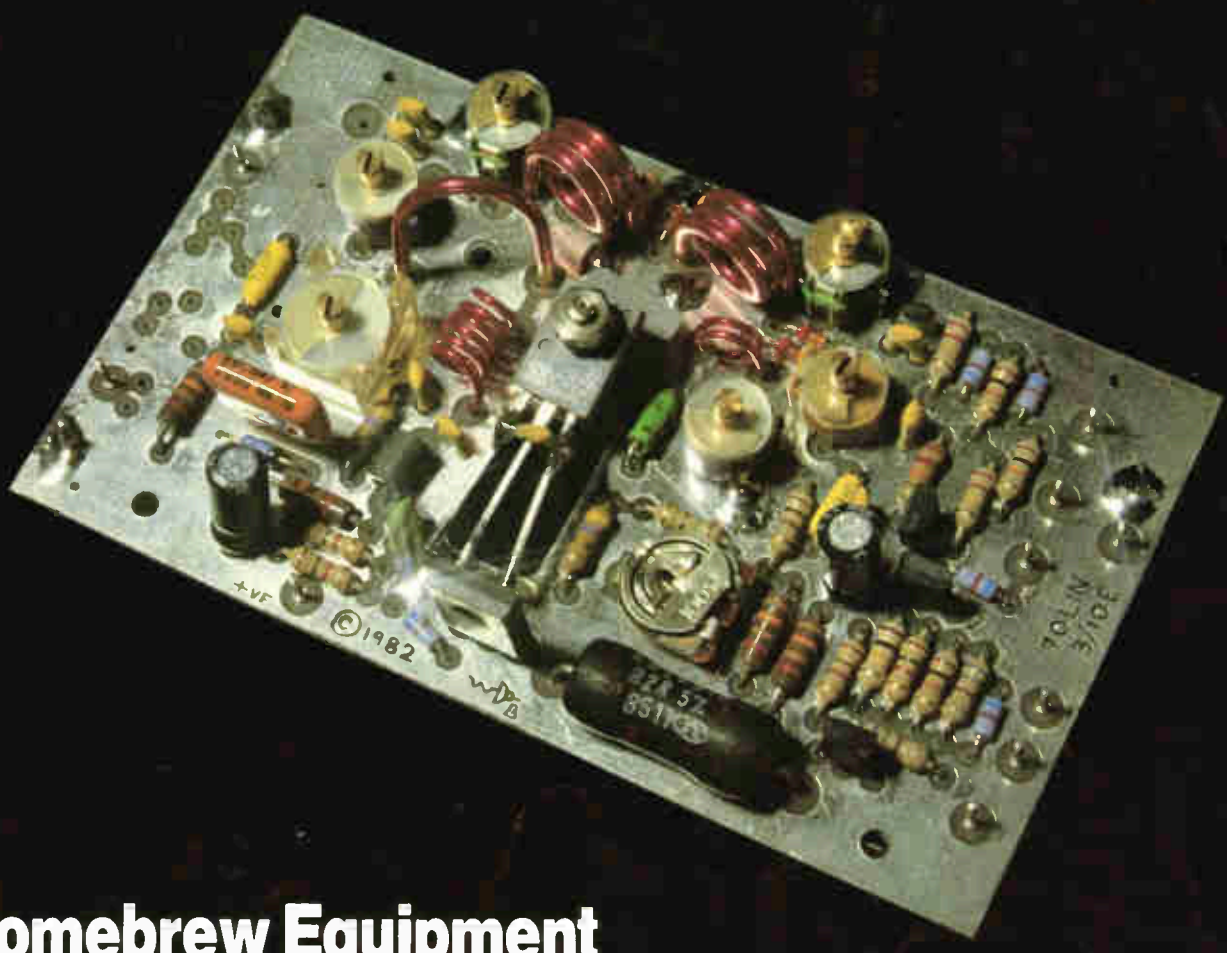
NOVEMBER 1988 £1.75

# Amateur RADIO

For all two-way radio enthusiasts

## DXpedition to Howland Island




## Homebrew Equipment

## Wood & Douglas 144LIN25B Amplifier Review

MORSE REPORT

## NEW BEARCAT

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**The UBC 200XLT is the handheld scanner with the latest facilities – 850-950MHz in 12.5KHz steps, 200 memories in 10 Banks.**

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| BJ200 Mk2 Handheld AM/FM Scanner | £199.50 |
| Sony ICF2001D SW Receiver plus Airband | £289.00 |
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| | |
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| Icom ICR7000 AH7000 Receiver plus Matching Discone | £937.50 |
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**EQUIPMENT IS NEW OR WHERE STATED * EX-DEMO ALL. UNITS HAVE FULL WARRANTY**

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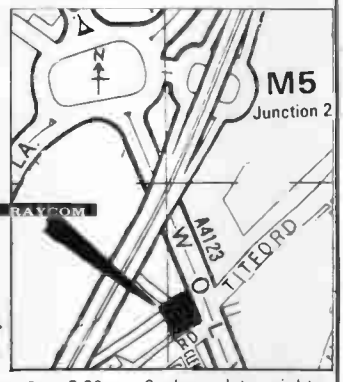


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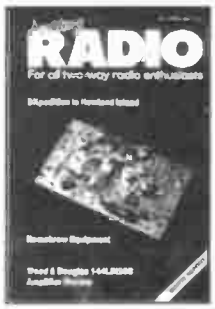
# Amateur RADIO

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# SONY ARE JUST 1 OUT OF 131 COMPANIES WHO CLAIM TO HAVE THE WIDEST RANGE OF SHORTWAVE RADIOS.

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The companies opposite are all those who stock our shortwave radios.

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This might give you the impression that they're fairly exclusive. Far from it.

With prices between £69.95 and £299.95, Sony shortwaves cater for everyone, from the everyday business traveller to the most demanding enthusiast.

At one extreme you'll find the ICF 5100.

It may look like the standard tranny found in most people's kitchen. It's as easy to use as your average tranny. But don't let that fool you.

A flick of a dial and Radio 1 is replaced by stations from every corner of the World (and the top, bottom and sides as well). To reduce interference it has a dual conversion circuit, a feature usually reserved for the most expensive models.

Speaking of which, at the other extreme is the ICF 2001D.

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You'll even find the World's smallest shortwave radio, the ICF SW1.

Slightly larger than a cassette box, it's just what you need when you wake up in a strange hotel room in Papua New Guinea, and feel a hankering for the news back home.

Whether it's a simple case of homesickness you want to cure, or an advanced case of 'enthusiast's fever', Sony shortwaves are the answer.

For a free trip around the World (well, its radio stations anyway), ask your nearest Sony Shortwave Centre for a free demonstration.

SONY.

**London:** SKB Limited, Video & Audio, 100 Ballards Lane, Finchley, London N3 2DN.

Edgware Electronics Centre, 194 Edgware Road, London W2.

Harrods Ltd., Radio & TV Dept., Brompton Road, Knightsbridge, London SW1X 7XL.

Knightsbridge Electronics, 155 Knightsbridge, London SW1 7PA.

LeSet Ltd., 115 Fulham Road, London SW3.

PNR Audio Vision, 28 Tottenham Court Road, London W1P 9RB.

Welbeck Video Ltd., 26 Tottenham Court Road, London W1.

Selfridges Ltd., Radio & TV Dept., 400 Oxford Street, London W1A 1AB.

Wallace Heaton Ltd., New Bond Street, London W1.

Berrys of Holborn, 37-39 High Holborn, London WC1.

Westminster Audio, 169 Piccadilly, London W1.

Galaxy, 230 Tottenham Court Road, London W1.

Spatial Audio & Video, 29 Tottenham Court Road, London W1P 9RE.

Massey Radio Ltd., 117 Chiswick High Road, Chiswick, London W4.

David Ingram (Hi-Fi Centre), 42-43 Lower Marsh, Waterloo, London SE1.

Alvabond, 70 Ballards Lane, Finchley, London N3.

Goodwins, 7 The Broadway, High Road, Wood Green, London N22.

**Southern England:** Suttons Limited, Bournemouth Sony Centre, The Quadrant, Bournemouth BA1 2AB.

Milton's Audio Visual Ltd., Southampton Sony Centre, 29 London Road, Southampton, Hants. SO1 2AD.

Brassky Limited, Colchester Sony Centre, 14-16 Culver Street West, Colchester, Essex CO1 1JG.

J. O. R. Gilbert, 35a High Street, Baldock, Herts.

Nicholls Bros., 82 High Street, Braintree, Essex.

Videovision, Camberley Sony Centre, 42 High Street, Camberley, Surrey GU15 3RS.

Videovision, Kingston Sony Centre, 40 Fife Road, Kingston upon Thames, Surrey.

Whomes Centre Limited, 28 The Mall, Broadway Shopping Centre, Bexleyheath, Kent DA6 7JJ.

Whomes Centre Limited, 32 The Mall, High Street, Bromley, Kent BR1 1TR.

Whomes Centre Limited, 84 Eastgate International Shopping Centre, Basildon, Essex SS14 1EX.

Hamilton Electronics Ltd., 35 London Road, Southampton, Hants.

Dawson Radio Ltd., 23 Seamoor Road, Westbourne, Bournemouth, Dorset BH4 9AA.

Tony Reynolds Radio, 12 Lichfield Terrace, Richmond, Surrey.

R. Jones Ltd., 60 High Street, Whitton, Middlesex.

Whitstable Teleradio, 75 Biggin Street, Dover, Kent.

Gerald Giles Sony Centre, 37 St. Stephens Street, Norwich, Norfolk NR1 3QN.

R. N. French, 16 Queens Parade, Hastings, East Sussex.

Manns Radio, 52 St. James St. Brighton, East Sussex.

Malcolm Audio & TV Ltd., 12 South Street, Chichester, Sussex PO19 1EH.

South Midlands Communications, SM House, School Close, Chandlers Ford Ind. Estate, Eastleigh, Hants. SO5 3BY.

Barretts of Canterbury, 1 Rose Lane, Canterbury, Kent.

Paul Dogra & Sons, 6 High Street, Slough, Berks.

Allders Dept. Store, Radio & TV Dept., North End, Croydon, Surrey.

Tru-Fi Sound & Vision, 2 Central Parade, London Road, Redhill, Surrey.

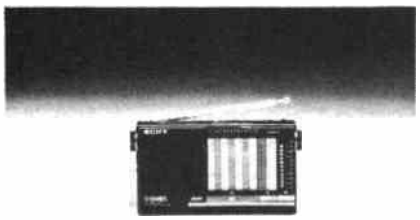
Tru-Fi Sound & Vision, 10-12 Grosvenor Road, Aldershot, Hants.

Tru-Fi Sound & Vision, 10 Church Street, Leatherhead, Surrey.

Lyles (Worthing) Ltd., 224 Findon Road, Findon, Worthing, Sussex.

Weybridge Audio, 5/6 Waterloo Terrace, Baker Street, Weybridge, Surrey.

ICF SW1



ICF 5100

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Loughton Photographic Limited, Southend Sony Centre, 11 South Church Road, Southend-on-Sea, Essex SS1 2NJ.

Loughton Photographic Limited, Chelmsford Sony Centre, 1-4 West Square, High Chelmer, Chelmsford, Essex CM1 1XS.

Waters & Stanton Electronics, 18/20 Main Road, Hockley, Essex.

Waters & Stanton Electronics, 12 North Street, Hornchurch, Essex.

Merrow Sound, 34 West Street, Horsham Sussex.

Merrow Sound, 45 Commercial Way, Woking, Surrey.

Merrow Sound, 22 Tunsgate, Guildford, Surrey.

Merrow Sound, 5 High Street, Epsom, Surrey.

**South West England:** Ron Millard, 31 Southgate Street, Bath, Avon BA1 1TP.

Tape Recorder & Hi-Fi Limited, Bristol Sony Centre, 8-10 Bond Street, Broadmead, Bristol BS1 3LU.

Tape Recorder & Hi-Fi Limited, Weston Sony Centre, 4 Waterloo Street, Weston-Super-Mare, Avon.

C. F. Loader, Plymouth Sony Centre, 20 Armada Centre, Armada Way, Plymouth, Devon PL1 1LE.

Hickmans Limited, Swindon Sony Centre, 39b Havelock Street, Swindon, Wiltshire SN1 1SD.

J. P. Williams Limited, Exeter Sony Centre, 15 Paris Street, Exeter EX1 2JB.

J. P. Williams Limited, Barnstaple Sony Centre, Holland Walk, Barnstaple, N. Devon EX31 1DW.

Battarbee's Limited, Taunton Sony Centre, County Walk, Taunton, Somerset TA1 3TZ.

Bee-Jay Television Ltd., 22 Clifton Down Shopping Centre, Whiteladies Road, Clifton, Bristol BS8 2NN.

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**Midlands:** B.A.T.S. Sony Centre, 160-162 Corporation Street, Birmingham, W. Midlands B4 6TB.

C.T.S., 3 Regent Grove, Leamington spa, Warwickshire CV32 4NN.

C.T.S., 58 Evesham Walk, Kingfisher Centre, Redditch, Worcester B97 4HA.

R. Tilney Limited, Bamford Sony Centre, 77a Abington Street, Northampton NN1 2BH.

Stuart Westmoreland Limited, Derby Sony Centre, 2c Albert Street, Derby DE1 2DS.

Kings Radio (Hereford) Ltd., 35 Widemarsh Street, Hereford HR4 9EA.

Robbs of Gloucester, 15 Worcester Street, Gloucester, Glos. GL1 3AJ.

Witney Audio Centre, 29 High Street, Witney, Oxon.

David Buswell, 5 Talisman Square, Kenilworth, Warwickshire.

Russell Acott, 124 High Street, Oxford, Oxon.

S. May (Leicester) Ltd., 27 Churchgate, Leicester.

Seymour Chemist Limited, 5 High Street, High Wycombe, Bucks. HP11 2AZ.

Fenway TV, 8 Victoria Way, Newmarket, Suffolk.

University Audio, Peas Hill, Cambridge.

Ringjay Electronics Limited, Coventry Sony Centre, 73 Lower Precinct, Coventry, West Midlands CV1 1DS.

R. C. Snelling, Blofield, Nr. Norwich.

Horntons, 8-9 Lower Temple Street, Birmingham B2.

Johnsons Shortwave Centre, 43 Friar Street, Worcester, Worcs.

Ray Withers Communications, International House, 963 Wolverhampton Road, Oldbury, W. Midlands.

Millers Music Centre, Sussex Street, Cambridge, Cambs.

**Northern England:** E. W. Hewitt Limited, Stockport Sony Centre, 104 Princes Street, Stockport, Cheshire SK1 1RJ.

E. W. Hewitt Limited, Altrincham Sony Centre, 91a George Street, Altrincham, Cheshire, WA1H 1RW.

E. W. Hewitt Limited, Warrington Sony Centre, 48 The Mall, Golden Square, Warrington, Lancashire, WA1 1QE.

Peter Bamford Limited, Hull Sony Centre, 42 Paragon Street, Hull, North Humberside HU1 3ND.

Jones of Oakwood Limited, Leeds Sony Centre, 103 Vicar Lane, Leeds LS1 6PJ.

Jones of Oakwood Limited, Wakefield Sony Centre, 35 Cross Square, Wakefield, W. Yorks.

Cleartone Ltd., Manchester Sony Centre, 66/68 Bridge St., Manchester, M3 2RG.

W. M. Hewitt, 549 Ecclesall Road, Sheffield.

Lester and Nix Ltd., 11 King Street, Belper.

Williams Electrical Shops, Sheffield Sony Centre, 955 Ecclesall Road, Banner Cross, Sheffield S11 8TY.

CBS Audio Vision Ltd., St. John's Precinct, Liverpool.

Fairbothams, 58 Lower Hillgate, Stockport.

Williams Electrical Shops, Rotherham Sony Centre, 7 Riverside Precinct, Corporation Street, Rotherham S60 1ND

Whiteleys, Deansgate, Blackpool.

Ball Bros., Bacup Road, Rossendale, Lancs.

J. G. Windows, 1-7 Central Arcade, Newcastle-upon-Tyne.

Goodrights Limited, Preston Sony Centre, 98/100 Fishergate Walk, St. Georges Centre, Preston, Lancs. PR1 2NR.

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Lawsons, 7 St. Anns Staith, Whitby.

Erricks of Bradford Limited, Bradford Sony Centre, 18 Rawson Square, Bradford, W. Yorks, BD1 3JP.

Hadwins, 29-33 Finkle Street, Kendle, Cumbria.

Misons, 11 Warwick Road, Carlisle, Cumbria.

Searle Audio, 229 Rawlington Street, Barron, Cumbria.

**Scotland:** Edinburgh Sony Centre, 386 Morningside Road, Edinburgh, Scotland EH10 5HX.

McMichael Bros., 9 Mill Street, Alloa, Clackmannanshire, Scotland SK10 1DT.

Graham Robertson, 5 Fountain Road, Bridge of Allan, Stirlingshire, Scotland SK9 4ET.

Video One, Glasgow Sony Centre, 31 Sauchiehall Street, Glasgow, Scotland G2 5HS.

Connolly Bros., Hi-Fi Limited, 31 Almondvale Centre, Livingston, Midlothian, Scotland EH54 6NB.

Connolly Bros., Hi-Fi Limited, 7 King Street, Kilmarnock, Scotland KA1 1PT.

David Steven, 1-3 Main Street, East Kilbride, Scotland.

Murray Mackie, 30 High Street, Fraserburgh, Scotland.

Martin E. Payne Limited, 38 South Methven Street, Perth, Scotland PH1 5NU.

Martin E. Payne Limited, 18 Union Street, Dundee, Scotland DD1 4BH.

C. Bruce Miller, 363 Union Street, Aberdeen, Scotland.

J. D. Brown, 28-36 Castle Street, Dundee, Scotland.

McMichael Bros. 23/27 Upper Craigs, Stirling, Scotland. FK8 2DG.

In Hi-Fi Ltd., 63 George Street, Edinburgh, Scotland.

**Wales:** Radiocraft Sonus Ltd., 251 Cowbridge Rd. Estate, Canton, Cardiff CF1 9TQ.

Radiocraft Sonus Ltd., 231 High Street, Swansea SA1 1NY.

Tele-Electrical Services, 9 The Brackla Street Centre, Bridgend, Mid. Glamorgan CF31 1DD.

**Northern Ireland:** F. Rea & Co., 24-30 Chichester Street, Belfast, Northern Ireland.

Laser Electrical Ltd., Unit 3, Abbey Trading Estate, Newton Abbey, Northern Ireland.

Audio Times, 85 Royal Avenue, Belfast, Northern Ireland.

**Channel Islands:** Reg Mauger (Sales) Ltd., 20 Halkett Place, St. Helier, Jersey, C.I.

Soundtrack, 1 Church Square, St. Peter Port, Guernsey, C.I.

C. R. Regent, 49 Halkett Road, St. Helier, Jersey, C.I.

7600DA

ICF 7601L

ICF 7600DS

ICF 2001D

# STRAIGHT & LEVEL

## NEW OWNER

Because of the growth of his cleaning business (Moortop Cleaning Co) Martyn Bolt G4SUI has decided to stop trading in amateur radio. The business Geefor Enterprises has been taken over by Ian Duffin of Stalham, Norfolk. All enquiries should now be directed to him on (0692) 82075.

Martyn Bolt would like to thank his customers for four enjoyable years in the amateur radio trade and hopes that they will continue to patronise Geefor under its new ownership.

## GODIVA AWARD

Coventry Amateur Radio Society has recently introduced a new award – the Godiva award. Details are as follows.

1 The award is available to all licensed operators and short wave listeners.

2 Contacts/stations heard must include:

G2ASF or G7ASF or any special event callsign operated by Coventry Amateur Radio Society or at least two club members. Also a sufficient number of Coventry stations (ie located within the city boundary) to achieve the requisite number of points:

20 points for any station located within the British Isles.

15 points for other stations within Europe.

10 points for stations outside Europe.

Each CARS callsign worked/heard = 5 points.

Each CARS member worked/heard = 2 points.

Each Coventry station worked/heard = 1 point.

3 All contacts must be made after 1 January 1988.

4 Contacts via repeaters are not acceptable.

5 QSL cards are not required, but a data list, signed and verified by two other amateurs is required.

6 There is no time limit for the achievement of the award.

7 Endorsements are available for: (a) achievement on a single band; (b) achievement using a single mode; (c) achievement using QRP (<5W).

8 All certificates will be numbered.

9 Cost of the award is £1.50.

10 To obtain the award send your data list and full payment to: J Ward G4HHT, 3 Shirley Road, Coventry CV2 2EL. Cheques etc should be made payable to Coventry Amateur Radio Society.

## LOUGHTON AND DISTRICT ARS

On 4 November Loughton and District Amateur Radio Society has a junk sale, and on 18 November a film show.

Meetings are held at Loughton Hall, Rectory Lane, Loughton, Essex IG10 3RU, in Room 20. They start at 7.45pm. All visitors are welcome.

## BARTG's AGM

The AGM is on 5 November at the Churchill Room, London House, Mecklenburgh Square, London WC1. It starts at 2pm.

One of the issues which is to be discussed is a proposed change of name from the British Amateur Radio Teleprinter Group to the British Amateur Radio Teledata Group. As the Group is now not only concerned with mechanical RTTY but also with computer RTTY, Packet radio, AMTOR and fax, it is felt that the possible change of name will be more indicative of the BARTG's current interests.

Because of this possible name change, the BARTG would like as many members as able to attend the AGM.

Further details are available from: *Ian Brothwell G4EAN, 56 Arnot Hill Road, Arnold, Nottingham NG5 6LQ. Tel: (0602) 262360.*

Finally, BARTG subscriptions for 1988 are £8.00. Details from: *Mrs Pat Beedie GW6MOJ, Ffynnonlas, Salem, Llandeilo, Dyfed SA19 7NP.*

## RALLY

The Verulam Amateur Radio Club's annual rally is on Sunday, 27 November at St Albans City Hall. Doors open at 11am and close at 5.30pm. Entry costs just £1.00. Attractions include club and trade stands, bring and buy, talk in on 2m, prize draw, refreshments and bar.

For further information contact Hilary G4JKS. Tel: St Albans 59318.

## DTI NEWS

On 30 September 1988 the Department of Trade and Industry announced changes to the amateur radio licences which will increase the use of digital technology. Digital communications include Packet Radio, Radio Teletype (RTTY) and Amateur Teleprinting over Radio (AMTOR).

The changes will enable radio amateurs to:

– use their stations for automatic digital communications;

– receive and transmit digital communications along a chain of amateur stations;

– allow such operation to be conducted unattended;

– keep a modified log to accommodate the speed of operation and complexity of chains involved in this form of communication.

