	0.24	BCV70	0.16	BF154	0.23	FT41	0.68	BU206	1.50	MJ3400	0.85
AY102	4.32	BC178A	0.12	BCV71	0.17	BF157	0.46	FT43	0.38	BU208	1.40	MJE371	0.44
BA110	0.68	BC182	0.10	BCV72	0.16	BF158	0.17	FT48	0.84	BU208A	1.40	IN4006	0.07
BA121	0.42	A B or C	0.09	BC211	3.21	BF160	0.23	BFW44	0.68	BU208.02	2.05	MJE2955	1.40
BA129	0.38	BC182L	0.12	BC210	2.60	BF167	0.32	BFX29	0.28	BU326S	1.75	MJE3055	1.40
BA148	0.16	A B or C	0.09	BD124P	0.70	BF177	0.42	BFX30	0.40	BU407	1.10	OA47	0.10
BA154	0.12	BC183	0.10	BC130Y	0.68	BF178	0.26	BFX80	0.46	BUX80	3.70	OA90	0.07
BA155	0.12	A B or C	0.10	BD131	0.38	BF180	0.27	BFX84	0.28	BUY20	2.75	OA91	0.07
BA157	0.28	BC183L	0.10	BD132	0.38	BF181	0.27	BFX85	0.35	BUY69A	2.80	OA95	0.12
BA164	0.14	A B or C	0.10	BD135	0.26	BF182	0.32	BFX86	0.44	BUY69S	3.98	OA200	0.06

### FUSES

QB 20mm 100 mA to 6.3A:  
**6p each 100 for £3.50**  
 Slow Blow 20mm 100mA to 200mA:  
**20p, 100 for £15.00**  
 Slow Blow 20mm 20mA to 800mA:  
**12p, 100 for £7.50**  
 Slow Blow 20mm 1A to 6.3A:  
**10p 100 for £5.00**

### L.E.D.'s

RED 3mm - 5mm **10p each**, 100 for **£6.00**  
 YELLOW 3mm - 5mm **13p each**, 100 for **£10.00**  
 GREEN 3mm - 5mm **13p each**, 100 for **£10.00**

### C-MOS

4000	0.19	4021	0.58	4036A	2.45
4001	0.24	4022	0.68	4038	0.73
4002	0.24	4023	0.35	4039A	2.70
4007	0.24	4024	0.49	4040	0.58
4011	0.24	4025	0.24	4042	0.48
4012	0.24	4027	0.44	4043	0.42
4013	0.35	4028	0.44	4044	0.48
4014	0.58	4029	0.73	4046	0.58
4015	0.58	4030	0.33	4049	0.38
4016	0.38	4031	1.28	4050	0.34
4017	0.54	4033	1.25	4051	0.68
4018	0.59	4034	1.40	4052	0.68
4020	0.78	4035	0.68	4053	0.58

### CHART RECORDERS

Brand new 3 channel pen recorders complete with charts spares kit. Full spec upon request - Once only bargain £40 - £10 p&p plus 15% VAT

### EXPORT TV'S AND VIDEO'S

Attractive prices on 22 remote control brand new guarantee. Write for details

### RESISTOR KITS

1/4W pack 10 each value E12 - 10R-1M  
 Total: 610 resistors **ONLY 5.75**  
 1/4W pack 5 each value E12 10R-1M  
 Total: 305 resistors **ONLY 3.35**  
 1/2W pack 10 each value E12 2R2-2M2  
 Total: 730 resistors **ONLY 7.95**  
 1/2W pack 5 each value E12 2R2-2M2  
 Total: 365 resistors **ONLY 4.75**  
 50V Ceramic Kit 5 ea value  
 125per Kit **ONLY £3.75 ea.**  
 400M Zenner Kit  
 55 Zenner **ONLY £3.75**