Most amateurs will not be allowed to operate a mailbox or bulletin board (a facility which receives and stores messages for or on behalf of other licensed amateurs for retransmission at a later time). The use of an individual's amateur radio station to receive his or her own personal messages is permitted.

The amended licences explicitly permit licensees to record and retransmit messages from other licensed amateur stations including the relaying of messages along a chain of such stations.

The licences also provide for the unattended operation of digital communications although this is limited to:

– the frequency band 50-51MHz, with a maximum power of 10dBW erp carrier or pep and the frequency bands 144-146MHz, the sub-band 436.6-436.8MHz, the bands 2310-2450MHz, 3400-3475MHz,

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

5650-5680MHz, 5755-5765MHz, 5820-5850MHz, the sub-bands 10,000-10,250MHz, 10,270-10,300MHz and 10,400-10,450MHz, the bands 10,450-10,500MHz, 24,000-24,050MHz and all bands above 47,000MHz listed in the Schedule to the Amateur Licence, with a maximum power of 14dBW erp carrier or pep.

There are special provisions for logging the automatic operation of digital communications. Automatic operation is taken as including both unattended operation and the use of the station as an intermediate link in a chain of stations. The requirement to record callsigns is waived for automatic operations involving digital communications. It is not necessry to record each and every contact or message passed, although the licensee must still record the time of commencement and shutdown of operation of the station.

A more general change in the way logs may be kept has also been announced. From now on a log need only be in 'permanent' form rather than in a book ( 'indelible. . .not loose leaf'). This means that logs may now be kept on magnetic disc or tape.

Some changes have been made to the requirement for identification to facilitate digital communications. Identification, which is required at least every 15 minutes, must be made in the type of transmission being used for the message. However, identification in Morse or telephony is required for periods during which transmissions are made lasting 30 minutes or more; Class B licensees may now use Morse in addition to telephony for identification purposes.

### Mailboxes/bulletin boards

The DTI has agreed with the RSGB a procedure for the licensing of mailboxes/bulletin boards. Under an agency agreement made with the Secretary of State for Trade and Industry, the RSGB will distribute notices varying the licence conditions of individual amateurs so as to authorise them to establish such a facility. (There will also be provision for microwave linking of mailboxes/bulletin boards).

Applications for this notice of variation should be sent to the RSGB, which will remain responsible for the co-ordination of such facilities.

Amateurs authorised by a notice of variation to operate their stations as a mailbox/bulletin board will identify their stations using a special GB7 prefix, allocated by the RSGB, ie GB7 + 3 letters. (GB7 + 2 letters will denote digital communication repeaters).

Operation of an amateur radio station as a mailbox/bulletin board without a notice of variation will be unlicensed use.

The DTI has also announced clarification of regulations for handling third party traffic by radio amateurs operating in the UK. This follows discussions with the RSGB.

The Amateur Service exists on the understanding that it is used 'for the purpose of self-training, intercommunication and technical investigations carried out by amateurs'.

Third Party Traffic should be regarded under two separate headings: the passing of messages on behalf of other licensed radio amateurs and the passing of messages on behalf of non-licensed people or organisations.

The DTI accepts that the passing of messages on behalf of other licensed radio amateurs (at home and abroad) does not contravene the prohibition against third party traffic to be found in the International Radio Regulations. Regulation 2733 prevents the Amateur Service being used for commercial (unlicensed) traffic. If UK radio amateurs were to pass messages on behalf of unlicensed people or organisations thereby providing a service, then a breach of the Telecommunications Act 1984 would take place.

Passing third party messages initiated by or intended for unlicensed persons is permitted under the terms of the amateur radio licence under three very limited circumstances:

**During Special Events:** a special event station is established by a licensee with the authority of a letter of variation administered by the RSGB on behalf of the DTI. The variation permits the licensed amateur's station to be used by unlicensed third parties for two minute periods only, and then only to discuss trivial matters of personal interest;

**At the request of a 'User Service'** for the purpose of self-training for natural disaster planning and other exercises promoted by the User Services. (User Services are defined in the licence);

**In the event of natural disasters** where the established lines of communications have failed. Under these circumstances the amateur may, without reference to User Services, pass messages on behalf of third parties until the normal communications systems have been restored. Such messages should only relate to matters directly concerned with relief of distress and should be kept as short as possible.

The bands identified for this purpose are: 3.5MHz, 7.0MHz, 10.1MHz, 14.0MHz, 18.068MHz, 21MHz, 24.89MHz and 144MHz.

## COUNTER/TIMER

Now available from Global Specialties is the Model 6010 fully programmable, low-cost counter/timer.

The new product is based on Global's 6020 IEEE-based instrument, but without some of the 6020's features and options, so that they have been able to achieve a low price of £795.00.

The 6010 gives optimum resolution throughout a frequency range of between 0.1Hz to 125MHz, and utilises both conventional and reciprocal techniques.

Using three independent channels and nine full size LEDs, thirteen different measuring functions can be provided including time interval averaging, rise/fall time, and peak voltage.

Featured in the counter/timer are internally pre-selected intervals or external intervals ranging from 100s to 1000s.

A trigger level function is included for eliminating false triggering on unknown signals, and a non-volatile memory is capable of storing up to ten complete front panel setups, guaranteeing duplication of multiple test routines.

For further information, contact: *Global Specialties, 2nd Floor, 2-10 St John's Street, Bedford MK42 0DH.*

## CAPACITOR RANGE

The Kemet 'Golden Max' ceramic dipped/radial capacitor range which offers over 300CV values has been introduced by STC Electronic Services.

Encapsulated in a moisture and shock resistant gold-colour epoxy coating which permits laser marking with exceptional clarity, the devices meet the flame requirements of UL 94V-0. Highly reliable performance is achieved by good electrode integrity, electrode-to-termination continuity and uniform dielectric thickness.

The devices are stocked in capacitance values ranging from 10pF to 1$\mu$F, at 200V, 100V and 50V. COG Ultra-Stable, X7R Stable and Z5U General Purpose dielectric types are available with an option of 5 case sizes.

Also offered are the CO52/62 Series moulded radial capacitors to IECQ PQC-43/45. These multilayer ceramic capacitors are designed for professional use in a wide range of application areas and are available in COG and X7R dielectric to IECQ specifications plus Z5U dielectric for commercial purposes.

Featuring a capacitance range of 10pF to 1$\mu$F, the

devices are offered in 200V, 100V and 50V versions.

For further details, contact: *The Capacitor Group, STC Electronic Services, Edinburgh Way, Harlow, Essex CM20 2DF. Tel: (0279) 626777.*

## DIGITAL MULTIMETER

The Pan 35-C, a compact digital multimeter with 4 digit LCD clock is now available from Electronic & Computer Workshop Ltd, for £37.40 (including VAT and P&P).

The multimeter, with a battery warning indication, has a 3½ digit LCD multimeter display to a maximum reading of 1999 and automatic range selection. Accuracy is rated at ±0.7% rdg ± 4 digit dc.

Range selection is automatic and readings can be taken in the following ranges: volt dc 200mV – 2V – 20V – 200V – 500V. Volt ac 2V – 20V – 200V – 500V. Resistance 200 ohms – 2k ohms – 20k ohms – 200k ohms – 2M ohms – 20M ohms.

Other features include a diode test, a continuity test, autopolarity indication and 100 hour battery life.

The meter measures 54 × 108 × 12mm, weighs 80g and comes complete with hard cover case, two batteries and instruction manual.

For further information contact: *Electronic & Computer Workshop Ltd, Unit 1, Cromwell Centre, Stepfield, Witham, Essex CM8 3TH. Tel: (0376) 517413.*

## FUSE MONITORING SYSTEM

Klippon Micro-Systems has developed a new combined fuse and fuse monitoring rail-mounted module – FM5/48D – which incorporates 5 fused channels, each capable of supplying 5A.

Each output channel of the device is monitored and, should fuse failure occur, a red LED comes on to alert the user. In addition, an alarm output is triggered for any channel fuse failure and this is offered as an open collector transistor output from the nominal 48V dc supply line which is capable of sourcing 100mA. The maximum operational current for the complete unit is 10A.

Other features include: green LED input voltage indication; humidity tolerance from 0 to 80% (non-condensing); 0.5-4.0mm² (solid) and 0.5-2.5mm² conductor acceptance and Polyamide 6.6 housing.

For further details, contact: *Klippon Micro-Systems, DPTS House, Cramptons Road, Sevenoaks, Kent TN14 5DZ. Tel: (0732) 460066.*

## FAST COMLINEAR OP-AMPS

Bandwidths of up to 180MHz are featured in Comlinear's new CLC205 and CLC206 wideband operational amplifiers, now available from Anglia Microwaves Ltd.

The two devices offer a choice of low power consumption (CLC205) or high drive capability (CLC206) and have features which have not been available before in this price bracket.

The CLC205 has a power consumption of 570mW at ±15V and just 56mW at ±5V – far lower than that of most high speed hybrid amplifiers. At the same time it is fast, with a settling time to 0.05% of 24ns and a 170MHz bandwidth (–3dB). Output drive capability is ±12V, 50mA; making it a good choice for flash A/D drive, D/A buffering and line driving in PC-based instrumentation as well as aerospace applications.

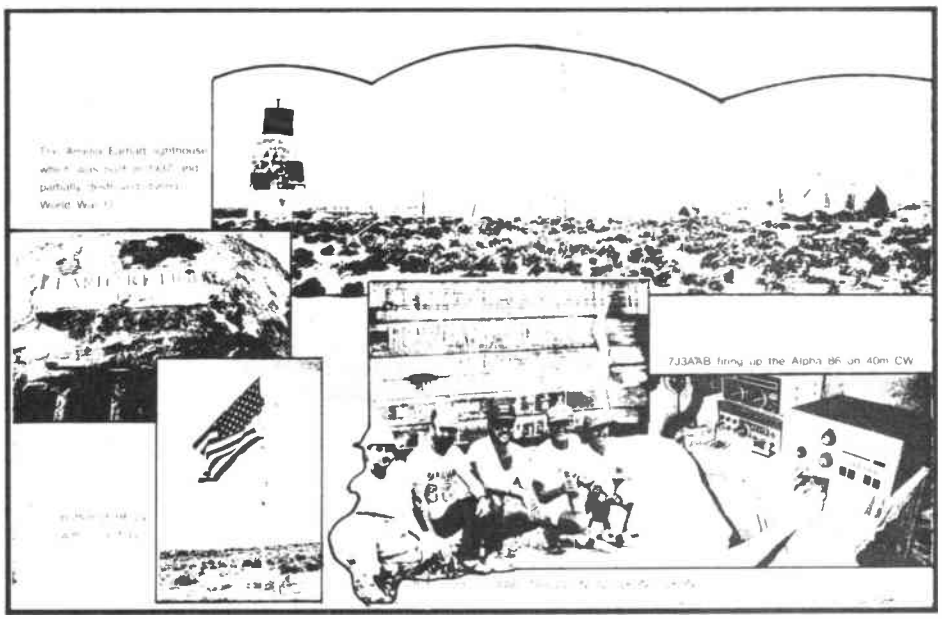
Designed for maximum speed and drive level, the CLC206 has a 19ns settling time and 180MHz bandwidth. Its output level is up to 100mA (150mA max) and slew rate is 3400V/us. This gives a full power –3dB bandwidth of 70MHz at 20V p-p with a gain of 20. Typical applications are signal distribution (50 or 75 ohms) and fast pulse response system operation over the full military temperature range from –55 to +125°C.

For further information, contact: *Anglia Microwaves Ltd, Radford Business Centre, Radford Way, Billericay, Essex CM12 0BZ. Tel: (0277) 630000.*

# DXPEDITION TO HOWLAND ISLAND

## by J B Smith VK9NS

Baker and Howland Islands lie approximately 1° north of the equator and about 179° west. Both are uninhabited by humans. However, Howland Island does have a history of colonisation in the 1930s. This colonisation by a handful of people was used by the USA to substantiate their claim to the islands. Howland became associated with the famous aviatrix Amelia Earhart and her last fatal flight. The Lockheed Electra went missing on route from Lae in New Guinea. Of course, WWII saw both islands in use as wartime airfields for US forces in the Pacific.




### In the beginning . . .

This story starts several months ago when I became interested in a possible DXpedition to Canton Island (T31). It had not been active for some time and it appeared to be quite easy to get to. Licensing would be no problem since I already held a T30 callsign.

However, as things progressed I realised that it would need a four day sea voyage to get to Canton Island, almost 1,000 miles east from Tarawa. I then thought that Baker and Howland (KH1) would be much more in demand. Six years had elapsed since SM0AGD had signed portable KH1 during a stay on Canton Island. On alternate days Erik also used a T31 callsign.

To understand the situation better, it has to be remembered that until the independence of Kiribati, Canton Island had been jointly administered by both the British and US governments. As a result, UK personnel interested in amateur radio were issued VR1 (T31) callsigns and US personnel were issued the KB6 or later the /KH1 callsigns. This convenient arrangement of two DXCC countries for the price of one came to an end about six years ago. Now the only way to work the KH1 is activity from Baker or Howland Islands.

Since both islands were US territories I approached the US Department of the Interior in Hawaii. After several false starts I finally talked with the people who dealt with Baker and Howland Islands. I was informed they were part of the US National Wildlife Refuge. Talking to Doug Forsell of the Fish and Wildlife Service I discovered several interesting things. Firstly, he had been to both Baker and Howland Islands and secondly he was extremely interested in my idea of visiting either island for amateur radio purposes.

There were, of course, a couple of valid points. Firstly, the department was interested in US representation and was not too keen on a completely 'foreign' invasion of the islands. It was also worried about the impact on the bird population of generators, antennas and a bunch of crazy radio amateurs working on a 24 hour basis screaming into microphones and so on.

After about six weeks, several letters and telephone calls, HIDXA and the US Fish and Wildlife Service came to a working agreement. We, the radio amateurs had agreement in principle for landing permission and they in turn had a method of getting to both islands at a considerably reduced cost to their department. HIDXA was to charter the vessel for the then planned 15 day charter.

Originally HIDXA planned for a 10 member team. Seven would be radio amateurs with at least a couple of US participants. The other three would be US Fish and Wildlife staff and one weather man. The agreement was that each member would share the charter costs equally and this would be about US$2600 on a pro-rata basis.

### Logistics

So, the ground work continued with more and more to do in the logistics of the operation. All major DX outlets were informed of our intentions. There is nothing on either island and so everything needed had to be taken. Much of the planning was done by fax, telex and telephone and of course dozens of letters. I noted in my mind how much easier this DXpedition was than our previous DXpedition to Heard Island. With the computer I wrote one letter and ran off copies – all addressed to different people. I could recall the letter and write a few updates and with fax facilities a great deal was achieved very quickly. Such is progress.

However, there was also one very prominent similarity to Heard Island. We had dozens of operators who wanted to go to KH1. A great and marvellous opportunity, wouldn't miss it for the world! But, as things moved along we remained stuck with only five operators. Also, for some reason or another, the US weather man was withdrawn at the last moment. The major effect was that HIDXA had a larger and larger commitment to the overall costs. At the last moment we had one more operator join us, Mac KV4AM decided to come along. Unfortunately, after travelling to Tarawa Mac pulled out and remained in Tarawa signing T30MA. He would have been our oldest member and on reflection he decided that the whole trip might be too much. In hindsight he was probably right as our stay on Howland was pretty basic and usually uncomfortable.

As a financial move the charter was cut to 13 days thus reducing costs by some US$3,500 and this allowed for seven days on the island. As events proved, we had just over six days ashore owing to rough weather on the way out. We would have liked to have extended the charter by a couple of days but financially it would have been crazy to do this.

The Shipping Corporation of Kiribati has a huge responsibility serving all the island groups. The company has an excellent reputation and although charter costs were US$1760 per day, the group was looked after very well. It was arranged that the vessel would remain in the vicinity of the island and also that the company would be responsible for getting the party and equipment ashore. This in itself is a major problem when landing through heavy surf on remote islands. The arrangement also relieved the party of a great deal of sheer physical effort. (I thought of this as we were finally getting ready to leave Howland Island. We were all very tired and even lugging everything down to the beach would

have been a problem. With the help of the crew, however, it was a different story. We did what we could and they did the heavy stuff).

The choice of Howland Island was taken quite early, largely as a result of Doug's advice and his flat statement that it was very hard to get ashore on Baker Island. That was good enough for me. However, we did play with the idea of putting Baker Island on the air for IOTA and carried a spare generator and so on. However, in reality it became apparent that much more could be achieved if we stuck together.

## Operators

In addition to charter costs each member had to find his way to Tarawa as this was our starting point and some 700 miles from our destination. Gradually the operator list filled up – the list started with Kirsti and myself and very quickly Jean-Louis TR8JLD decided to come. He travelled all the way from Gabon in West Africa – such is dedication. Almost immediately he was followed by Chris KA1OOZ from Connecticut, who had just upgraded and was awaiting his new call. Most will now recognise this new call as NO1Z. This was the one finally used for the operation. Ron 7J3AAB was then in the running. Finally, Jackie 7J1ADX, who was also an early starter. Unfortunately, he had to withdraw due to work problems during our time frame. So once again we were back to five radio operators, until the very late appearance of Mac KV4AM mentioned earlier.

It is my opinion that we really needed at least one more operator and I still feel that the original idea of seven operators was about right. We had an enormous commitment in the shape of 6m, RTTY and a brand new YL country. Not to mention a genuine attempt to operate 160m. So in some respects it was a great pity that we could not have got just one or two more operators.

On arrival in Tarawa just a couple of weeks before departure, there was much to do. A great deal of equipment had been freighted from Japan and Norfolk Island. The US Fish and Wildlife staff had also freighted many of their basic needs. They had to be self sufficient and they came well prepared. Customs, shipping, freight, generators, antenna supports, operating areas, shelter and so on were among the things that I needed to finalise.


*From left: Ron, Jean-Louis, Chris, Jim and Kirsti*

With the help of Ali T30AY I knew my way around Tarawa within a couple of days and all the contact points. I had met the chief customs officer and so on.

## Major hiccup

However, almost immediately there was a major hiccup; one of the three reserved Yamaha 2.8 KVA petrol generators had been sold. There had been a power failure on one of the nearby islands and a generator was needed urgently. As a result there were only two generators left and these were not enough. I had always planned for three stations plus RTTY and 6m. There was no chance of getting a generator to Tarawa on time unless more expense in air freight was incurred.

Our salvation came in the form of a large diesel generator which was being held for a local Catholic Mission. They had not enough money to pay for it, so it was being held for them. I then suggested a deal; if they would let us have the generator for 15 days (to cover the DXpedition time) HIDXA would sell it to them, with a $1000 discount, as a slightly used item. This is the stuff of the bargain basement but it was a reasonable approach for HIDXA as we got all our power for $1000. The generator was paid for on the spot after one quick visit and discussion at the shipping company as to whether they could get it ashore. This was to prove no problem.

The generator was started soon after arrival, fuelled on the run (very carefully) and was shut down just after our last QSO some six days later.

With the problem of shelter we had a stroke of luck. In a telex to Tarawa, I had asked if there was a local Boy Scout group which might have tents that we could hire, to save the expense of buying them. A few days later I had a reply that a large tent 15ft square was available for hire at a very reasonable daily rate.

When we went to check the tent we found that there were no ropes or pickets. I had to order 20 strong wooden tent pegs to be made. Plastic covered rope was also obtained and we were in business. The tent was repacked and it was hoped that the next time it was unpacked we would all be on Howland Island. It easily accommodated all our stations and the mountain of junk which we carried. In addition we had a bit of room for a cot to grab a nap.

Two other areas of shelter had been planned and the wooden frames had

*The operating tent which we hired*

*Nei Momi tackles the surf*

been made and labelled for easy assembly at our destination. A further area of shelter was also envisaged using framing and tarpaulins with the Amelia Earhart beacon as a tie point. This worked out very well. Kirsti and I brought along a tent but this proved to be inadequate for the very windy local conditions.

### Antennas

As part of the antenna farm we had two Cushcraft 3el beams. Two seven metre masts were to be organised locally using 2in water pipe. I had checked that this was available but it turned out to be quite difficult to obtain. There was a large bundle of it in the shipping yard but this was a lost consignment with no paper work. Customs clearance was impossible and it became a dead end. I offered to quietly remove three lengths and return them in due course, however, it was not to be. Very frustrating. Finally, a source was found and they were welded to my specifications and a suitable base made from old car wheels and a simple bearing system also arranged. The masts worked very well in practice but finally confirmed a principle I have always believed in. It is based on Murphy's Law; the one which says that your beam is never in the right direction. Armstrong methods are fine but I will always make one antenna rotate electrically in future. It is well worth adding a rotator and cable to the heap of equipment usually carried.

Guy rope was purchased and the mast problems finally fixed. All welding was done locally but I thought it was expensive. However, the people involved were not Kiribati people and that may explain the situation.

### Final arrangements

Gradually Jean Louis and I got more and more of the essentials organised. We had an arrangement with the shipping company where they lent us one of their ship containers to store our bits and pieces. This also pleased customs who were quite happy to release our freight into this other bond area. It worked very well in practice and provided good shelter and security for all our material.

Water and fuel containers, fuel pumps, tables, chairs and so on gradually built up and our store started to look fairly full. Fuel for the generators was now arranged with the purchase of 400 litres of diesel and 400 litres of petrol for the one back-up generator we decided to carry, just in case. Lubricating oil was purchased, in smaller quantities of course and also Kerosene for our stoves. A promise was made that the fuel would be delivered on the day of our departure.

Things were really moving along now with the arrival of Mac then Chris and finally Kirsti and Ron, along with Doug and Dick of the US Fish and Wildlife Service. Departure had been set for 6pm on Thursday 24th March. This allowed all the latest arrivals one full day of shopping for anything needed at the last moment.

Doug and Dick purchased fresh fruit; bananas, limes, coconuts, papaya (paw-paw), imported apples and oranges and so on. It was time to buy the soft drinks and a few cartons of beer, all based on a ration of so many cans a day. The arrangement worked out fine. Even after our return to Tarawa we still had a stock of beer, although this had been increased by a donation of two cartons of beer from the Captain of the *Nei Momi*.

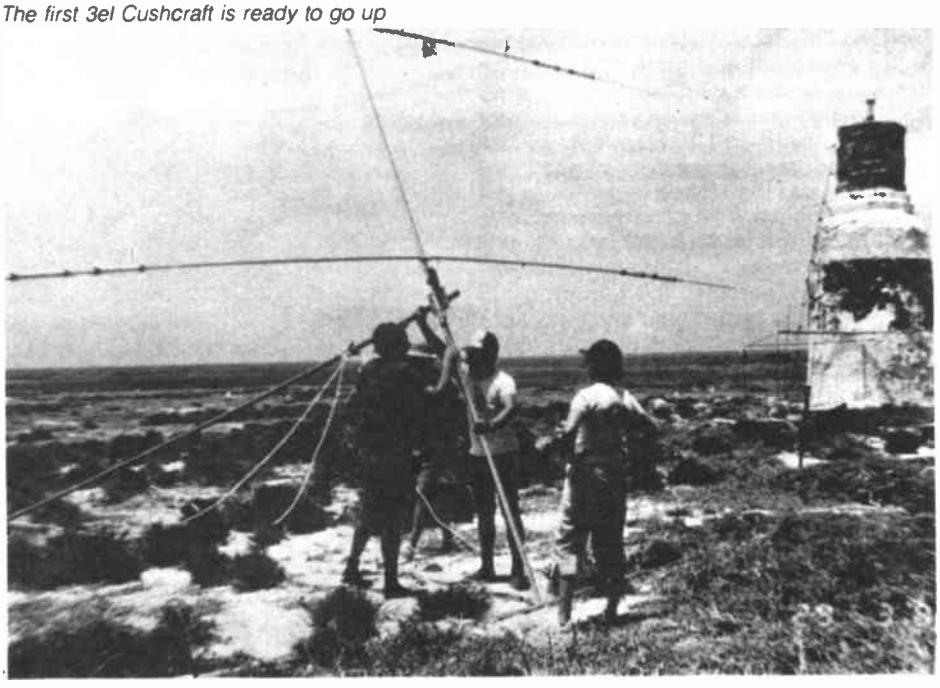
The vessel has the unlikely name of Miss Marble. It was built in Japan, and the passenger area which we occupied was really nice. Clean and had everything one could hope for without the expense of an ocean liner. The crew cared and made us feel at home. The food was simple but well-cooked and served with the smile that was important to them. I must comment on these wonderful people of Kiribati and their continuing ability to smile and be friendly. It became a feature of all our dealings with them.

### On our way

By 6pm we were all aboard, the fuel had been delivered as promised and loaded. Our generator was safely aboard and stowed and finally the large aluminium dinghies were loaded. Each of us were getting settled in our small but comfortable cabins and there was a call for a meal. We thought that we were on our way.

We finally cleared the quay for Howland Island early next morning and some hours later were clear of the reef surrounding Tarawa. The sea was pretty rough and a strong 25 knot headwind very apparent. In fact this weather pattern followed us all the way to Howland Island and it took over four days to finally arrive off the island about 9 o'clock in the evening. In the bright moonlight we could see the old Amelia Earhart Beacon and the long edge of beach dead ahead. It was an exciting moment.

*The first 3el Cushcraft is ready to go up*



*Some of the equipment we used*

We drifted off the island all night until dawn next day, then we attempted to get ashore. Our excitement had been dampened slightly as the breaking water on the reef looked very formidable. However, the first boat was soon loaded and on its way. It had to land well down from the target point of opposite the beacon due to rough water. This resulted in a long slog bringing gear up to our intended operating area.

The next boat was better and made it through the surf almost on target. So with one boatload after another, all the group and our gear gradually made it ashore without mishap. Fuel drums were floated ashore and were soon in position near the generator.

**In business**

A start was made to pitch the tent and the generator was already in place. The tent was pitched in quite windy conditions but it went up all right with many willing helpers. With the wooden pickets and rope in place the tent started to look quite a substantial shelter. That evening we were hit by a wild squall and heavy rain, and I think we were very lucky that the tent stayed up. Next morning we had a hurried re-assessment of the tent guying. It was then made very secure in a couple of hours. We had no more trouble.

With the tent up, a station was quickly organised. One of the power cords was run and connected to the generator. In the meantime Jean-Louis and Ron were assembling one of the Butternut verticals. They quickly had this HF antenna ready and the coax was plugged into the rig. 'All switches off', I cried and started the diesel. It was a comforting sound as we finally had power available.

The rig was switched on and NO1Z/KH1 was finally on the air. We said hello on 14220kHz, with Bob KH9AC being first in the log. A quick résumé and acknowledgement that all were ashore safely and we moved to 14195kHz, split to 14200-14210kHz. The DXpedition was in business! It was a great moment for us all. The planning, hard work and rough sea voyage suddenly seemed worthwhile.

As the hours progressed, another antenna was raised and then both beams were in the air and so on. Very quickly another station was connected up and brought into action. The DXpedition was very lucky with propagation and the bands remained open hour after hour. Always a huge pile-up and always more and more to be done.

Conditions on the island were very basic, it carried much more grass cover than had been expected. Most photographs show the island as a white sandy, coral area. All around were the birds and they quickly adjusted to our presence. There was not much time for sight seeing but gradually we got around.

The focal point of the island is of course the Amelia Earhart beacon. Built in 1937 as a memorial to this famous aviatrix who disappeared over the Pacific on route to Howland Island. This is an aviation mystery which has never been solved. In addition the settlers of the 1930s built their town Itascatown and signs of their work are quite prominent. Long stone walls mark the boundary of their small community buildings, representing many hours of hard labour. It must have been a lonely sort of life, perhaps compensated by the beautiful beach on the lee side of the island with its fringing reef and pure white sand.

There are many mementos to their occupation of the island and it was a surprise to talk to one station in Hawaii who had been one of those early settlers. He had many questions. Were we really on Howland Island? Was the beacon still there? Had we seen an old bulldozer which was left behind? Had we had any luck on the North Reef with the lobsters, there for the catching at night with a suitable light? I promised him a few photographs on my return to Norfolk Island.

Howland Island has never been active in a radio amateur sense since 1948 but there are records of pre-war QSOs and I have a couple of letters from people who were on this island during the war and also pre-war. In due course I hope to be able to get a better picture of this era.

**Excitement**

We certainly had our moments of great excitement during our stay on the island: someone, as 6m opened up, hearing our beacon VK9NL/KH1 running on 50110kHz; Kirsti working several stations during the opening; one memorable sunset opening on 160m when the strength of the incoming signals was unbelievable; still being called and working stations after many QSOs and long after sunset proper; the early moments of RTTY and giving Howland Island for the very first time in this mode; another major pile-up. It was the same

*Jean-Louis TR8JLD writes with his left hand and sends with his right*

story for most of our 166 hours of continuous operation. There seemed to be no end to the clamour for QSOs.

### New YL country

It was exciting to see Kirsti giving all and sundry a new YL country. She was the only one to use this call as all other operators used NO1Z/KH1. So it was with just around 27,500 QSOs in the log that it was time to leave. A final QSO with a JA station and we all used him to say our farewells to these memorable six days. There is excitement, challenge and personal reward with these DXpeditions which is hard to describe. All DXpeditioners seem to feel the same way. Certainly all of us felt that we had done a good job.

### Lady Luck

On the credit side we had no major equipment failures. Usually this is the curse of DXpeditions – as the linear blows a string of diodes after a power surge or a front end receiver MOSFET gives up the ghost in response to an overdose of RF as another operator opens up on the same band. The dozens of things that can and do go wrong didn't this time. In short Lady Luck smiled.

The loading and return to the *Nei Momi* is a bit blurred; we were all very tired as there was so much to do. However, beams, verticals, tents and so on all came down much quicker than they went up. We cleared our site efficiently and slowly but surely we were all back on board safely. It had been a long wet morning and many of our cardboard containers looked very soggy. The weather proved Doug wrong when he told us that it rarely rained on Howland Island. We now know that this may have been true once but with overcast skies and showers most days the weather pattern has clearly changed.

### Thanks

To all who helped make this DXpedition possible many thanks, in particular the members of HIDXA. Thanks also to all the operators who worked so hard, to Kirsti, Chris, Ron and Jean-Louis.

All major contributors are acknowledged on the QSL card. These cards are now being mailed and we hope you like them.

## Log Breakdown of the DXpedition

| Log Totals | NO1Z/KH1 | VK9NL/KH1M |
|---|---|---|
| 160m CW | 190 | – |
| 160m SSB | 1 | – |
| 80m CW | 136 | 193 |
| 80m SSB | 407 | – |
| 40m CW | 1741 | 436 |
| 40m SSB | 741 | 175 |
| 20m CW | 3365 | 370 |
| 20m SSB | 5681 | 427 |
| 15m CW | 3168 | 1353 |
| 15m SSB | 3689 | 155 |
| 10m CW | 1428 | 219 |
| 10m SSB | 3145 | 366 |
| 6m CW | | |
| 6m SSB | | 30 |
| | 23692 | 3724 |

Totals are around 27,416 QSOs. There are some QSOs on 6m CW and also a couple of hundred RTTY QSOs which should be added.

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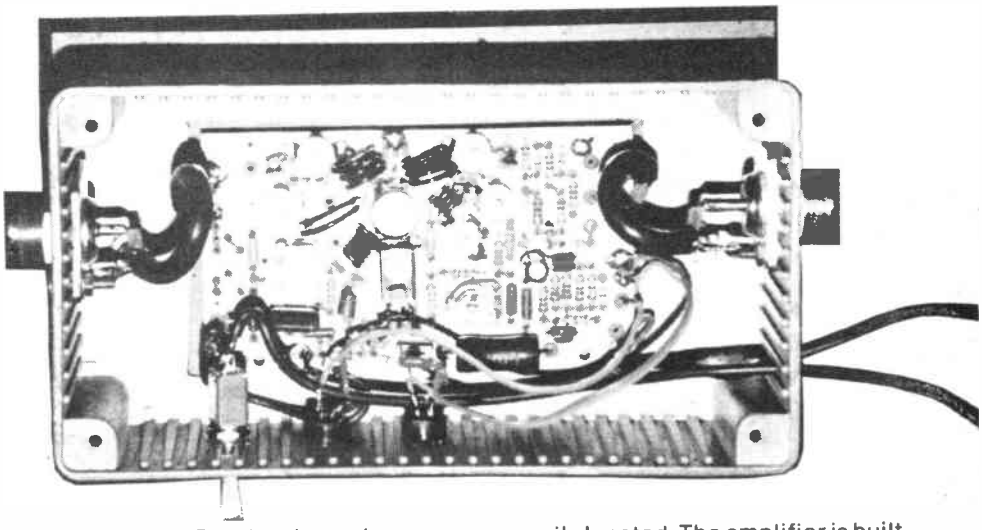
# WOOD AND DOUGLAS 144LIN25B AMPLIFIER REVIEW

by

Steven Goodier G4KUB

and

John Goodier G4KUC



In the January 1988 issue of *Amateur Radio* I described a base station adapter for the Yaesu FT-209 hand-held 2m transceiver. I mentioned at the end of the article that I would be reviewing the Wood & Douglas 25W linear amplifier and giving details about fitting it to the adapter. The following is a complete review of the Wood & Douglas 144LIN25B amplifier kit and it was decided from the start that the review would take the form of a complete constructional project. Apart from describing the kit, I will also detail the kit's construction, mentioning any problems I encounter along the way. I will also recommend a suitable case and heatsink, plus wiring information and alignment details which will result in a fully working 25W linear amplifier.

### Introduction to the amplifier

Wood & Douglas have been producing very high quality VHF/UHF communications kits for a number of years and have built up a unique reputation for designing high quality products. Their range of products varies from fully synthesized transceiver kits for both 2m and 70cm, ATV transmitters, low noise preamplifiers to general accessories such as tonebursts, piptones and audio CW filters. Of greater interest to us is their range of linear amplifier kits which can be built more cheaply than purchasing a ready built commercial unit.

The 144LIN25B linear amplifier is the high power version of the Wood & Douglas 144LIN10B. It has been designed with the current generation of multimode transceivers in mind such as the very popular FT-290R (it requires a drive level of between 2-3W for full power output). The changeover is fully RF sensed which gives a straight through path in receive mode, or when the power supply is disconnected. Wood and Douglas claim a less than 1dB loss in receive gain. Transmit is achieved in one of three ways; 1. RF sensed; 2. the point marked '+T' is applied to the positive line; 3. the point marked '−T' is applied to earth.

The main RF device which is TR1 is thermally tracked, with TR3 giving excellent stability of the bias current over a wide temperature range. It is recommended that a good heatsink is fitted and a 2° CW or better is used.

The amplifier has a minimum gain of 8.5dB that is about 7 times in real terms, so a drive of 3W will produce an output of about 21W. There are two LED outputs on the board, these indicate 'Power on' and 'Tx'. The size of the amplifier is 92 × 54mm and the PCB is double-sided. The specifications of the amplifier are shown in the table below and the circuit diagram is shown in *Figure 1*.

The kit arrived in a large padded bag which kept the components well protected from damage in the post. All the components were contained in three self-sealing plastic bags and the parts were easily located. The amplifier is built on the 70LIN3/10E PCB and the board is double-sided, roller tinned and is of very high quality. All the components seemed to be of high quality and the coils came ready wound which is a great help. The instructions for building the kit are contained in five A5 pages split up into five sections: construction, testing, circuit diagram, components list and PCB overlay plus additional notes about heatsinking. There is also an additional checklist of components and this helped to identify the diodes, coils and variable capacitors, but there was no circuit description. The choice of case, heatsink, LEDs, switches and connectors is left up to the constructor and this will be dealt with later.

### Specifications

| | |
|---|---|
| Size | 3.6x2.1 (92x54mm) |
| Power | 12v @ 150mA quiescent, 2.5 Amps peak |
| Mounting | PA stud, sensing transistor and two M2.5 holes |
| Gain | 8.5dB minimum (ie 3W input giving 21W output) |
| Switching | PIN diode, RF sensed with manual overide (+ve or ground initiated) |
| Receive loss | 1dB maximum |
| Outputs | LED drivers for 'POWER' and 'TX' indication |

### Construction

The first thing to do is read the instructions two or three times and make sure you understand them thoroughly. It is also a good idea to familiarise yourself with all the components. When you have had a good look at the kit and have read all the instructions, should you then feel that it is beyond your constructional skills, Wood & Douglas will replace your kit with a ready built and tested module for the additional balance. This kit is a fairly advanced project using an expensive RF device, so if you are in doubt then it is wise to return the kit for a ready built unit. If after completion the board develops a fault, then Wood & Douglas will service it for a fee of £6.75 (including VAT and return postage).

I will now deal with building the kit as set out in the supplied instructions, but I will add my own comments and additional information where needed. When building the unit I would advise you to follow the instructions to the letter as they are well set out and provide useful tips. Remember to take things slowly and double-check all your work. *Figure 2* shows the PCB overlay.

1.Check the PCB for any faults or

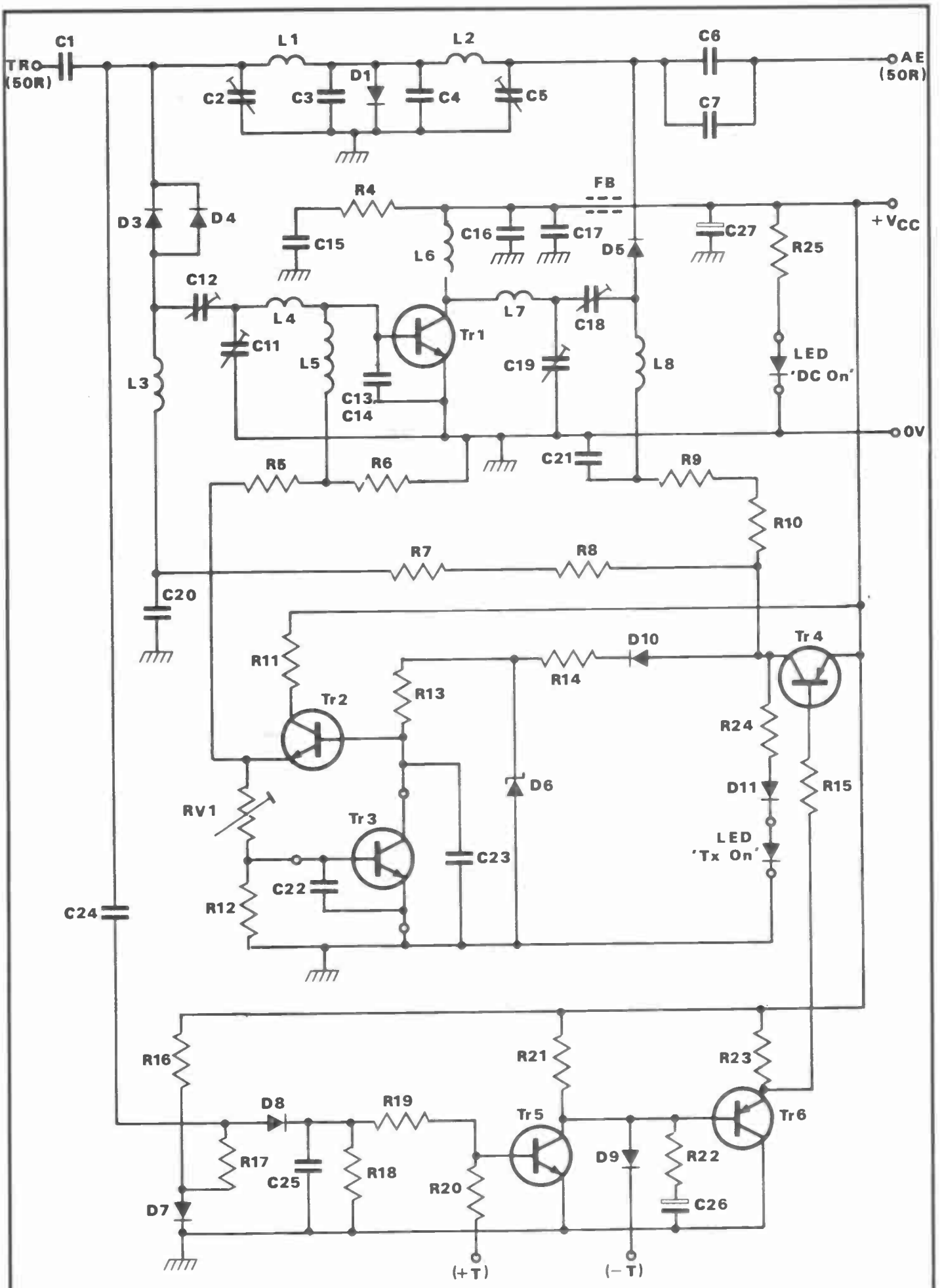



***Fig 1:*** *Circuit diagram of the 144LIN25B. TR1 and TR3 are thermally tracked and are mounted on the heatsink*

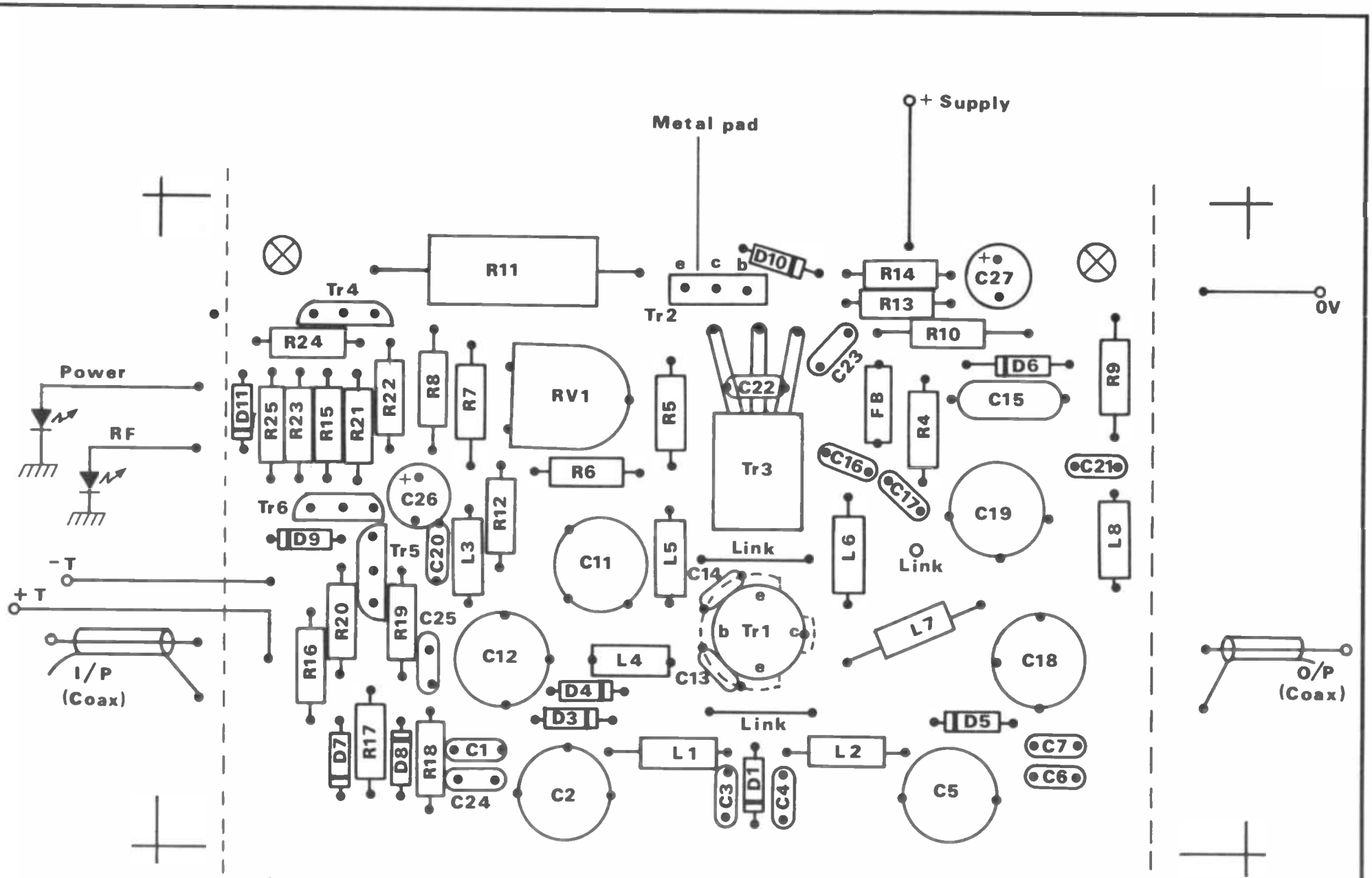



***Fig 2:*** *PCB overlay. The board is double-sided and some components are top soldered*

undrilled holes. The next thing to do is make a template of the board by placing it on a blank sheet of paper and drawing around it, making sure to mark the position of the mounting holes. This will help in marking out the metal work later.