### SOLDERING AIDS

Antex 15W iron	5.25	BT Plug & 3M lead	1.25
Antex 18W iron	5.50	BT Master Socket	2.85
Antex 25W iron	5.75	BT Sec Skt	1.95
Antex elements	2.75	BT 4-core cable 1M	0.15
Antex bits	0.90	BT approved 100M	12.00
Antex stands	2.10	BT approved telephones	4.50
Spare nozzles	0.65	Viscount	£32.00
Dessolder Tool	4.50	Statesman	£29.50
25W Kit-iron with 13A plug and stand	ONLY £10.00	Slimtel	£22.50
18W Kit iron 13amp & stand	9.90	All carry BT guarantee	

### TRIM-TOOL SET

A handy set of four double-sided plastic trim tools of varying sizes - supplied in attractive wallet **£1.40**

### NI-CAD CHARGER

Universal charger to charge PP3 AA C D **PRICE £5.95**

### NI-CADS

PP3	£4.45	4	16.00
1A	£0.95	10	8.00
HP11	£2.30	4	5.50
C	£2.35	4	8.75

### BATTERY HOLDERS + SNAPS

EH73S/Take 2AA Cells	17p
A302/Take 4AA Cells	21p
A304/Take 6AA Cells	32p
EH80S/Take 8AA Cells	40p
EH80T/Take 10AA Cells	48p
CX2/Take 2 C Cells	29p
B203/Take 4 Cells	31p
DX2/Take 2 D Cells	29p
PP3 Battery Snap	7p, £6/100
PP9 Battery Snap	17p, £16/100

### 74LS

LS00	24p	CA3011	2.20
LS01	24p	CA3014	2.20
LS02	24p	CA3018	0.86
LS03	24p	CA3020	2.10
LS03	24p	CA3028A	1.10
LS08	24p	CA3080E	1.80
LS09	24p	CA3085	0.68
LS10	24p	CA3086	0.60
LS11	24p	CA3090AQ	3.40
LS12	24p	CA3030E	0.90
LS13	33p	CA3140E	0.45
LS14	48p	HA1336W	1.59
LS15	24p	LM324N	0.45
LS20	24p	LM339	0.40
LS21	24p	LM348	0.60
LS22	24p	LM380(14 PIN)	
LS30	24p		1.80
LS32	24p	LM381N	1.75
LS37	24p	LM382N	2.00
LS74	33p	LM386	0.99
LS122	68p	LM387	2.00
LS138	44p	LM389N	1.60
LS139	58p	LM3914N	3.10
LS151	70p	LM3915N	3.45
LS155	55p	555NE	0.80
LS157	45p	C-mos5555	0.88
LS158	58p	741	0.35
LS160	62p	SAS560S	1.85
LS161	68p	SAS570S	1.85
LS162	70p	TA7205AP	1.30
LS163	68p	TA7222P	2.32
LS166	1.50	TDA1004	4.95
LS170	1.40	TL072	0.75
LS244	0.80	TL081	0.35
		TL084	1.10

### IC SOCKETS

D11 to D11		
8 pin	0.08	0.70/10
14 pin	0.10	0.95/10
16 pin	0.11	1.00/10
18 pin	0.14	1.60/10
22 pin	0.21	1.95/10
24 pin	0.25	2.25/10
28 pin	0.30	2.75/10
40 pin	0.34	3.10/10

### BUZZERS

Solid State	
6volt	80p
12volt	80p

### BRIDGES

1/2A 50V	0.27
100V	0.28
200V	0.32
400V	0.40
600V	0.57
800V	0.68
2A 100V	0.52
200V	0.55
400V	0.61
600V	0.67
800V	0.70
6A 100V	0.66
200V	0.68
400V	0.74
600V	0.80
8	

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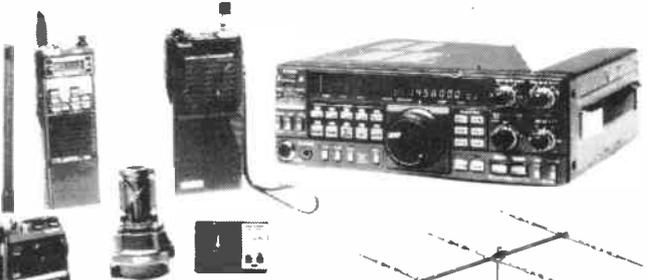
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