2. Fit all the trimmers. These are colour coded and be sure to choose the correct values. As these are the first components to be mounted on to the board, make sure you choose the correct holes. If you are unsure about the colour of a particular capacitor then you can double-check it with the components checklist which is supplied with the kit. Some of the capacitors are top soldered and this is indicated on the PCB overlay. You will be unable to top solder C19, so two rivets have been placed through the board for this purpose.
3. Fit all terminal pins. These are used to connect cable to the board and there are 13 in all. Some are top soldered.
4. Fit the through links around TR1 and adjacent to C17. On the board supplied, a stud was placed through the hole near C17 so no link was needed. All links are soldered on both sides.
5. Fit all resistors. Double-check their values before fitting.
6. Fit all capacitors *except* C13, C22, C14 and C9. These are fitted later. All capacitors should fit flush with the board. Keep all leads as short as possible. Double-check the polarity of the electrolytic capacitors.
7. Fit all the diodes. Most of these can be identified by the coloured markings; it is best to refer to the additional components checklist for this information. In the kit supplied to me, D1 and D5 are made up of two diodes, one of which is soldered under the board. The only two diodes which were not clearly marked were D3 and D4, these turned out to be small chunky devices with a blue dot at one end. Lead lengths on D1 to D5 should be kept very short.
8. Fit all the transistors except TR1 and TR3. TR4, TR5 and TR6 look the same so be careful to choose the correct device.
9. Fit all the coils. These are easy to identify as they vary in size. L7 needs to be a height of 15mm off the board.
10. The next job is to fit TR1 which is the main power device. Before I did this I used the board as a template to mark the drilling positions on the heatsink. It is possible to use the paper template to do this job (more about the drilling of the heatsink later on). The transistor has four leads which need to be cut short before mounting. It is important to mark the position of the collector onto the transistor itself, I used a felt tip pen to do this. The collector lead can be identified by the angled corner on one of the legs (the legs of the transistor are clearly shown in the instructions). Use a pair of sharp scissors to trim the leads short. When satisfied, fit the transistor through the mounting hole and solder all four legs. Next, fit C13 and C14. These are fitted between the base and emitter and then soldered on the track side. Keep all leads very short.

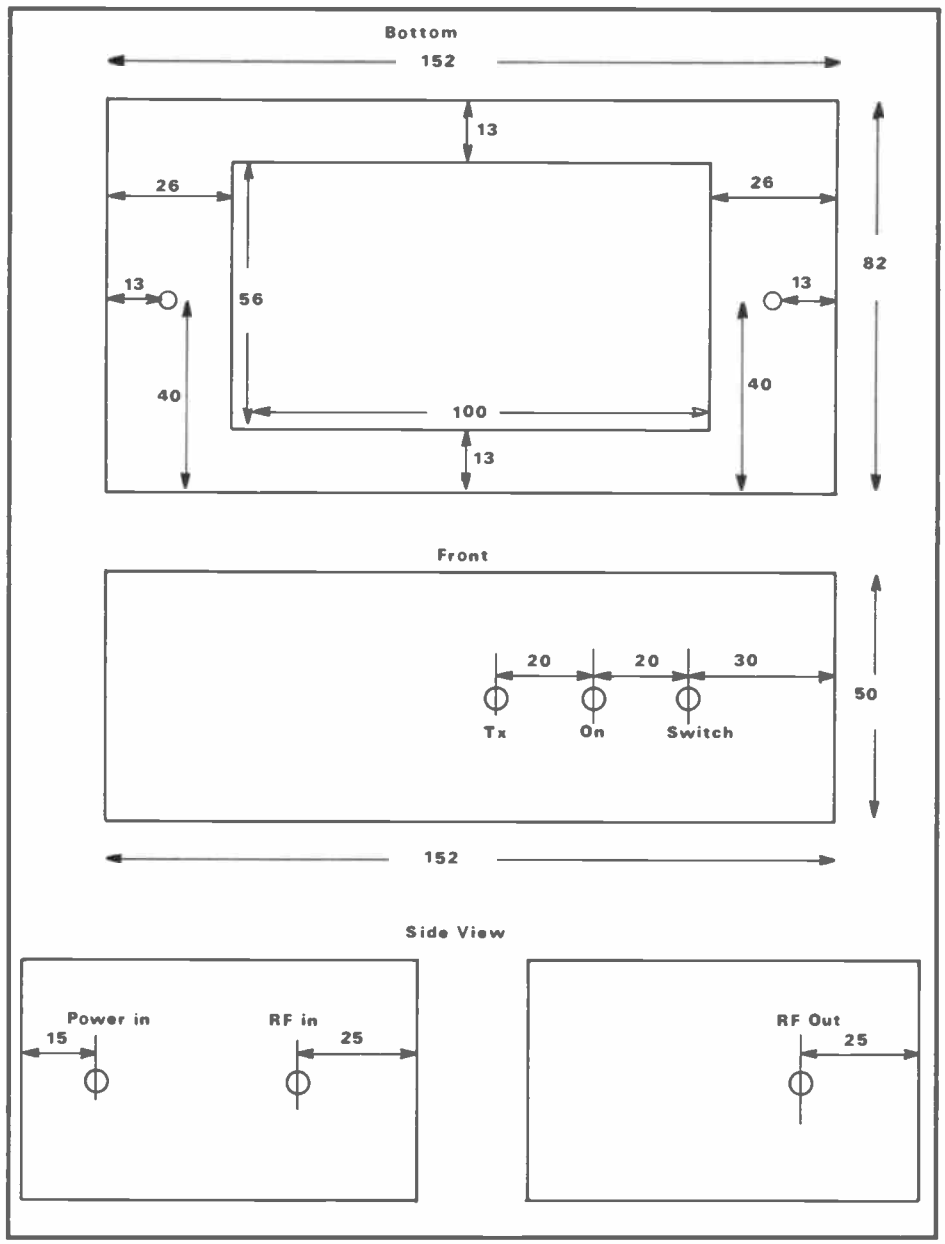



***Fig 3:*** *Case details. A large hole is cut into the bottom of the box to take the PCB board. The heatsink is bolted to the underside with bolts at either end*

That completes most of the PCB assembly. The next job is to prepare and drill the heatsink. If you have not already marked the positions of TR1 and TR3 on the heatsink then use the paper template to do so. Wood & Douglas recommend that a 2° CW heatsink is used. The one I used is available from Verospeed (Cat No 253-25535C) and is 152 × 94mm in size and rated at 2.25° CW. First drill the hole for TR1, making sure you do not use too large a drill bit. Then drill the mounting hole for TR3, again make sure this is not too big. Drill two mounting holes at either end of the heatsink which can be used to mount the amplifier to the box. Use the mounting kit supplied and bolt TR3 to the heatsink, using thermal grease on both sides of the mounting kit. Bend the legs up and solder C22 between the base and emitter, again keeping the leads short. With a test meter set to read 'ohms', check there are no shorts between TR3 and the heatsink.

Before mounting the PCB on to the heatsink, give the board a final check for poor solder joints, solder splashes etc. Although it's difficult to check all the components, it's worth giving the diodes and transistors a quick check to ensure they are in the correct way round. Apply thermal grease to TR1 and bolt the PCB into position, if all is well then the legs of TR3 should appear through the profiled hole on the PCB. Bend the legs of TR3 towards the pins and solder. This completes the construction and mounting of the linear amplifier.

Before testing, mount the linear into its box. The diecast box I used was 152 × 82 × 50mm and is also available from Verospeed (Cat No 86-20103J). Cut a large hole in the bottom of the box and drop into place the amplifier and heatsink as one unit. The drilling details of the box are shown in *Figure 3.* The components list shows the extra parts needed to finish the unit. I pre-wired the LED drivers, power supply cables and coaxial INPUT/OUTPUT leads before fitting and this made wiring up a lot easier.

## Trimming Percentages

| C2 | C5 | C11 | C12 | C18 | C19 |
|---|---|---|---|---|---|
| 90% | 90% | 55% | 45% | 50% | 50% |

### Testing and setting up

To set the amplifier up you will need a test meter capable of reading up to 2.5 amps and, if possible, it should have a 50mA resolution, VHF power meter and 50 ohm dummy load. The layout of the test equipment is shown in *Figure 4*. To set it up see the table above and follow points 1-4.

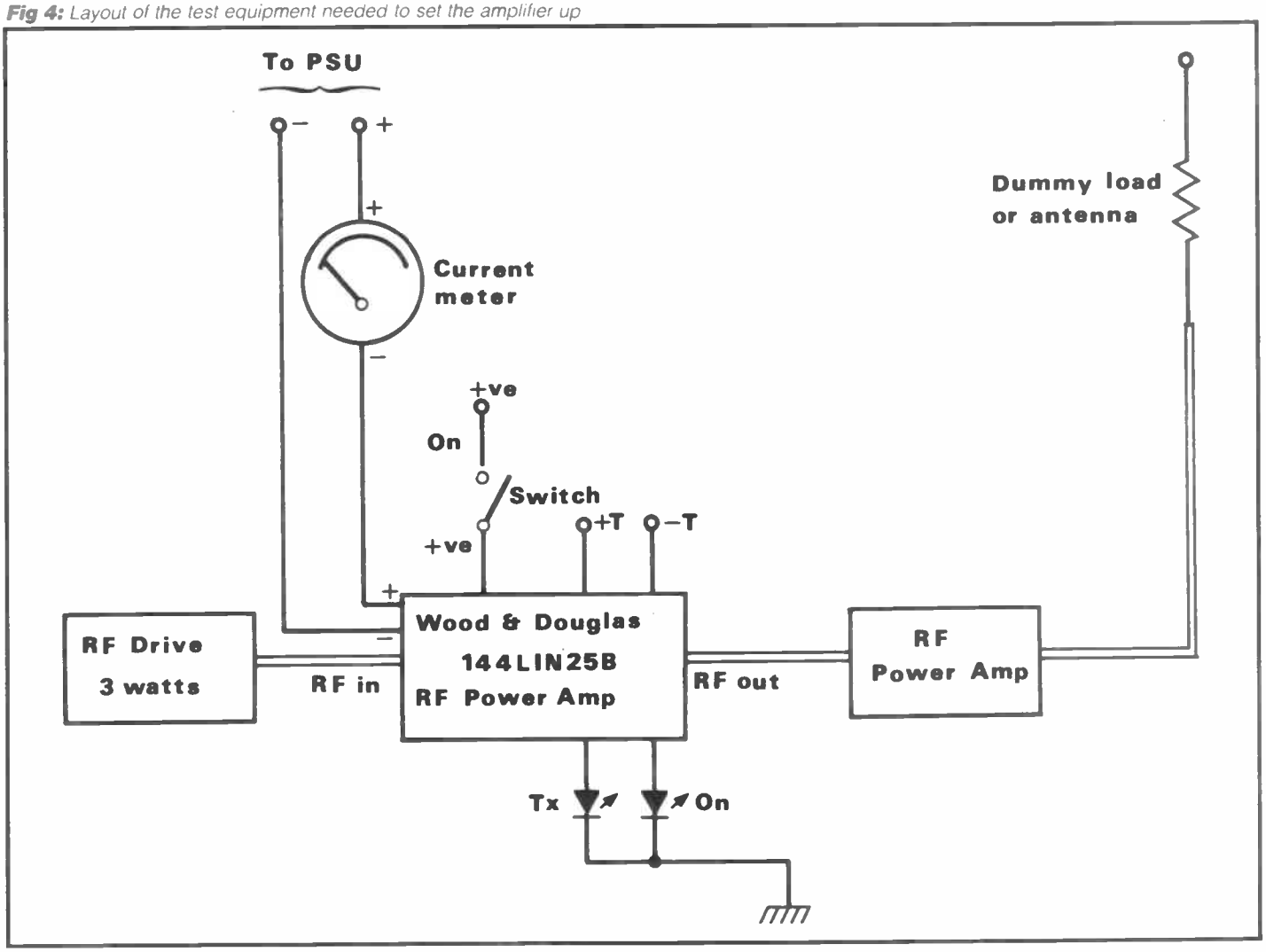
1. With no power supply connected to the amplifier, key the driver (in my case a Yaesu FT-209 hand-held, about 2.5W) and peak C2 and C5 for minimum power loss in transmit. C2 and C5 should settle at about the same settings, ie not with one at minimum and the other at maximum.
2. Set P1 fully clockwise. Connect a dc power supply with an ammeter in series as shown in *Figure 4* and set the meter scale to read about 50mA FSD. Switch the supply on and the 'POWER' LED should light, the current drawn should be less than 20mA. If higher, turn off and check for constructional errors.
3. Switch the power off and reset your current meter to read about 500mA FSD. Connect a lead to either '+T' or '–T' on the PCB. Switch back on and when '+T' is connected to +12V, or terminal '–T' is connected to 0V, the current should increase to about 150mA and the 'Tx' LED should light; in my case the current reading was 165mA. Again, if the reading is very much higher switch off and check for errors. With one of these pins still enabled turn P1 anti-clockwise for an increase in current of about 50mA.
4. Apply about 3W of RF to the input. Changeover should occur, this is indicated by the 'Tx' LED. Adjust C11, C12, C18 and C19 for maximum power output, *do not* adjust C2 and C5. C11 and C12 will interact as will C18 and C19, so repeat all adjustments several times. Power output should be about 22W for a 3W drive.

This is where I started to encounter some problems. Following the instructions for testing and setting up, all seems to be fine and I was obtaining the results as stated. When I applied about 500mW from the Yaesu FT-209 hand-held, there was no problem in tuning the amplifier for about 8W output. When about 2.5W was applied to the input, the output power would only increase to about 15W. All seemed fine until I went back to receive. The FT-209 switched back, but the amplifier seemed to stay on transmit. This was indicated by the 'Tx' LED staying around 2W (shown on the power meter). I think TR1 was breaking into oscillation when a certain amount of power was applied to the input. This oscillation seems to keep the changeover activated. The linear was not returning to receive when the drive was de-keyed. After testing the amplifier with a drive of 500mW, all seemed to be OK. The problem only occurred when applying about 2W or more.

I tried for a couple of hours to cure the fault, but I was completely lost as to why it was happening. After much head scratching I decided the best course of action was to take up Wood & Douglas' offer to repair non-working kits. I packed the kit up, posted it back to Wood & Douglas and eagerly waited its return.

About 10 days later the kit arrived back, I was informed they were unable to correct the fault stated, but that they had fitted a 330R resistor to prevent latching of the changeover. Wood & Douglas re-tested the amplifier with various power levels and all worked well. They re-aligned the linear for maximum power output at 145.000MHz. Their specification check showed that only 0.4dB was lost through receive and power out was 22W

***Fig 4:*** *Layout of the test equipment needed to set the amplifier up*



out for 3W in and 4W out for 0.5W in, all at 145.000MHz and 12V dc.

I'm not sure what caused this mysterious fault but it did show that the kit was built correctly to begin with, and I must congratulate Wood & Douglas on the repair service as this gives more confidence to the first time kit builder. I reassembled the board back onto its heatsink and refitted it back into its box. I then applied 2.5W of RF from my FT-209 hand-held and obtained 22W output. Switching the rig to low power I obtained about 7W output. All worked fine this time with no trace of the previous fault.

### Using the amplifier with the FT-209 base adapter

In the original article *FT-209 Base Station Adapter*, the intention was to include the Wood & Douglas linear amplifier in the base adapter itself. I must admit I did jump the gun a little with this suggestion, and without doubt it is much better to house the amplifier in its own box. If you wish, the linear may be included in the same box, but this is better done right from the start, rather than being an add-on later due to the amount of metal work involved. If housed in a separate box the linear can still be controlled from the front panel 'HI/LO' switch as originally intended.

If you are using an FT209RH then you will have to lower its power output, this is because the RH version of this rig is capable of supplying well over 5W output. The best way to do this is to drop the supply voltage down to about 8.5V, this will produce an output of about 3W. The internal power supply unit used an LM317T voltage regulator and the output voltage of this device is set by resistors R1 and R2. To drop the voltage down, replace R1 with a 560R and replace R2 with a 680R, this should produce about 8.5V output.

### Conclusion

I have to congratulate Wood & Douglas on producing such a fine product. If you are looking for a linear amplifier and you want to save some money by building it yourself, then I can highly recommend the 144LIN25B. The instructions are clearly laid out and the PCB and components are of the highest quality. Apart from the few problems I had with setting up, my linear amplifier is working well. The only thing I think is missing from the kit is a length of RG174 miniature coaxial cable for making the RF connections. I usually leave my FT-209 set to low power and drive the amplifier with about 750mW, this produces an output of about 7W. If I drive the amplifier with a full 3W, the output increases to 22W. The heatsink runs very cool over a long period of time.

The nice thing about these kits is that you are not left on your own if you have problems getting the board going. At the time of writing, 144LIN25B kit is £35.75 and the 144LIN30 is £36.25. The hardware packing to complete the amplifier is £14.25. For more information, contact Wood & Douglas at Unit 12-13, Youngs Industrial Estate, Aldermaston, Reading, Berkshire RG7 4PQ, or telephone (07356) 71444. I would like to thank Wood & Douglas for their help with this review.

## Components List

| | |
|---|---|
| Wood & Douglas 144LIN25B Amplifier Kit | |
| Diecast Box 152x82x50mm | VERO 86-20103J |
| Heatsink 2.25° CW 152x94 | VERO 253-25535C |
| RF sockets to suit | |
| Single pole ON/OFF switch | |
| LEDs and Holders | |
| RG174 min Co-axial cable | |
| Nuts, bolts etc | |

# HOMEBREW EQUIPMENT

## ATU FOR 3.5 TO 30MHz by Alan Malcher G4TPM

One of the benefits of homebrew equipment, apart from its low cost, is that a little imagination and foresight renders equipment more versatile by incorporating additional circuits or devices.

When I designed this ATU, I decided that not only should it efficiently carry out its primary role of tuning antennas to resonance, it should also incorporate an antenna switching system, so that three separate antennas could be switched in or out at will.

In addition, the ATU could be completely bypassed when using antennas such as multi-band beams and trap verticals. As most readers may be aware, it is not always necessary to have an ATU in series with a well designed and suitably erected trapped aerial; either wide-band beam or vertical.

A 50 ohm load is also built into the ATU for test purposes and the SWR and power meter are built into the front panel.

The advantages of using an ATU on an HF receiver, especially when the receiver is used to cover a large number of bands, cannot be overestimated. ATUs which are used solely for receiving can produce a 5/9 signal from an apparently dead band. This ATU can produce excellent results when connected to a communications receiver and may prove to be of enormous benefit to the serious short wave listener.

Needless to say, if this equipment is to be used only on receivers, then the dummy load, SWR and power meters do not have to be incorporated into the design. Consequently, the variable capacitors and coil windings will not have to be robust as the circuit will not dissipate a high power.

*Figure 1* shows the basic pi circuit, the necessary switching circuits for the three antenna sockets and a 50 ohm dummy load. Switches 1 and 2 are used to electrically lengthen or shorten the two coils, according to which band of frequencies you select. The remaining two controls are for the two variable capacitors.

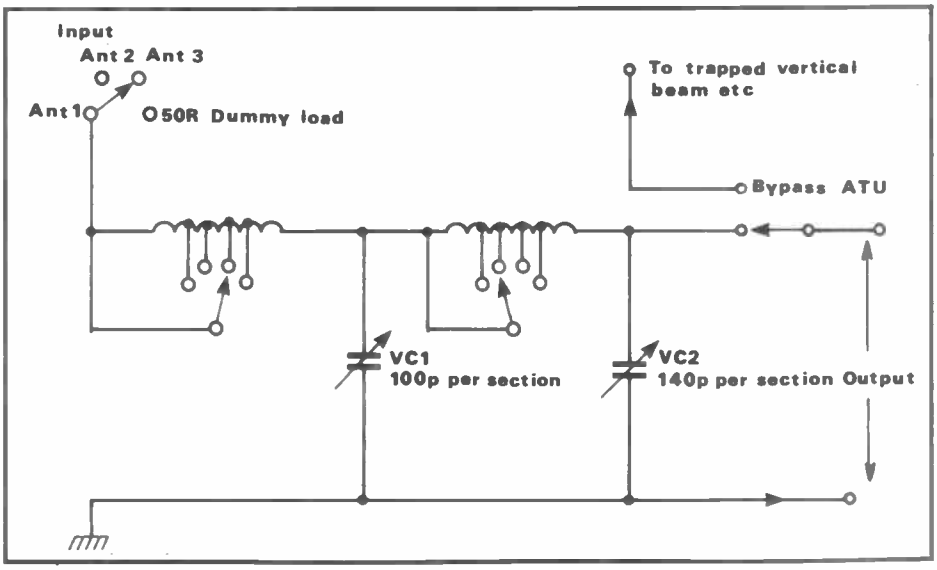



***Fig 1:*** *A basic Pye circuit with a few alterations*

### Making the coils

The first items to build are the coils. Once again, I have opted for simplicity and have reduced the cost of construction without decreasing the operating efficiency. The formers are made of 5cm plastic piping, as used by plumbers, readily available from DIY shops at a cost of approximately £2. You will require two tubes, both 16cm long and, purely for cosmetic purposes, it is suggested that each of the ends is slightly tapered with the aid of a fine file.

The coils are made from hard drawn copper wire, the same type used in electrical installations. Once again, this can be purchased from DIY shops.

Remove about 60cm of the insulation and twist 30 turns of the wire around a broom handle. I have deliberately wound the wire into coils that are smaller than the plastic formers to ensure that the wire will tightly fit the plastic pipes. Now slide the coils onto the plastic formers and space the coils out to prevent them shorting together.

Although the coils may appear to be secure, I recommend that 'Superglue' is used to ensure that each winding is firmly attached to the former. Give the coil and the former a liberal coating of shellac. Both should look like the illustration in *Figure 2*.

With a fine file, remove the shellac from the coil where the taps are to be soldered. As can be seen in *Figure 3*, the coils will be tapped at 1, 5, 9, 13, 17, 20, 22, 24, 26 and 28. The winding can be counted from either end.

The two coils are now bolted to a piece of non-conductive material. I used

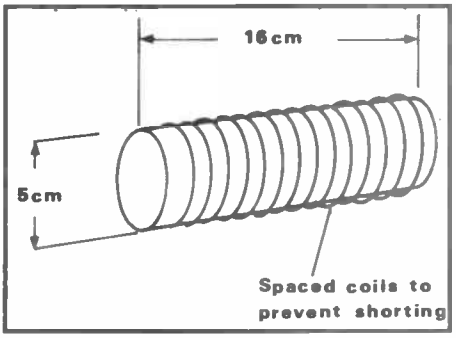



***Fig 2:*** *The plastic formers*

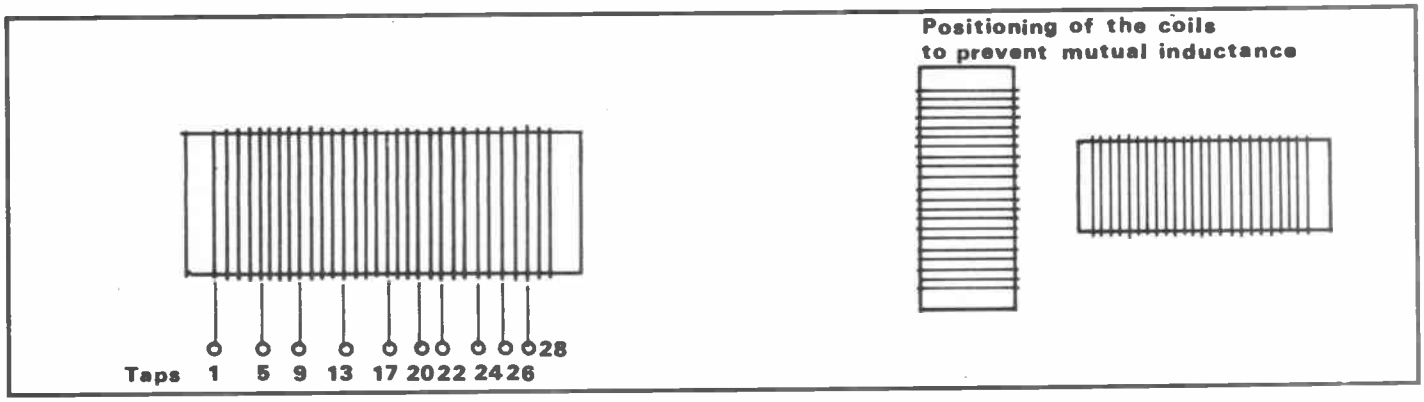



***Fig 3:*** *Forming the coils with hard drawn copper wire*

Bakelite for this ATU. It is important to lay the coils in such a way that there is no possibility of conductive reactance between the two coils; induced voltages *must* be avoided. This can be achieved by positioning the coils as illustrated in *Figure 4*.

### Taps

Tap 1 of coil 1 is soldered to the antenna input socket and tap 28 is soldered to tap 1 of coil 2 so that both the coils are physically connected. There is a total of 22 taps and each one is shown in *Figure 5*. By closely following the diagram in *Figure 5*, readers should find no difficulty in building the circuit. To prevent common faults, such as arcing and spurious emissions, each component must be securely bolted to the chassis of the ATU. I also found it necessary to glue to the chassis all the wires leading from each component. This resulted in a solidly built and robust piece of equipment.

### Take care

In *Figure 4* you will note that, due to the position of the two switches that electrically lengthen and shorten the coils, it would have been impractical to glue these wires to the chassis. Instead, the wires were deliberately soldered under tension to their respective components. This ensures they are secure and free of possible movement.

If the ATU is to be used with a tcvr, when selecting the components, the variable capacitors and switches must be capable of passing at least 200 watts.

### Components List

32cm of 5cm plastic piping
300cm (approx) of hard drawn electrician's cable
1×2-gang variable capacitor
1×3-gang variable capacitor
2×10-position switches
3×PL59 sockets

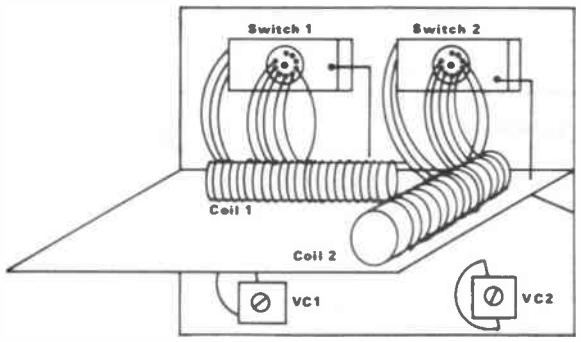



**Fig 4:** *Switch wires are under tension to keep secure*

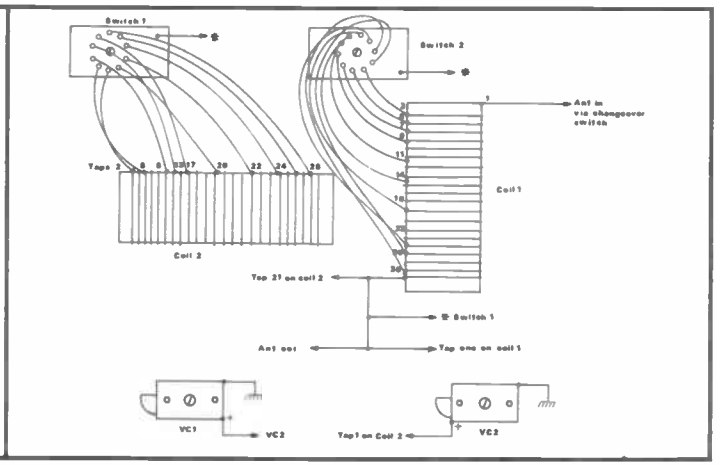


**Figure 5:** *Switch 1+2 are multi-point rotary*

# PROJECT BOOK

*by Martin Williams*

There are many occasions where it may be useful to have some extra gain available. Perhaps you have a 'scope or some other piece of test gear which is not sensitive enough for your requirements? Another common requirement is having to find some means of boosting the sensitivity of the older type of scanner receivers. These usually cover a wide frequency response but, unless you paid an arm and a leg for your own, the chances are that it's deaf. This is especially true at the higher frequency end of the scale.

### The answer

What you need is a good preamplifier with a reasonable gain and a good noise figure. What used to take a handful of components can now be done with an integrated circuit and a couple of discrete components. One device which makes this possible is the RS Components RS560c (also available as the Plessey SL560c). This can be set up to give a variety of gain, bandwidth and noise parameters by simply choosing a couple of resistor values and running it from the appropriate voltage supply line.

### General purpose

The circuit shown in *Figure 1* is for an amplifier that has a gain of 10dB and a reasonably flat response from 3 to 300MHz. It will handle a maximum input voltage of 300mV peak to peak and will provide a maximum output of 1.5V into a 50 ohm load. The unit needs a 9V supply and the current consumption is about 35mA.

### 50 in/out

If you want to use 50 ohm lines on both the input and output circuits then use the circuit shown in *Figure 2*. This is actually the simplest circuit of them all. It provides a gain of about 15dB falling to around 10dB at 200MHz. At this frequency it will provide 5mW of output. Note that the supply voltage is now 6V and *not* 9V.

### Low noise

Now we come to the broad band, low noise system shown in *Figure 3*. This is designed to run from a standard 12V supply from which it draws 3mA. The specification is excellent; input and output impedances are both matched to 50 ohms. The gain can be reduced from 20dB to 13dB by installing the track between pins 4 and 5 of the integrated circuit. The noise figure is 2.5dB and the specs are held up to at least 150MHz.

### Construction

These units should all be built on a double-sided PCB with the upper side used as an earth plane. The physical layout can follow the electrical layout shown in the diagrams. All connections, especially those to the decoupling capacitors, should be kept short. Supply lines (lower than 12V) can be obtained by using dropping resistors and Zener diodes. Remember to place a .01ufd disc capacitor directly across the diode to eliminate the noise that these devices generate.

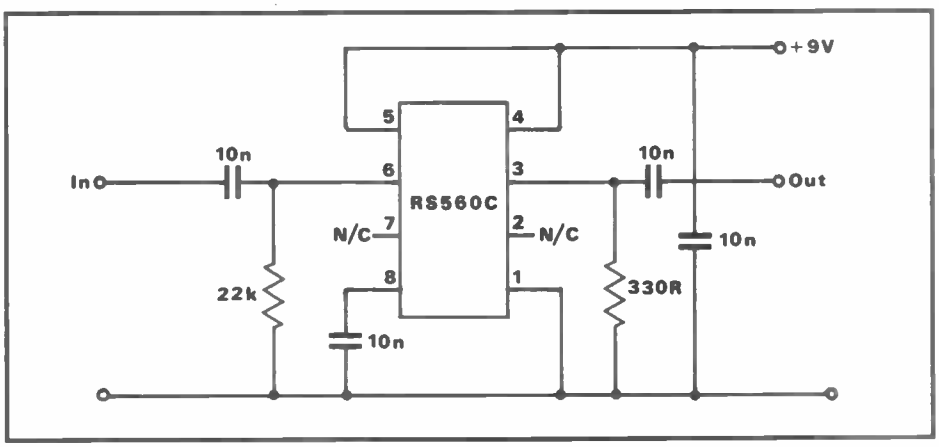



*Fig 1*

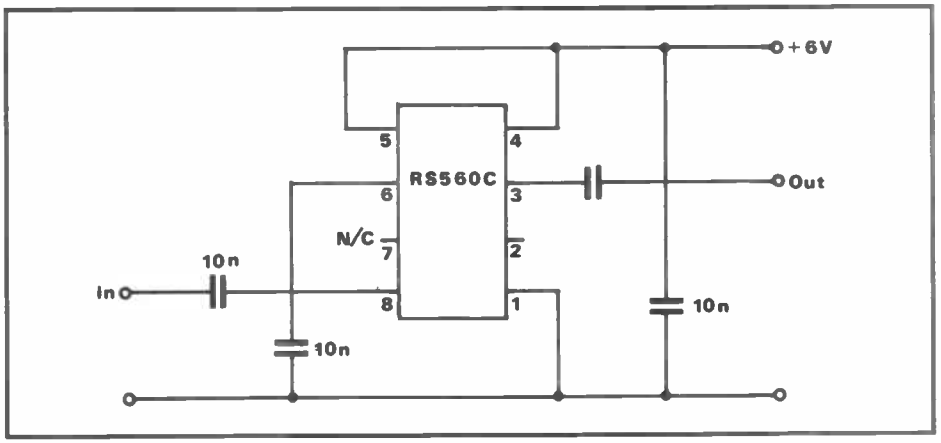



*Fig 2*

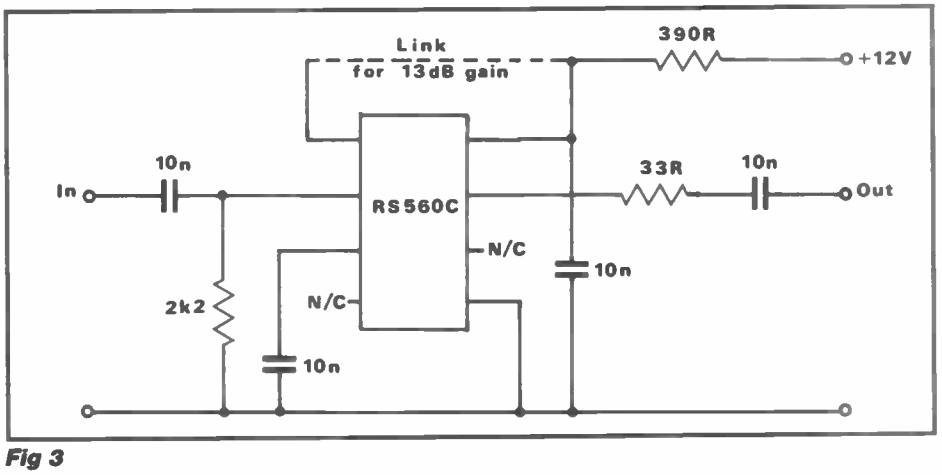



*Fig 3*

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# DX DIARY

**News for HF operators compiled by Don Field G3XTT**

As always, the RSGB's HF Convention proved to be a roaring success, with a large number of overseas visitors including ZL3GQ, K3ZO, W9KNI, W0AIH, N4AR and others. Paul, W0AIH, gave a fascinating presentation on how he has been able to build up a massive contest station on a shoe-string budget, with over 20 towers, some around 200ft high, supporting an enviable selection of antennas for all bands. Another Paul, F6EXV, told the story of the recent operations from Kingman Reef, Palmyra Island and Eastern Kiribati. From the continuous 60mph winds on Kingman, to the crabs on Palmyra (into everything and forever climbing over the rigs), the discomforts were considerable. All credit then to Paul and the rest of the gang for a terrific operation, giving many European DXers their first contact with these rare spots.

The foreign visitors made a clean sweep of the DX Quiz, with F6AJA taking top honours, followed by ON5NT and F6EXV. ON5NT also showed some slides of the FV8NDX/P operation from 'les Sept Iles' and of his recent visit to Finland.

A major talking point at the Convention was the possible impact of the recent changes to the DXCC rules. Rule 2a 'Separation by Water' has been reworded considerably, supposedly to clarify the interpretation which the ARRL had been applying all along. However, the new wording seems to allow new interpretation. The rule used to say that an island would count separately for DXCC if it was over 225 miles away from the relevant mainland.

Between groups of islands rule 2b was applicable, which specifies a distance criterion of 500 miles. The new rule 2a refers not to 'mainland' but to 'a continent, another island or group of islands that make up any part of the parent DXCC country'. Rule 2b still applies to 'additional' island groups. Confused? So am I.

However, some US DXers are already saying that the new wording could lead to anything from twelve to twenty new 'countries' including Jarvis Island, the Marquesas Islands and others. Specifically, KN3T, K3NA, W6SZN and VK8XX planned to put their interpretation to the test from Rotuma Island (currently part of Fiji) from 22 October until 5 November. The callsign was expected to be 3D2XX. A German group operated from Rotuma as 3D2XR some years ago, but at that time separate DXCC status was refused by the ARRL.

While on the subject of possible new countries, the ARRL has recently received yet another package of documentation from the operators of 4J1FS (see *DX Diary* for September). Meanwhile, there is already talk of a further operation from Malyj Vysotskij in May 1989.

Once again we were treated to some excellent DX openings during September, with 10m positively buzzing with Pacific and Asian DX day after day. It was interesting to note the vagaries of propagation – at times KX6 was coming in short path (over the North Pole) while, at the same time, KH6 was workable long path. You just have to keep that beam turning!

Tony, VP8BRR and Steve, VP8BUB continued to put in appearances from South Georgia. Both are scientists with no previous experience of amateur radio, and had trouble understanding what all the fuss was about! By now they will have had to take the antennas down for the seal breeding season, or the seals will simply demolish them. However, some further operation may be possible before Tony leaves Bird Island next March.

## DX news

JX1UG is now operational from Jan Mayen Island and will be there until the middle of April. He will be active on 80-10m, both SSB and CW, using an HF beam together with a Butternut vertical for 80 and 40m. LA5NM, who will handle his QSLs, made a plea for some consideration for JX1UG, particularly on 80m.

LF openings to distant parts can be very short from those northern latitudes, and LA5NM asks that European operators be prepared to stand by while JX1UG looks for more distant QSOs when propagation is suitable. LA5NM notes that very often the DX end of 80m is full of strong Europeans working strong East Coast US stations for hours on end, thus preventing truly DX QSOs from taking place.

VE3IEO is widely reported as organising a major Pacific DXpedition starting next January and taking in KH5, KH5K, ZK1 (both North and South) and T32. The crew will consist of HB9AEE, HB9AHL, F5II, NM2L, ZF2KN, KD2HE and VE3IEO himself. They are currently seeking loans of gear as well as financial help. Sounds like an interesting one to look out for although, having seen the slides of this year's KH5 operations, I wouldn't recommend KH5K to any but the most experienced navigators and operators.

Bernhard, DL2GAC, who made the news earlier this year with his operations from various islands in DU and 9M6, will join DF5UG, DJ9RB and others in India in January. They will make a special effort on the LF bands and will no doubt be turning up from some offshore islands.

C9MKT, who continues to show up on one or two weekends each month, is now acceptable for DXCC credit. Apparently, his activities are monitored closely by the authorities in Mozambique. So, if you work him, keep the exchange to the bare formalities.

Ian, G4LJF, is off on his DXing travels again. Ian will be in Antigua from 17 November until 3 December and plans to be active on all bands, both SSB and CW. As I write this the callsign is uncertain, though it may be V21LJ. Check the usual DX frequencies (14195, 21295, etc, plus 25 up on CW).

More rumours about a possible operation from Vietnam. This time the talk is of a one month operation from 21 October by HA5KDQ, HA5PP and HA5MY, using the callsigns 3W8DX (on SSB) and 3W8CW (on CW). Some QSL addresses have even been quoted! We can but hope.

*DX News Sheet* reports that UA1OEL will commence a tour of duty from Franz Josef Land around the time that this column appears, and promises lots of activity, especially on 160m CW.

Baldur, DJ6SI, is off again. By the time you read this he should be active from Niger (5U), and will be there until 6 November. As usual, look for Bal on CW, 25kHz above the band edge on 20, 15 and 10m, and just inside the band on 40 and 80m. Bal has been putting on these DXpeditions for many years now, and usually manages to fund them from the dollar bills and IRCs people send with their QSLs. CW only for the most part, both because Bal is a superb CW operator and also because his English is limited. He is always easy to find and work.

The active DXers among you will also remember that Bal was one of the members of the ill-fated Spratly DXpedition in 1983 when two of the operators lost their lives following an attack by South China Sea pirates.

Rick, NE8Z, hopes to be back in South America between late October and early November and, specifically, plans an operation from the Galapagos Islands from 1 until 4 November. Later in November, KH6JEB hopes once again to

operate /KH7 from Kure Island. Moving into December, 3B8DA will be back in 3B6 on business and hopes to be allowed to operate. Let's hope he can, as the Mauritian authorities have been reluctant to allow 3B6 and 3B9 operation in recent years and these countries are starting to climb up the 'wanted' lists. And another one for December. JF1IST, a well-known DX operator, will operate TA1E from 19 to 31 December. Nearer to home, *DX News Sheet* reports that G4UOL will sign GD4UOL from 19 November until 2 December, CW only.

### RTTY

Despite the clash with the HF Convention, I was able to operate some RTTY during the CQWW RTTY Contest in September. My contacts included OD5NG, HD8EX, 5B4MD, UL0P/UZ9FWA, UD/UZ3PWX and, best of all, a 15m contact with KX6OI. The 'got away' list included SU1ER, FT5ZB, J52US and NH6I.

Looking to the future, T5GG now has RTTY gear and should be active for several months. Incidentally, the UA3AKR RTTY mailbox on 14088kHz often contains useful snippets of DX information. Type the command 'INFO' to download the relevant file.

I note that a couple of packet mailboxes are now operational on 10m FM. DF5FF-10 is on 29250 and EA3BKZ-2 on 29310, both using 1200 baud as per 2m. No doubt there will be more. Although 10m FM looks a good bet for packet enthusiasts, let's hope the activity settles down on just one or two channels so that it can co-exist with other 10m FM operation; including voice repeaters. The IARU Region 1 HF Working Group meeting which was held in September, failed to reach agreement on recommended frequencies for packet operation on HF, so unfortunately, we can't look to a lead from that direction. I understand the RSGB representatives did their best to point out that failure to make recommendations could lead to serious conflict between packet operators and existing users, especially on 20m. Many of the other countries represented at the meeting either failed to recognise the problem, or were not prepared to do anything about it.

### Contest update

In addition to the CQWW CW Contest operations which I listed last month, OH8PF will operate as EA8AGD and NQ4I will be active from 9Y4.

### Japanese DX contest

I have recently received from Japan the details of a new contest sponsored by *Five Nine*, a Japanese amateur radio magazine. The contest will take place during the 48 hour period from 2300 GMT on 11 November. Points are gained by working Japanese stations on phone in the 80 to 10m bands. You score 2 points per QSO on 80 and 10m and 1 point per QSO on 40, 20 and 15m. The multiplier is the number of Japanese prefectures worked in all (a maximum of 50 per band – see map). DX stations give signal report and serial number, while Japanese operators will give a signal report and the number of their prefecture. You can enter as single operator single band, single-op multi-band, or multi-op multi-band. There will be a variety of certificates and plaques for leading stations in each category. Single operators are restricted to a maximum of 30 hours of operation. I have copies of the cover sheet and full rules if required. Entries should be sent to: *Five Nine*, Box 8, Kamata, Tokyo 144, postmarked no later than 31 December.

Look out for the TOPS CW Contest on 5/6 December, starting at 1800 on the Saturday and running for 24 hours. This contest is 80m CW only and I always find it a lot of fun.

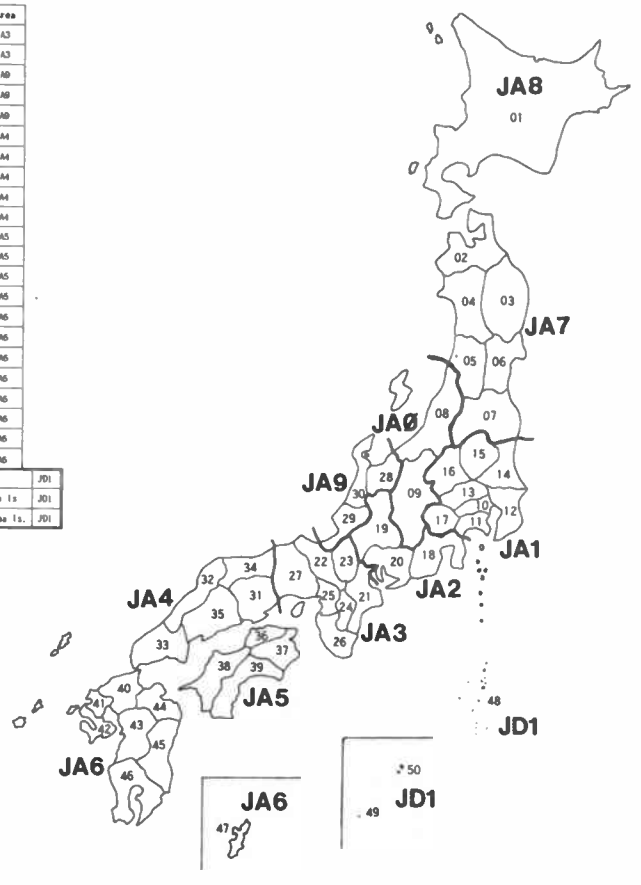
Early notice now of the UBA contest, run by the Belgian National Society. The CW leg takes place on 28/29 January 1989 and the SSB leg on 25/26 February. Both are for 24 hours from 1300 GMT on the Saturday. Score 10 points for contacts with ON, DA1 and DA2 stations, 3 points for contacts with other EEC stations and 1 point for contacts with stations outside the EEC. 43 multipliers are available per band (80-10), consisting of the nine Belgian provinces (Belgian stations will send a two letter identifier), the various Belgian prefixes plus DA1 and DA2 and the remaining countries of the EEC (with EA6, GM, GW, SV5, etc, counting separately).

I can provide a photocopy of the full rules, address for logs, etc, for the above contest on request. The reason I wanted to pass on details, though, was to mention various associated awards. The highest scoring station in each category (single-op single-band, single-op multi-band, etc) from each country will receive a special award. All participants working at least 40 stations and sending in a log will receive a certificate. Contacts will also count towards the new E-1992-C (European Community 1992) award. This award will commence on 1 January 1989 and requires 144 contacts with the 12 member countries of the EEC. If you work 144 such stations in the UBA contest, with at least two, but no more than 24 per country, you qualify immediately, provided you submit the award claim with your contest entry. Outside the contest, you can qualify for the award by working 144 EEC stations with at least 6 and no more than 20 stations per country. The rules also allow for a mix of contest and non-contest QSOs and the combining of QSOs made in more than one UBA contest. Again, if you need full information please drop me a line and I will send you a photocopy.

Finally, in September I mentioned the computerised 'DX Edge', and I have also mentioned some of the public domain amateur radio software for the IBM. This has prompted Richard Wilmot, GW3RRI, of Technical Software to send me details of his amateur radio software for the BBC, Electron, Commodore and Spectrum computers. One in particular, the UK/Europe Map and Locator, looks of possible interest, as do his various RTTY, CW, SSTV and AMTOR packages. I haven't had the opportunity to try any of them out, but if you run one of these machines it might be well worth dropping Richard a line to his callbook address for details.

**JARL PREFECTURE / NUMBER LIST**

| Nr | Prefecture | Area | Nr | Prefecture | Area |
|---|---|---|---|---|---|
| 01 | Hokkaido | JA8 | 26 | Wakayama | JA3 |
| 02 | Aomori | JA7 | 27 | Hyogo | JA3 |
| 03 | Iwate | JA7 | 28 | Toyama | JA9 |
| 04 | Akita | JA7 | 29 | Fukui | JA9 |
| 05 | Yamagata | JA7 | 30 | Ishikawa | JA9 |
| 06 | Miyagi | JA7 | 31 | Okayama | JA4 |
| 07 | Fukushima | JA7 | 32 | Shimane | JA4 |
| 08 | Niigata | JAØ | 33 | Yamaguchi | JA4 |
| 09 | Nagano | JAØ | 34 | Tottori | JA4 |
| 10 | Tokyo | JA1 | 35 | Hiroshima | JA4 |
| 11 | Kanagawa | JA1 | 36 | Kagawa | JA5 |
| 12 | Chiba | JA1 | 37 | Tokushima | JA5 |
| 13 | Saitama | JA1 | 38 | Ehime | JA5 |
| 14 | Ibaraki | JA1 | 39 | Kochi | JA5 |
| 15 | Tochigi | JA1 | 40 | Fukuoka | JA6 |
| 16 | Gunma | JA1 | 41 | Saga | JA6 |
| 17 | Yamanashi | JA1 | 42 | Nagasaki | JA6 |
| 18 | Shizuoka | JA2 | 43 | Kumamoto | JA6 |
| 19 | Gifu | JA2 | 44 | Oita | JA6 |
| 20 | Aichi | JA2 | 45 | Miyazaki | JA6 |
| 21 | Mie | JA2 | 46 | Kagoshima | JA6 |
| 22 | Kyoto | JA3 | 47 | Okinawa | JA6 |
| 23 | Shiga | JA3 | 48 | Ogasawara Is. | JD1 |
| 24 | Nara | JA3 | 49 | Okino-Torishima Is | JD1 |
| 25 | Osaka | JA3 | 50 | Minami-Torishima Is. | JD1 |



# TUNING THE WIRE

## by Ken Williams

## THE DIPOLE AERIAL PART 3

Less experienced amateurs may often be heard bemoaning the fact that, although they were most careful in cutting their aerials to the correct dimensions, the VSWR on their feeders is still far from optimum.

As we saw, however, in the two previous articles in this mini-series, there are many factors which can affect the resonant length of an aerial. Although the published figures are an excellent guide, the final length must always be determined by experiment. This article is devoted to the gentle art of tuning aerials.

### Test equipment

The physical length necessary to achieve resonance for an aerial is affected by nearby objects, be they buildings, trees or even the earth. The object of tuning is, therefore, to compensate for the effect of these so that the aerial presents a good match to the feedline.

In the case of a perfect match, at resonance the aerial would present a pure resistance to the feedline. Off resonance, a reactive component would also be present – capacitive at lower frequencies and inductive above.

In practice, a perfect match is rarely obtained and these effects are exacerbated. It is, therefore, desirable to strive for the best possible match and try to ensure that any combination of impedance and reactance 'seen' at the bottom of the feeder cannot possibly damage the transmitter.

The basic aerial test instrument is the VSWR meter which gives a measure of the power being reflected back down the feeder. For this purpose the relatively inexpensive meters available are quite adequate for they are reasonably accurate at low VSWR values and at higher ratios will, at least, indicate the effect of any aerial adjustment.

The second instrument is the RF noise bridge. Of these, the simpler models will measure the impedance presented to the transmitter while the better ones will indicate both this and the reactive component on the feeder.

I have seen aerial tuning instructions which suggest the use of a grid dip oscillator to determine resonance with the aerial at low level. I am not, however, in favour of this technique for, in raising the aerial to operating height, both the resonant frequency and the radiation resistance will change. I feel that the technique of measuring the parameters indirectly, with the aerial at operational height, is preferable.

The exception to this is in the optimisation of VHF beams which can be adjusted quite successfully at only a few feet above the ground, provided they are pointing vertically upwards.

### Physical construction

A basic dipole aerial is a piece of wire of specific length suspended above the ground, divided at the centre at which point the feeder is attached.

Insulators are fitted at the extremities of the wire and at the centre, the latter also providing support for the feeder. If the coaxial feeder is in use, the latter may also incorporate a balun.

The length of a half-wave dipole is 468/F feet, where F is the frequency in megahertz, this dimension making allowance for electrical length, etc. In the case of an aerial operating on a harmonic. the length is (492 [N-0.05])/F feet, where N is the length in half-wavelengths and F is the frequency.

A simple computer program is included with this article for these calculations.

Although the wire must be of a specific length, as we have seen, this may be affected by the presence of nearby objects. Provision must, therefore, be made for easy adjustment.

The author has found two methods for this. The first uses one segment of a very large 'chocolate block' connector to secure the aerial wire to the insulator. By passing the wire through the connector and insulator and back through the connector, a neat and secure yet easily adjustable termination is achieved.

Alternatively, secure the insulator a short distance before the end of the aerial, leaving the remainder hanging down for adjustment with a pair of side cutters ( *Figure 1* ).

In the former case, the initial aerial length should correspond to a little more than that for the low frequency end of the band. In the latter, the distance between the insulators should be a little less than for the HF end of the band. A 'tail' is then added which brings the total length up to that for the LF end of the band.

The feeder may be of balanced twin or coaxial cable. The former has the advantage of being lighter, less lossy and less obtrusive. A balun may be placed at the operating position to convert the balanced feed to the unbalanced output of the transmitter or aerial matching unit. Alternatively, some AMUs incorporate a balanced output for direct connection to such feeders.

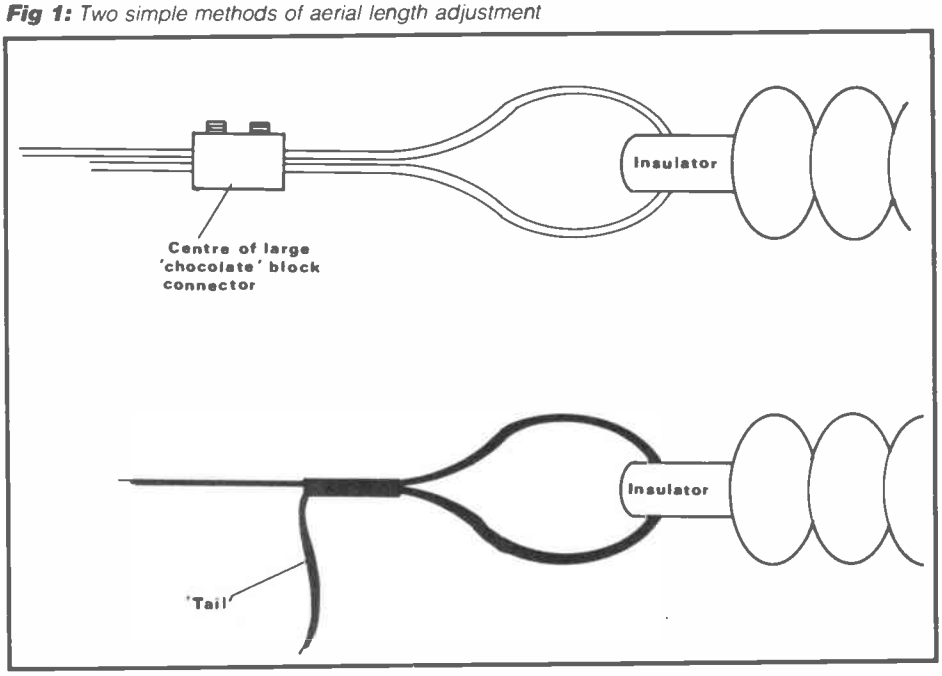
Where coaxial cable is used, the balun is used as the centre piece of the aerial. The balun need not necessarily be of the traditional ferrite type. There are several alternatives, including one used by several eminent operators, which is merely a coil of six turns of the feeder about six inches in diameter, the whole being held together with two or three tie-wraps.

The aerial should be made from semi- or hard drawn copper wire. If soft copper is used, over a period it will stretch and the resonance will lower. It will also be more susceptible to breakage in high winds or icy conditions. The aerial should also be erected as high, and as far, from nearby objects as possible.

### First tests

With the aerial erected, connect the lower end of the feeder to a VSWR meter and from there directly to the transmit-

***Fig 1:*** *Two simple methods of aerial length adjustment*



| Band | Length (FT) | Variation 100kHz |
|---|---|---|
| 3.5 | 133.7 | 3.6ft |
| 7 | 66.8 | 0.9ft |
| 10 | 46.3 | 0.5ft |
| 14 | 33.4 | 0.3ft |
| 18 | 25.9 | 0.14ft |
| 21 | 22.2 | 0.1ft |
| 24 | 18.8 | 0.9ins |
| 28 | 16.7 | 0.7ins |

ter. Do not put the AMU in circuit.

Turn the VSWR meter to maximum sensitivity and apply just sufficient power from the transmitter to drive the meter to the 'calibrate' mark. Measure the VSWR at every 50kHz across the band, recording the figures.

From these, it should be obvious at which frequency the resonance lies. If the advice given previously that the aerial should be initially cut long has been taken, this should be at the low end, or even outside the band.

If the resonance is obviously outside the LF end of the band, shorten the aerial by an amount corresponding to about 200kHz. If resonance is within the band, shorten to bring the resonance to the part of the band most frequently used. The length increment per 100kHz is calculated in the computer program on page 32. If no such machine is available, use increments of one inch at each end on 10m; two inches on 20m; four on 40m and eight on 80m.

If the resonance is found to lie HF of the desired frequency, obviously the aerial will have to be lengthened. If the chocolate block method of adjustment is being used and all adjustment has been used up, the only alternative is to add a 'tail'. If the alternative method is used, there should be no problem in extending or replacing the tail.

When the minimum VSWR has been obtained at the required part of the band, perform a last measurement of VSWR every 50kHz across the band and record the figures in the station log for future reference.

It is now time to replace the VSWR meter with the noise bridge and measure the impedance at which the transmitter is looking.

As we saw in a previous article, the VSWR represents the ratio of the impedances of the aerial to the feeder. So, although the VSWR may be approaching 1:1 at resonance, at the edge of the band this may rise to 3:1 or higher. If the feeder is 50 ohms, this could mean that the transmitter is looking at 150 ohms, which would limit its output to some degree, but it could equally mean that it is seeing 17 ohms. Although with valve transmitters this is of little importance, with solid state equipment, instability or even destruction of the PA transistors could result.

While a good AMU should take care of such problems, this is not always the case and, as they say, forewarned is forearmed and precautions can be taken. This could take the form of moving the resonance of the aerial sufficient to ensure the lowest possible VSWR at each end of the band consistent with reasonable VSWR on the frequencies most commonly used.

With the noise bridge connected, perform a plot of the impedance across the band, recording the figures in the station log. It would also be interesting to draw graphs of VSWR and impedance on the same axes and compare the impedance with VSWR (see *Figure 2*).

In conclusion, if the dipole is being fed with 50 ohm coaxial feeder and the noise bridge indicates that the impedance at resonance is around 70 ohms, consider replacing the feeder with a length of 75 ohm coax or twin. The converse is also true.

If the dipole measures a very low impedance, such as 20 to 30 ohms if the aerial is on the LF bands, consider feeding with a quarter wave length of 50 ohm feeder. This would act as a quarter wave transformer to give the transmitter a much higher impedance.

## Long dipoles

We saw earlier in this series that dipole aerials could be operated on odd harmonics of their fundamental resonance. However, due to the difference between the electrical and physical lengths of aerials, this is not quite true.

The only case where this is useful on the HF amateur bands is on 40 and 15m. Unfortunately, a half-wave dipole resonated at 7.0MHz is 66.8ft long while three half-waves at 21.4MHz are 67.8 feet.

An aerial cut to the compromise length of about 67.5 should perform reasonably adequately on both bands.

In practice, the wisest course would be to erect an aerial of a compromise length and perform a VSWR plot for each band. From these, considering the relative importance of each band to the station, make suitable adjustment, permitting the higher VSWR to exist on the less important band.

## Parallel dipoles

The adjustment of parallel dipoles attached to a single feeder is exactly the same as for a single dipole. Each will affect the others to some slight degree but this will be compensated for in the adjustment techniques described earlier. It would probably be advisable to adjust the highest frequency dipole first.

When all dipoles have been resonated, perform a second set of frequency/VSWR plots to ensure no further interaction has occurred.

## Multiband trap dipoles

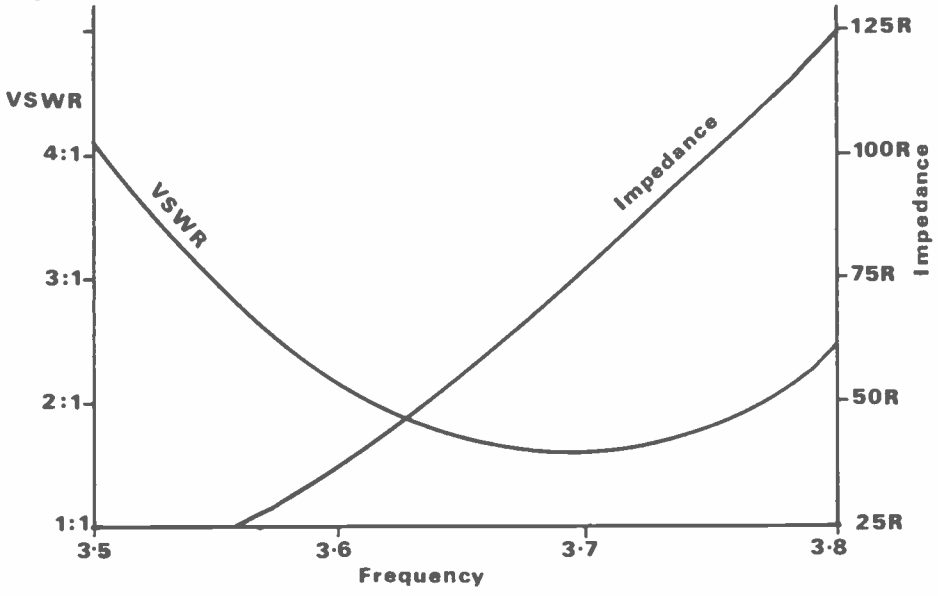
The multiband trap dipole is a compromise aerial which operates as a dipole on 80 and 40m, as three half-waves on 20m, five on 15m and seven on 10m.

Provided it is erected well in the clear and at a reasonable height, the compromise will, in general, hold. However, in many cases the user has neither the length or the necessary height and as a result the aerial has to be bent to be contained within the available space.

In such circumstances, proximity to nearby objects affects some bands more than others with the inevitable result that the overall compromise is lost and the aerial will no longer be effective on all bands. Under such circumstances the best which can be achieved is to make the aerial effective on the most used bands and gracefully accept defeat on the others.

On erecting the aerial, the first task is to resonate the 40m section between the traps. Contrary to the belief of some amateurs, this section does not resonate on 21MHz for the traps are ineffective at this frequency.

***Fig 2:*** *Plots of VSWR and impedance of a typical 80m dipole*



```
10  REM:AERIAL LENGTH CALCULATIONS
20  CLS
30  PRINT"
40  PRINT"LENGTH OF WIRE AERIALS"
50  PRINT'
60  PRINT"1. HALF WAVE AERIALS"
70  PRINT
80  PRINT"2. LONG WIRE AERIALS"
90  PRINT
100 INPUT"Select 1 or 2", A
110 ON A GOSUB 120,340
120 CLS
130 PRINT"
140 PRINT"HALFWAVE AERIALS"
150 PRINT"
160 INPUT"FREQUENCY (MHZ) ",F
170 L=468/F
180 PRINT
190 PRINT"AERIAL LENGTH AT ";F; " MHZ IS ";(INT(10*L))/10;" FEET"
200 F=F+.1
210 M=468/F
220 I=(L-M)
230 PRINT
240 IF F21.5 GOTO270
250 PRINT"VARIATION = ";(INT(100*I))/100; " FT/HUNDRED KHZ"
260 GOTO280
270 PRINT"VARIATION = ";(INT(10*(12*I)))/10;" INCHES/HUNDRED KHZ"
280 PRINT
290 INPUT"ANOTHER CALCULATION (Y/N)",B$
300 IF B$="Y" OR B$="y" GOTO120
310 IF B$="N" OR B$="n" GOTO20
320 GOTO290
330 END
340 CLS
350 PRINT"
360 PRINT"LONG WIRE AERIALS"
370 PRINT
380 INPUT"LENGTH OF AERIAL IN HALFWAVELENGTHS ",N
390 PRINT
400 INPUT"FREQUENCY (MHZ) ",P
410 CLS
420 Q=(492*(N-.05)/P)
430 PRINT"
440 PRINT"LONG WIRE AERIALS"
450 PRINT"
460 PRINT"THE LENGTH OF A ";N;"HALFWAVELENGTH LONG WIRE AT ";P;"
      MHZ IS ";(INT(10*Q))/10;" FEET"
470 PRINT'
480 P=P+.1
490 R=(492*(N-.05)/P)
500 IF P21.5 GOTO540
510 S= (INT(100*(Q-R))/100
520 PRINT"VARIATION = ";S;" FT/HUNDRED KHZ"
530 GOTO560
540 S= (INT(10*((12*Q)-(12*R)))/10)
550 PRINT"VARIATION = ";S;" INCHES/HUNDRED KHZ"
560 PRINT'
570 INPUT"ANOTHER CALCULATION (Y/N) ",C$
580 IF C$="Y" OR C$="y" GOTO340
590 IF C$="N" OR C$="n" GOTO20
600 GOTO 570
```

*This program, which should operate on almost all small computers except Sinclair, calculates the length of dipoles and the variation in length per 100kHz*

Remembering that a trap operates effectively as an insulator, the centre section acts as a dipole and adjustment is the same as detailed earlier.

The next task is to perform VSWR/frequency plots for each of the other bands in turn. At this point it will probably be useful to also plot these graphically.

Note the frequency at which the aerial resonates on 80m. This will normally be in the upper part of the band and will not change substantially throughout future adjustments.

Examine the plots for the 20, 15 and 10 metre bands, noting whether a resonance falls within or near (ie VSWR less than about 5:1) any of these.

It is now a matter of selecting for which of the DX bands the aerial will be optimised. From the plots it may be noticed that a slight increase in length will bring one or two bands into resonance.

Alternatively, a decrease will bring in a band which is considered more desirable. The final decision is a matter of operator choice based on the operating practices of the station.

Having decided on which DX bands the aerial will be optimised, the variation in length can be determined from the computer program.

It should be noted that it is unlikely that a very low VSWR will be achieved on any of the DX bands for at these frequencies the radiation resistance of a dipole operated on multiples of its fundamental frequency increases, reaching about 130 ohms when seven half-waves long.

As previously, the final action is to record VSWR and noise bridge plots in the log for future reference.

## The G5RV

The design of the G5RV multiband dipole leaves little room for adjustment. The matching stub acts, in many ways, as an extension of the horizontal wire. In general, therefore, it is more convenient to adjust the length of this stub than the main aerial wire.

The first task in optimisation is to perform VSWR plots for each band in turn from which may be determined any necessary adjustments. Provided it is remembered that any adjustment affects all bands, a reasonable compromise tuning may be reached.

## Feeder checks

Unless brand new feeder is being used it is wise to check that all is well before incorporation in an aerial system. This task may seem daunting but a simple technique is described in the ARRL Antenna handbook.

One end of the feeder is short circuited and a low level of RF is fed to the other end via a VSWR meter. The VSWR obtained is compared with a graph (see *Figure 3*) from which the loss at that frequency may be determined.

## General

On reading the foregoing, the basic principles of tuning any aerial are evident. A VSWR plot is first taken and, from the results of this, any necessary adjustment in length may be made. Having completed this, an RF noise bridge plot is made to confirm that the feed impedance is a reasonable figure and, if not, to warn of impending trouble if solid state power amplifiers are used.

On bands where a low VSWR is impossible all is not lost for, even with standing wave ratios up to 5:1, on high

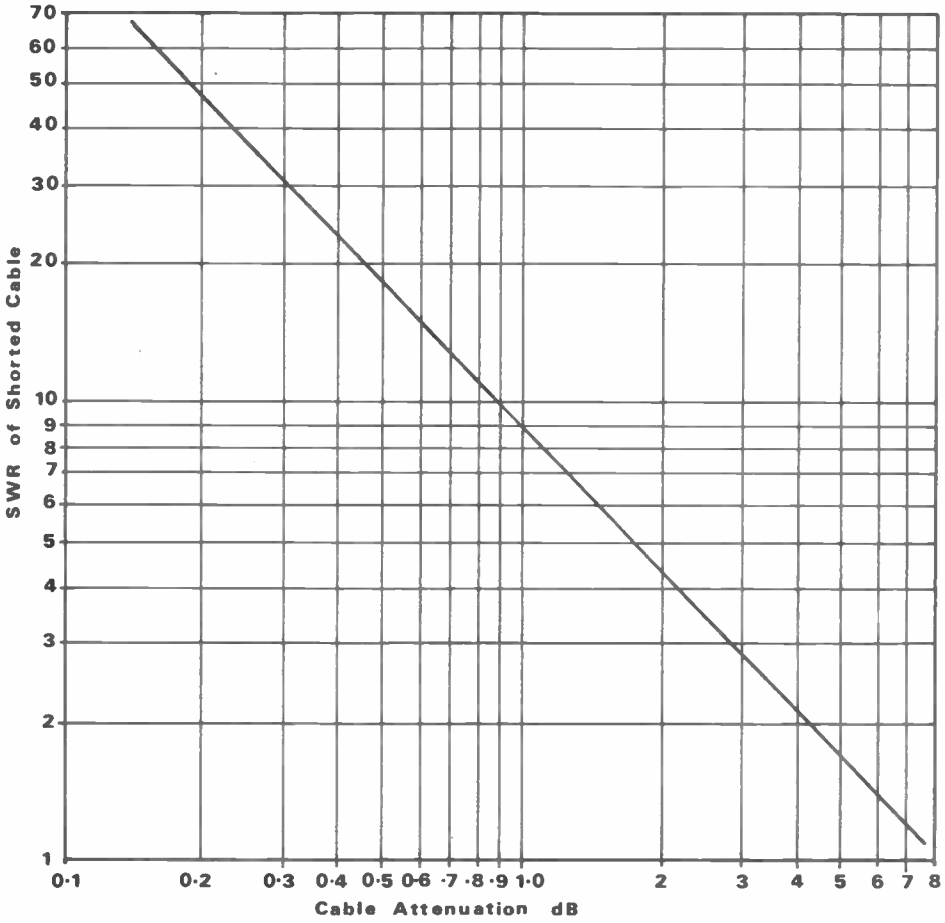



***Fig 4:*** *The ARRL Handbook method of checking losses on coax cable*

frequencies feeder losses on coaxial cable are not excessive and if balanced twin is being used, they will be even less. These losses are essentially due to the dc resistance of the feeder conductors. All RF reaching the aerial will eventually be radiated if only because it has nowhere else to go.

In such circumstances the only likely problem is matching the feeder to the transmitter, for many commercial aerial matching units are not capable of handling such high VSWRs.

## Conclusion

By following the general principles outlined almost any simple or multiband dipole may be resonated on one or more bands. Requiring only two relatively inexpensive instruments and patience this will pay handsome dividends, particularly in terms of ease of matching the feeder to and safeguarding the transmitter.

# SECOND-HAND

by HUGH ALLISON G3XSE

### Slide switches

The biggest problem with a useless slide switch is finding a replacement with mounting holes that are the same distance apart. I must confess that I have given up and now tend to modify them myself (*Figure 1* explains all). I bought a big box of slide switches for 50p that seem to have their mounting holes closer together than most. When a slider is required, I use one of these and turn the holes into slots with a pair of cutters.

Another annoying problem is when the moving part of the replacement switch (normally black) will not go through the front panel cut-out of the item under repair. To rectify this, file the front panel and open up the cut-out. I have not had much success filing the black piece down on the switch. Even if you file down what will become the underside of the switch, it always looks a little rough.

The biggest enemy of the humble slide switch is heat which is either coming off other components, or generated within the switch due to overloading. If the plastic piece is distorted, it is time for a replacement.

The other great enemy is grit, particularly sand. I once spent an enjoyable morning repairing a colour video camera after someone had accidentally buried it in sand on a beach. The slide switches came up like new after being carefully taken to pieces, washed in solvent and re-assembled.

### Oscillating IFs

'The BFO is on, even when it is switched off', wailed the dejected owner of a ten year-old general coverage receiver. After feeding it with mains and an aerial I had to agree with his description. If you tuned around a station, the whistles were there as you went through it. One very important clue was given by removing the aerial and tuning the BFO (after switching it on, obviously). The receiver had now become an audio tone generator. The IF, in this case tuned to 465kHz, was oscillating instead of amplifying. Turn on the BFO to 465kHz ± 3kHz, and as you tuned the BFO the receiver obligingly screamed out the difference (the 'beat'). You could then achieve a 3kHz tone, down to zero and then back up to 3kHz as you turned the BFO knob.

### What is the cure to this problem?

Well, there is one more quick and easy check to make before starting. Turn the audio gain (volume) well up and see if the set 'motor boats'. This is an old term that quite accurately describes the noise you might get. If you hear this, you will do well to use a big value electrolytic down the HT rails. For valve sets, try 8μF, and for transistor sets try 100μF, with volts to suit. The noise indicates that the decoupling capacitor has probably gone and you are getting interaction between the various stages in the set.

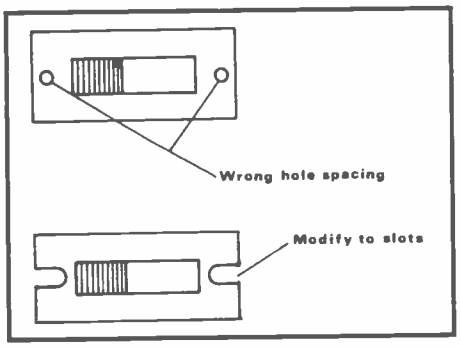



***Fig 1:*** *Modified slide switches*

If you have straight oscillation then it should not be too hard to cure, since we are only talking of one or two valves or transistors. Look at the IF stages. Are any cans or screens missing? If not, it is a good bet that a capacitor of some sort has ceased to work. Liberally use a similar value of capacitor across everything in the area (one at a time) and when the trouble stops, you have got it. No capacitors across those tuning the IF cans though!

If this does not solve the problem, go across each capacitor with your avo; set off, avo on low ohms. Any short? No? It's really not your day, is it?

Oscillation does tend to say that the active device, be it valve or transistor, is capable of gain, so it probably really is innocent. This only leaves the resistors to think about.

In the case of the set under discussion, there were 150 ohm resistors in series between the collector and the IF coils and one of these had decided to become a dead short. This is unusual.

If all else fails, solder a resistor across the collector part of an IF coil. Start with, say, 1k and go up until it oscillates, then back down a little. It will widen out your IF but this is often negligible. After all, if the set is on the verge of oscillation, the positive feedback is probably sharpening it back up for you.

### Repairing it logically, part II

A few months ago, I detailed how to repair an 'average' receiver (if such a thing exists) by working through it, stage by stage, forward from the audio amplifier. Another approach is to put a signal at the front end (ie into the aerial socket) then follow the signal path back through with a 'scope. This technique is more or less restricted to owners' signal generators and oscilloscopes.

Ideal for this was a Trio JR500 receiver that came in the other day. Bags of hiss and all sounding quite lively but mega deaf, like 10mV up the aerial hole for a slight 'squark' out of the speaker. I must confess that the best clue was right there in front of me, the pre-selector knob was not peaking on any band, but I ignored this and decided to use the 'follow through' technique.

With the 10mV up the aerial socket, a 'scope on the anode of the RF bottle showed almost the same again. This really was a breakthrough. The incoming signal is at a nominal 50 ohms, which will be transformed to a higher impedance by the input tuned circuits. Therefore, more volts than the 10mV should have been on the grid, and many more should be on its anode. A good replacement was used but there was still no change. An inspection of the valve base showed no volts missing and everything was more or less correct. It was now time to look at grid 1 with the 'scope.

There was less than 10mV, and no peaking. The pre-selector tune, a shiny variable capacitor, which was quite solidly bolted to the chassis with all its screws intact, was not making contact with the earth. I undid the screws, did them back up and all was well.

To return to the 'work back from the aerial' technique, the first stage, assuming an RF amplifier, should be contributing 10dB or so of gain, give or take generous allowances for impedance mis-matches etc. Thus, 10mV input should be giving 100mV or so up the mixer. The reason for using 10mV input is that this is the minimum you can expect to see on your average 'scope which is tooled-up wih an X10 probe. Put a bigger signal in and you will start overloading the set.

### Mixers

This is probably the most difficult stage to work through. There is usually a *loss* through a mixer stage, thus your 10mV, which became 100mV thanks to the efforts of the RF stage, will now be down to 50mV or so on the input to the first IF stage active device. Note where we are looking (after the IF coil). This is because there is so much junk lurking on the anode/collector of the mixer (oscillator breakthrough, other mixes etc) that you cannot reasonably expect to see the wanted signal. It is also worth remembering that selectivity is now involved, the receiver needs to be accurately tuned to the signal generator.

Fine, super. You have a non-working set that probably isn't too accurate on its tuning anyway, and some fool is suggesting that you accurately set it onto an unstable signal generator? OK, have a look at the mixer anode/collector and swing the generator about the required frequency. It's a good idea to have about 1kHz mod on the incoming signal (look for some of that on the 'scope) and time bases, nice and slow to suit. As you swing

the oscillator about you should notice a fairly sharply defined change in the muck you are looking at. Note how many kHz of swing you can make on the signal generator, probably 100kHz or so in the case of an HF receiver, then transfer the 'scope to the first IF input and swing again while looking for a peak.

The anode/collector of the first IF should really be humming and there should be yards of signal there, a volt or so at least. The detector (which is after the next IF) should have tens of volts floating about.

It is a good idea to practise this 'work through backwards' technique on a good receiver before using it in anger. It is not as simple to repair as going forward from the speaker, but it's worth considering if there appears to be plenty going on in the 'dead' set.

**GDOs**

Grid Dip Oscillators. Well, valve ones are. These are solid state equivalents that have carried on the generic name. GDOs are an extremely versatile tool. Although I have access to magnificent test equipment, there are still times when a twenty-five year old Electroniques valve mains powered GDO is indispensable.

The basic idea is that, in a valve oscillator, the grid current will change a little when the oscillating coil comes into close proximity to another coil which is resonating at the same frequency. Thus, the thing is an oscillator as well as a simple signal generator. Most GDOs have a facility to stop them oscillating and the meter can be used as a (tuned) field strength meter.

The prime use of a GDO is to 'see' where a coil/capacitor combination is tuned. You simply hold the 'unknown' near the GDO and tune for a response. Incidentally, after getting a response you will know the capacitance and the frequency, you can thereby work out the inductance of your unknown. The GDO can now be used as an inductance meter. After establishing the inductance, change the capacitor and find the resonant frequency. You can now work out the new capacitance and use the GDO as a capacitance meter.

One clever trick is to couple an aerial into a GDO via a couple of turn loops and find the resonant frequency of the aerial. This facility is absolutely brilliant for 10m aerials and CB enthusiasts.

How much does it cost for such a wonderfully versatile bit of kit? Second-hand valve ones will cost around ten to twelve quid. Solid state GDOs are more expensive at around fifteen to twenty quid because of their variety of uses. The 'Tradiper' (see photograph) is one I bought five years ago for a tenner and it has often helped get me out of a few tight corners.


## News and comment from Glen Ross G8MWR

First of all this month, I would like to mention a couple of items relating to six metres. The first, is that reports are coming in of an opening to South Africa at around lunchtime on 27 September. This event coincided with a massive increase in the sunspot count which took it to the highest levels seen so far in this cycle.

There are no details to hand yet as to just what was worked, but it does seem from the reports available that the opening was restricted to the southern part of Britain. Certainly, by the time I got on the band at around 1.30pm there were no signs of any activity in the Midlands. Within the last year we have had openings to the United States, Canada, the West Indies and now South Africa. With band conditions steadily improving over the next few years, it looks like being an exciting time on six metres in the future.

### Nasty noises

We are starting to receive some semi-official noises from the powers that be with respect to certain signals on 50MHz that are, to say the least, just a little larger than might be expected within the current regulations. Linears running 100W and more, were available commercially in the permit days and are obviously still around. It is also not too difficult to build a PA using readily available valves that will easily push out around 200W. Feed these to a pair of stacked four element beams and you have a very large signal.

### Out of order

The problem is that unless you are using damp string to feed the aerials, this is completely unlawful. The word is out that the authorities are starting to have a serious look around. I suppose the real problem is that if you are the sort of person who bends the rules simply to get a good squares and countries score then nothing, short of getting caught, is going to stop you.

### Information

The DTI does a lot more than simply issue licences to deserving amateurs. Another of their functions is to provide information on many aspects of radio usage. At present, they have ten different leaflets and books which are of specific interest to amateurs. These cover everything from how to become a radio amateur, through to things like how to get a repeater licensed.

The nice thing about the DTI is that the information is available free of charge. To find out just what is available, ask for listing BR 81. The address for your enquiry is: Library Service, Room 605, Waterloo Bridge House, London SE1 8UA.

### The think tank

The comments I made on the RSGB's thinking behind the new student licence have certainly raised a lot of interest. As expected, most of those who already have a licence said we did not need a novice grade, while those who are not licensed said we did! The tank is still leaking and I can now give you some more of the 'behind the scenes' deliberations. One of the ideas is to encourage youngsters into short wave listening, which is an excellent idea.

To make sure that they are genuinely interested, there is a proposal that they will have to present a number of QSL cards (the actual amount has yet to be determined) before they can take the licence examination.

### Examinations

It has been suggested that the exam should be drawn from a bank of about a thousand questions and that the exam should be marked on the spot by 'accredited' amateurs and that the candidate should be told their result there and then. This could put the examiner into a few tight spots. It would, however, be a liberalisation of the system and could eventually lead to similar marking in other areas.

### Licence types

Three different types of licence have been under consideration. The first goes back to our old friend the 'Artificial Aerial' (or non-radiating) licence of pre-war days. This would enable new licensees to build keyed and modulated oscillators of restricted power and on specified frequencies. The second type is the 'Supervised' licence. The first stage to this would be to extend the greetings message capability from special event only status to all stations.

### One up

The second stage would be to allow 'a defined class of people' supervised operation of any amateur radio station. Just who would make up this defined class is anyone's guess. Any such general facility would require a revision of the present licences, but there is also the idea of issuing special permits to certain amateurs.

### The student

This is the real meat of the job. It seemed likely that this would result in a low power CW licence with a small frequency allocation and this is still a strong possibility. However, there have been thoughts of a much wider base. 50MHz has been suggested as 'primarily for data', 430MHz is listed as 'FM and data', with 1.3GHz as 'wideband TV and data', whilst 10GHz is presented as 'suitable for lab type experiments, TV and data'.

### Incentives

It seems that there must be a limit on the time that the licence can be held. The open-ended approach that is used in the USA has resulted in a huge population of amateurs who own a hand-held and operate through the local repeater. It seems that they are not interested in moving on to greater things. The RSGB recognises this problem when it asks, 'Do we want a large permanent population in the student licence class?'

### The gear

The RSGB thinks that it should be home-made and, to avoid big problems, possibly built 'under supervision of a technically competent person'. Another way of keeping out of trouble would be to 'require the use of one of a range of approved designs' which could be supplied as kits or, and this seems to defeat the idea of promoting home construction, ready-built units.

As far as VFO or crystal control is concerned, the RSGB looks both ways at once saying that 'there are strong arguments for crystal control' but that a VFO may be better used in some bands.

### New society

At present, the RSGB has about two hundred associate members and they feel that many of the newcomers would not join on this basis. The idea is to set up a new society especially for them. This will probably be known as the Young Amateurs Radio Association, or YARA. It is intended that this should be open to anyone under eighteen who holds any

class of amateur radio licence. Perhaps this signals the death of associated membership of the RSGB? It would be run as a separate organisation and the young members would decide the policies etc of the group. The RSGB says 'Young people are quite capable of doing this if correctly motivated'. Judging by what goes on at the normal AGM, it seems that the same officials do not think that older members have the same capability!

It is also on the cards that a questionnaire asking for views on the subject will be placed in magazines other than *Radcom*, to obtain ideas of non-members of the RSGB. The mole is still at work and more background news will be brought your way as soon as it is available.

### Our awards

Time for an update and this time we have claims from G6MXL, who comes from Poole. He goes first for a Gold award on 144MHz where his best DX was 1386km to OK2WCK. Other nice calls noted are LX2GB in Luxembourg and UT5DL in the Ukraine. He next claims a 432MHz Silver award with some nice contacts being made to OE5MKM and EA1BLA; the best distance on this band being 862km. This distance is nearly equalled in his claim for a Bronze award on 1296MHz. His best.contact is 819km to HB9AMK. The interesting thing about this is that he only runs two watts on 23cm. This result really shows what a superb band 23cm is when it is open; perhaps this is the reason why so many people bypass 70cm and move straight up to the higher frequency? If you want information about the awards, send an SAE to the address at the end of this article.

### 10GHz

This year's cumulatives have now come to an end with some very high scores being returned for the series. An interesting point has been the big increase in SSB activity. Actually generating SSB at these frequencies is not too difficult. Trying to make the signal stable enough to read is a different matter altogether though. The main difficulty is due to temperature changes on hilltops moving the frequency of the crystal oscillator in the transverter. A slow drift can be tolerated as it simply needs the receiving station to chase you with the RIT control.

The big problem can best be described as 'warble' on the signal. This can make SSB sound more like FM and is the very devil to cure. The fact that so many people have managed to get good signals on the band is a great credit to them. Like all good things, the completely home-built 10GHz station is starting to succumb to the inroads of commercial gear. Perhaps we should not lament this too much, as it shows that a lot of people are interested in the band; otherwise the manufacturers would not make the gear.

24GHz has also seen more use this year, mainly using wide band FM. This is now becoming the home of the 'everything here is home-made, old man' brigade.

### Contests

The next VHF contest is on 30 October and is a leg of the 1.3/2.3GHz event. This is followed on 6 November with the 144MHz cumulative. The following day sees the 432MHz cumulative. The Club Class contest is held on 12 November. Two more cumulatives finish the month out, with the 1.2/2.3GHz on the 15th and the next leg of the 432MHz on the 23rd. The rules for all of these events can be found in various editions of *Radcom*.

### Close down

That is it for this month. The postal strike has done nasty things to the incoming mail, but the trusty Prestel machine has been keeping me in touch with the world. Please contact me direct at: 81 Ringwood Highway, Coventry, or on Prestel using 203616941. Good hunting.

# DATA SHEET by Ian Poole G3YWX

Integrated circuit technology has made many inroads into RF circuit design and construction. This has been made possible by devices like the Plessey range of RF integrated circuits. Devices like the SL610, SL611, SL612, SL640 and SL641 RF amplifiers and mixers have established themselves with amateurs and professionals alike. In fact, the famous G3ZVC design for a simple transceiver uses them and it has formed the heart of many an amateur project. The use of these ICs has enabled the design to be simplified so that a simple board forms the heart of the sideband transceiver. Only an external local oscillator, RF amplifiers and filters are then required.

Of the ICs in the Plessey range the SL610, 11, 12 and SL640/41 are the most commonly used. The SL610 and 611 are RF amplifiers whilst the SL612 is an IF amplifier. The SL640 and 641 are RF mixers.

## Amplifier specifications

The three RF amplifiers; the SL610, 611 and 612 are similar to one another in many respects. They have the same pin connection as shown in *Figure 1*. However, the gain and bandwidth figures vary to enable them to fulfil a wide range of applications. The SL610 has a gain of 10 and an upper bandwidth of 140MHz at −3dB, whilst the SL611 has a gain of 26 and a 100MHz bandwidth. Finally, the SL612 has a gain of 50 but its bandwidth only extends up to 15MHz.

For all of the ICs a supply of 6 volts is recommended but they will tolerate up to 9 volts. Their supply current is typically 15mA which means they consume about as much as a single transistor stage. Whilst looking at their supply requirements it is worth mentioning that these ICs do have their own internal decoupling. Although this is often adequate for RF decoupling, any low frequency components of ripple need to be properly filtered so that they do not cause any intermodulation.

An AGC facility is provided on all three of the chips. This is controlled via pin 7. If this connection is left open circuit, or it has less than 2 volts applied then the gain remains at its maximum. As the voltage is increased the gain is reduced until the voltage reaches its maximum of 5 volts. At this point the gain is reduced by around 50dB in the case of the SL610 and 611 or 70dB in the case of the SL612.

## Operation

These amplifiers are very easy to use requiring only a very few extra components around them to produce the complete circuit. As an example a simple one stage amplifier is shown in *Figure 2*.

From the circuit it can be seen that the two earth pins (4 and 8) are connected to different points. In fact, it is particularly important that pin 4 is associated with the input circuitry whilst pin 8 is associated with the load. If the two pins are directly connected together there is a risk that the common series resistance in the earth line may give rise to instability.

It is also worth noting that it is necessary to use a series resistor in the output if the IC is going to drive low impedances, ie 50 ohms or so. The resistor should be placed in series with $C_2$ and should be around 50 to 100 ohms. This resistor is needed because driving a low impedance load directly tends to remove the internal negative feedback. This results in poor linearity, instability and poor gain control. The inclusion of the series resistor ensures there is always sufficient negative feedback and that the circuit operates correctly.

## SL640 and SL641 mixers

Apart from the amplifiers there are also mixers which are available in this series of ICs. The SL640 and SL641 are both double balanced mixers capable of use up to 70MHz. They differ in their output circuitry. The SL640 has two outputs. One includes an integral load resistor and the other is an emitter follower. The SL641 has only one output and does not have an integral load resistor. This is because it is designed as a current drive for a tuned circuit.

The supply for these ICs is basically the same as for the SL620 series amplifiers, ie nominally 6 volts. The current drawn is reasonably low. Typically either IC will draw about 10mA, but it is wise to allow up to a maximum of 17mA in the case of the SL640.

The performance of the SL640 and 41 means that they are more than adequate for the majority of communications applications. They have a gain of approximately unity over the signal path and can

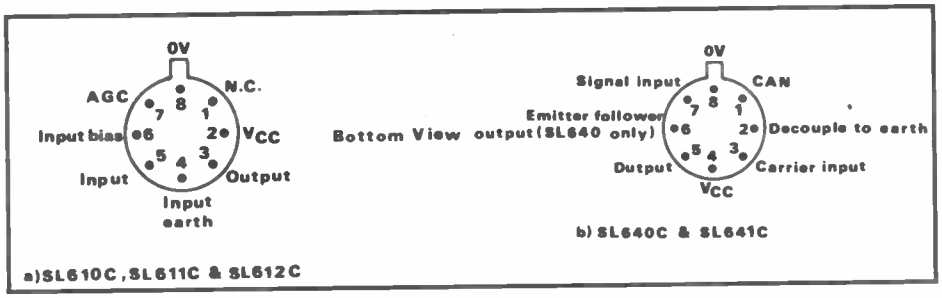



***Fig 1:*** *Pin connections*

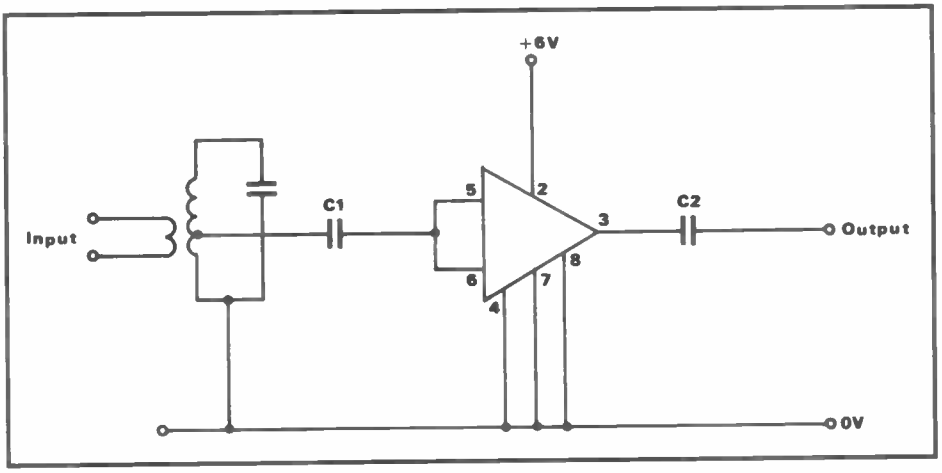



***Fig 2:*** *A typical RF amplifier*

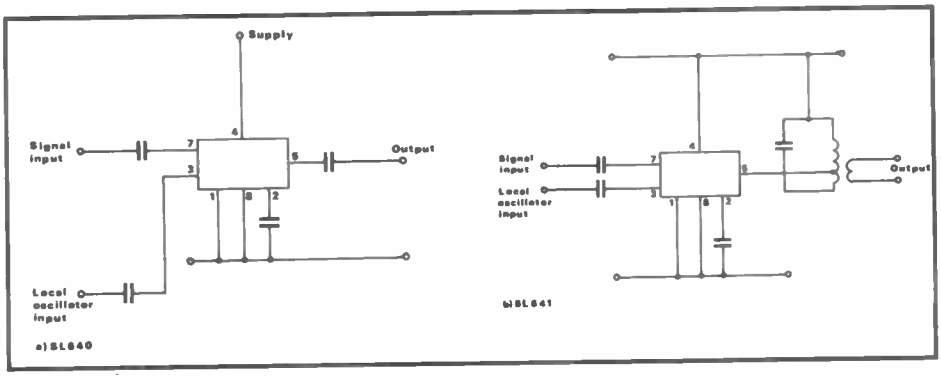



***Fig 3 right:*** *Circuits using the SL640 and SL641 mixers*

operate with signals up to 200mV rms. In addition they offer a 'worst case' signal leakage of −18dB for the SL640 or −12dB for the 641. Carrier leakage is also specified and this is −20dB for the 640 and 112dB for the 641. These are worst case figures and the typical figures mean that a good improvement on them could be expected in most cases.

These parameters, coupled with the ease with which they can be used, means that these ICs can find uses in receiver mixers, transmitter modulators, and even frequency synthesizer phase comparators.

**Mixer circuits**

Like the SL620 amplifiers these mixers are easy to use. This can be seen from the basic circuits for using these devices which are shown in *Figure 3*.

When designing or building circuits using them there are a few points which should be noted. Firstly the supply rails should be well decoupled for low frequencies as well as radio frequencies. This is because even small amounts of signal on the supply can seriously degrade the leakage performance or introduce intermodulation.

Decoupling is also important on pin 2 of the IC. This is an internal bias point and should be connected to ground via a capacitor. The value of the capacitor should be calculated so that it is a low impedance at any of the frequencies likely to be used.

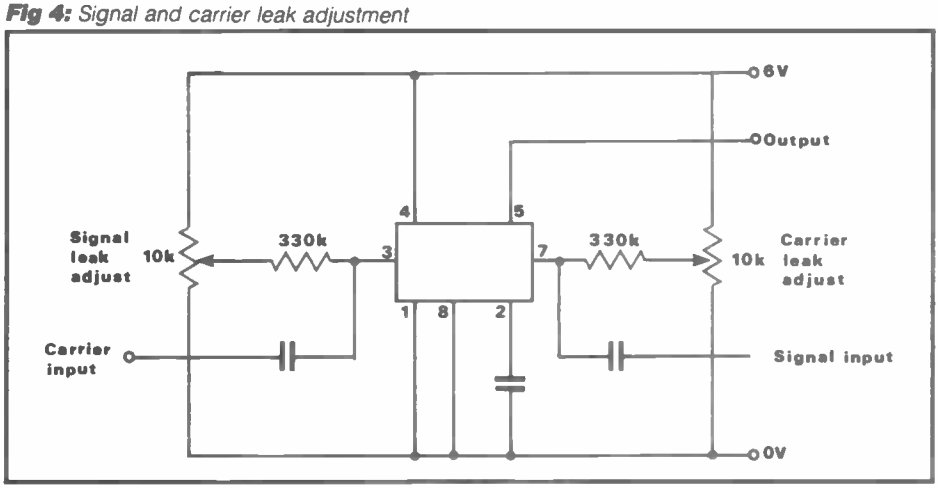
It is also necessary to connect pin 1 directly to earth. As this pin is connected to the can it must be grounded to screen the IC itself and prevent pick-up of any unwanted signals.

Apart from the basic precautions required to ensure the IC operates properly it is also possible to improve its performance by adding a few extra components. In particular, it is possible to reduce the level of signal and carrier leakage by the addition of two potentiometers. Using the circuit shown in *Figure 4*, it is possible to obtain a null in both the level of signal and carrier leakage. Whilst this facility may not be required in most applications it can be useful sometimes.

**For the future**

These ICs have been used in many designs over the years and have proved to be very successful. They provide a cheap and easy solution to many problems and as such they have found favour in several areas. However, Plessey, the manufacturers, have not been satisfied to let new technology pass them by. They have introduced new ICs on to the market. In fact some of their chips contain a single conversion receiver and are well suited to NBFM applications. Other ICs of interest are their high speed dividers which synthesizer addicts may want to use up to frequencies of 1GHz or more.

***Fig 4:*** *Signal and carrier leak adjustment*



# SHORT WAVE LISTENER

## TREVOR MORGAN GW4OXB

We have all heard the high pitched squawking, chirping, growling and all manner of 'interference' from QRM (man made noise). To the listener it can either be a pain in the rump or the target for some research, all depending on your interests.

The many noises we hear can come from a number of sources and, if we are interested, their translation can become a hobby in itself. All you need is a computer to hook up to your receiver and a couple of programs.

First, let's have a look at some of the noises you will hear while tuning on the bands. The frequencies mentioned are those on which the modes are regularly heard, but they can be heard all over the radio spectrum and it's up to you to look for them yourself, or get the necessary guides to help you.

Morse code is the mode we are most familiar with. It is easily identified by its rhythmic 'dots and dashes' and is still in use by many 'official' sources, as the signals are easily readable even in noisy conditions. The speed at which Morse can be sent enables messages to be passed very quickly and although the amateur examination only requires a speed of 12 words per minute to be sent and received, many amateurs can operate at 50 words per minute! Machine sent code can be 250 wôrds per minute or more!

There are many dedicated 'code readers' who can translate Morse quickly and accurately. For those who wish to improve their knowledge of Morse code, there are programs available that are compatible with most home computers. It is best to use a filter between the receiver and computer, as signals close to the one selected can corrupt the translation. Amateur Morse can be heard on the lower ends of the amateur bands (below ***70). Commercial Morse can be heard almost anywhere, including on the amateur bands. Some is sent or received in plain language while much is sent or received in letter code which, unless you have access to secret codes, will be of little use.

### Other sources of QRM

RTTY or 'Radio Teletype' can be easily recognised from its two-tone 'warbling' sound and is used extensively by news agencies as well as embassies and commercial interests. Originally transmitted and received by electro-mechanical instruments (such as the Creed machines), the use of computers has made reception of these signals a simple matter for the interested listener. As with Morse, programs are available for all the popular computers or, alternatively, code readers can cope with RTTY.

Filters are advisable as RTTY can be 'corrupted' by close proximity signals, but the filter should not be too narrow as the high and low tones must be present to translate the code. Amateur RTTY can be heard around 80kHz up from the bottom band edge, eg 14080 and 21080 etc. News agencies can be heard around 10433, 10238, 14760, 16341 and many other frequencies.

SITOR is a refined sort of RTTY, offering greater operational accuracy. It is primarily used by marine services for ship to ship and ship to shore communications. An amateur version called AMTOR was derived from the original system by G3PLX. This mode is also translatable by dedicated code readers or computers and can be recognised by their cricket-like chirping. AMTOR can be heard just below the RTTY frequencies and SITOR can be heard around the other bands (try 4344, 6363, 8717).

SSTV (Slow Scan Television) is a method of transmitting low definition pictures within the narrow radio bandwidth. Although 'moving' pictures are possible, the complete 'frame' takes too long to build up so movement is extremely jerky. Generally, still pictures are transmitted and these can either be 'live' (using a video camera) or computer derived. Usually, an amateur station will send CQ calls in text and, after making a contact, will transmit test pictures or a test card design showing his callsign. With modern computers, some of these pictures can be very good indeed and, in fact, photographs are often sent between stations. The signal is a very chirpy one and easily recognised. It can be translated using a suitable computer program. The busiest frequency is around 14230.

Fax (facsimile transmission) is used by weather stations, news agencies, security agencies and, nowadays, by businesses; although most of their transmissions are made via a telephone link.

The pictures are produced by scanning a drum holding the original with a spot of light. This is picked up by a photocell or a similar device which converts the picture to radio frequencies (more modern systems use a flat-bed system, similar to a photocopier). The faster the drum speed, the better the quality, so a speed of around 240 lines per minute is used for detailed weather maps and charts. The signal is, once again, easily recognised. A high pitched tone holds the frequency open and, when the detail is being transmitted, this is accompanied by a 'grating' noise which varies with the intensity of the picture being sent. It can also be translated using computer programs. At the moment, there are few of these around and those currently available are mainly for the BBC models. However, a recent addition to the Spectrum library makes reception of this mode cheaper (see later for details). Although the BBC system is expensive, the results are superb. Frequencies include: 4782, 8040 and 10250.

Data transmissions are very varied and can take a wide variety of forms, such as the amateur 'packet' radio or the commercial 'data-call' systems. These modes transmit blocks of data, some having error checking devices built into the program. Computer programs are available for the amateur system but not, as far as I know, generally available for the commercial systems.

Data transmissions are used extensively by the space administrations to guide satellites. They can also be used by satellites to transmit details of orbits and weather pictures back to earth.

So, that's a brief résumé of the origins of some QRM interference. Of course, there are other noises that crowd the bands, such as OTHR (Over The Horizon Radar) and various defence systems which are usually beyond our sphere of interest.

Now to the 'how to get into it' bit. You will have gathered that a computer is a must. How much you spend on the computer is a matter for you to decide. Naturally, a high quality one is going to cost a few bob, but it will ensure good quality results. The trouble with this is that various 'interfaces' (non-optional extras) may be required to make the thing run the programs. There are a number of reasonably priced computers on the market which are suitable for our purposes but, and here's the next problem, the programmers do not write programs for them. So, unless you can write programs yourself (and how many of us can?) it is best to stick to the popular computers.

A failure in battery powered motoring he may be, but Clive Sinclair really did turn the computer industry on its head. The Spectrum line still has the greatest following of any computer in this country and even the Amstrad versions are basically the same. As a result, programs that are produced for the, say, Amstrad Spectrum Plus 2, are usable on the original Spectrum Plus 128K. Conversely, programs made for the even older 48K Spectrum can be used on the Plus 3. Although some people regarded the '48s' as unreliable, much of the

problem was caused by removing printers or interfaces while the computer was still plugged in . . . – instant death of the main chip!

The other main contender in the reasonable price range is the Commodore. In various guises, these have also stood the test of time and are still well catered for by software houses. The 64 is the best buy, but there are plenty of programs for Commodore's Vic 20, C16 and +4. (Interfaces are usually required).

The computer usually regarded as the 'best' is the BBC. However, it is not cheap and nearly always requires interfacing. The results, however, are excellent and the 'Weefax' colour pictures (from weather satellites) have to be seen!

The monitor can be cheap or expensive, according to the model of your choice. A 12in monochrome television will give you a reasonable result but, if you have bought a BBC 'B', then you'll appreciate the high definition colour monitor. However, if you have a Spectrum 48K+, the quality from a 14in portable colour TV will be quite acceptable.

OK, if your budget is tight, you can buy a second-hand Spectrum 48K+ for £20, a mono TV for another £20 and spend a couple of quid for a cassette recorder, say fifty quid for the lot!

You may well ask why I haven't mentioned other computers like the Atari, Electron, Dragon etc. Well, with the first, there are few programs made for them, and the last two have been out of production for some time. Unlike the Spectrum, these computers have never received enough support from the main software houses, although there are still a few programs available.

That gives you an idea of the sort of signals that are about, and what you need to receive and translate them. But what about programs? The chart gives you an idea of what is available. I have not listed all the programs, just those that are easily obtained. Those requiring interfacing are marked with an asterisk.

So, have fun! Let me know what you find out there on the bands!

| Supplier | Computers | Programs available |
|---|---|---|
| JEP Electronics | Spectrum, Commodore* (64, Vic 20, CI6, +4), MSX*, Amstrad 464/6128*, BBC 'B'*, Electron*, Dragon*, Atari 520/ 1040* | RTTY, Morse, SSTV, Fax |
| Technical Software | Spectrum, Commodore*, BBC*, Electron* | RTTY, CW, SSTV |
| Spacetech | BBC* | Satellite WXSAT |
| ICS | Dedicated code readers, no computer needed | CW, RTTY, AMTOR, FAX |
| Pearsons | Spectrum transceive programs | RTTY, CW, SSTV |

**Addresses:**
JEP Electronics, New Road Complex, Kidderminster DY10 1AL.
Technical Software, Fron, Upper Llandwrog, Caernarfon LL54 7RF.
ICS Electronics, PO Box 2, Arundel, West Sussex BN18 0NX.
Pearsons Computing, 42 Chesterfield Road, Barlborough, Derbyshire S43 4TT.
Spacetech, 21 West Wools, Portland, Dorset DT5 2EA.

## Awards

Award claims are still coming in regularly, and this month we have a good crop again.

Peter Cain of Newcastle put in his first claims for North America, South America, Africa, USSR, Asia and Oceania. Nice full set, Peter! Some nice loggings in the Oceania list included P29, T25, FO0, AH6, ZK1, T30, and lots of VK/ZLs.

Trevor Newstead of Morcambe claimed South America, USSR, Asia and North America. Some nice stuff in there too with VP2, VP8, CO2, TG9, HH2, EX1, 8P6, KP2, LR1V, V31, ZZ5, J87, AP2, HL9, HS0 and OD5.

Geoff Hughes was next in the queue with loggings from his QTH in Chelsea to claim the Silver Prefix award. Nice ones included AP6, AZ1, BJ1, DU7, HV3, J45, T77V, TC1, VX3, XB5, YC0, YD1, 6W6, FW8, J73, TQ6, CX9 and S0RASD.

Peter Uhren of Waren, DDR, claimed for North and South America, Asia and USSR, listing some nice prefixes amongst them, like AT0, BY5, DX9, KK7/DU3, PZ9, VS6, V85, 8J3, TX0, VP8, XR4, J73 and OA8.

Newcomer to the hobby, at least to the amateur bands, Mike Turner of London asked if W8NAI, 9Y4MJK, JF7TYA, 5Z4JM, VK6PM and NP2CM were rare DX. Well Mike, with super efficient receivers and high gain aerials, not to mention the current high sunspot level (sunspot activity is still unusually high, but the rate is showing signs of levelling off during this current cycle), there is little of what you could call rare DX. With a good receiver and aerial, you should be able to log anywhere in the world.

However, as I have said before, I prefer to translate DX as 'desirability'. Working on a personal premise that my own equipment, location and time on the air limits determine the contacts I can make. Therefore, although working into Indonesia may be easy to some amateurs, I'm rarely on at the right time and invariably in a lousy location anyway, so getting a call from YB1AQC the other day was definitely rare DX for me. It's all a matter of what you can hear and when you can listen that makes a logging worthwhile.

## A new fax program

While at the NEC in July, I spotted a new program for the Spectrum for receiving fax. Not having tried this mode and being a sucker for anything new, I gave my wallet an airing and bought the program with its 'interface'.

The program is produced by JEP Electronics and consists of the software on tape and a small interface that plugs into the access port at the back of the Spectrum. To set up for reception, you plug in the interface, plug your printer into that and then fit the power plug. *Never fit the power plug before plugging in accessories!*

On loading, you are presented with the usual 'menu' which offers RECEIVE MODE, VIEW SCREEN, SAVE/LOAD, HELP PAGE, SET CLOCK and PRINT SCREENS. Receive mode is highlighted and you can change the selection with the cursor keys. The first thing to do is to set the clock, which is very simple and results in a 24 hour clock showing top left of the receive screen. Once you are happy, you can connect your receiver to the ear socket on the computer.

In the manual supplied, a few specimen frequencies are given. Choosing 4.782, I immediately found the signal and, with a little fine tuning, a map began to form on the screen. At this time, I remembered that it is always best to read the instructions first. I had a wide blank strip right down the centre of the screen . . . not a pretty sight! So, to the handbook. I found that a simple adjustment called 'slipping the picture sideways' was all that was needed.

Once I had sorted things out, it was very interesting to see quite a clear weather map forming on the screen. With a little practice, I was able to recognise the British Isles and the Mediterranean.

The next map received was a 'Sea Ice Chart' clearly showing the positions of icebergs. Over the next couple of hours I received a number of different charts and maps.

One of the controls selects the area of coverage of the picture which enables you to select the area you want and enlarge it to fill the screen.

There are two ways of committing the picture to memory. One allows you to select which screens you wish to memorise, while the other automatically memorises each screen in turn. Once the screens are in the memory, you can dump these to the printer for hard copy. Screens can be printed as received but this resets any 'slip' commands you have used and pauses reception during printing.

The program certainly does what it's meant to and gives very acceptable results even if limited by the computer and the printer quality. At a cost of £31.00 inclusive, it is a fairly cheap way of getting into fax.

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# Tony Smith G4FAI takes his bimonthly look at the world of dots and dashes

### Bold's first Morse theorem

Dr Gary Bold, ZL1AN, writes *The Morseman* column in *Break-in*, the journal for NZART. Together, we have a useful arrangement, enabling us to pass on to our own readers interesting snippets from the other's work.

Introducing himself in his first column, June 1987, Gary wrote:

'Why am I doing this? Am I an anachronism from the past (I can remember back three sunspot cycles) espousing the cause of an archaic form of digital communication? A fervent advocate of days that were? No. I just like Morse. I have been speaking it for 27 years and it has become my preferred mode of ham communication.'

He also formulated his first Morse theorem. 'Every CW Ham has a preferred range of speeds outside of which he rarely operates or listens. The maximum and minimum speeds are in the ratio 2:1.'

He explains: 'If you can readily copy 20 wpm, you will almost never listen to stations outside the speed range 10-30 wpm... This is completely sub-conscious. The reason for the upper limit is current ability. The lower limit is more interesting. I've heard QRQ operators, after tuning over the CW section of a band populated by a few slow, hesitant beginners, announce "the band is empty tonight".

'It seems that, to them, code beneath the lower speed limit may not even be "noticed" as Morse. Some tell me they even have difficulty reading slow Morse! So if a high-speed type does not come back to your careful 12 wpm answer to his CQ, maybe you are not being snubbed, maybe you just "weren't perceived". Maybe someone will do a psychological study of this someday.'

### EUCW fraternising CW party

The European CW Association's major event of the year takes place on 19-20 November. It is to encourage CW operators, of all abilities, to come on the air, to meet each other in a friendly spirit and to demonstrate that CW is alive and well. It is not a contest in the strictest sense, although certificates are awarded to the first three stations in each class. In the true amateur spirit, and out of consideration for other band users, the times and frequencies have been arranged to cause minimum interference to stations not taking part.

All amateurs are welcome to join in, whether experienced or beginner. For members of EUCW organisations there are QRO and QRP classes, while non-members can use any power. There is also an SWL section. In the past there have not been too many UK operators taking part, even though stations across Europe were waiting to work them. Perhaps this year there will be a stronger UK presence now that FISTS has joined EUCW. Members of the G-QRP Club are eligible to participate in the QRP class, transmitting low power and working stations of any power.

The rules have been published in the journals etc, of the various EUCW member organisations and in *Morsum Magnificat*. Non-members wishing to participate in this event can obtain full details by sending me an SAE at 1 Tash Place, London N11 1PA.

### Happy birthday

Two years ago I joined with two Dutch amateurs in launching the English language edition of *Morsum Magnificat*, a unique magazine devoted entirely to Morse telegraphy, past, present and future. Last year my Dutch friends had to pull out and I found myself producing the magazine single-handed. It has not been easy, but *MM* is still running and goes to Morse enthusiasts of all abilities in some 30 different countries. If you are interested in the world-wide traditions, practice and culture of Morse telegraphy, write to me for more details and a free back issue of *MM* (limited offer).

For a Morse enthusiast, I must have one of the most interesting mailbags in the world. Most days I receive correspondence with information, articles, photos etc, relating to varied aspects of telegraphy. One advantage is that I have a wonderful supply of material to share with readers of this column.

### Bastard bugs

Of interest to users and collectors of bug keys, for example, is an article in the latest issue of *MM*, Autumn 1988. Apparently, Horace G Martin, inventor of the Vibroplex, had such a successful patent specification that he put the makers of 'pirate' bugs out of business. He was also able to insist that all professional users of such bootleg keys across the United States paid his company a licence fee of $2.00 to 'legalise' them. These keys became known as 'legal bugs' or, more commonly, 'bastard bugs' and are now popular collectors' items. This story is told by Louise Moreau, W3WRE (a noted telegraph historian, and herself the owner of some 300 keys) in her six-part *Story of the Key* which is currently running in *MM*.

### Earth connection only

In the field of military communications, Louis Meulstee, PA0PCR, relates the history of the power buzzer. Before the invention of radio, many attempted to achieve telegraphic communication without wires by means of earth and water conduction. These experiments stopped when Marconi successfully demonstrated the commercial use of radio waves, but were revived during WW1 as a means of communication in trench warfare.

The invention of valve amplifiers resulted in earth current ranges which were quite unattainable previously. A French instrument, the *Parleur* or power buzzer, was adapted by the British Army and used for Morse communication in 1917/18 in situations where shelling was so intense that cables and wireless aerials were destroyed. When the war ended the experiments stopped again. As with so many other forgotten inventions, one wonders what greatly improved results could be obtained with today's advanced technology.

### Speed record claims

In anticipation of the Region 1 Second High Speed Radio Telegraphy Championships, to be held in Hanover in November 1989, the June issue of *IARU Region 1 News* formally records the record claims of the Russian and Romanian winners of the 1983 Moscow Championships.

The top speed for receiving groups of random letters was 320 characters per minute, while for figures it was 500 cpm. In sending random letters, 219.9 characters per minute were achieved and, with figures, 294.3 cpm.

This is the level of performance to be challenged by next year's competitors. It will be interesting to see what happens. Previously all entrants had to be in teams, but a new individual class is to be created for 1989. The full details of the 1983 record claims for eight different classes of entry are too lengthy to include in here, but are reproduced in full in *Morsum Magnificat*.

# 50MHz

by Ken Ellis G5KW

### Exceptional conditions

In this column last September, I referred to 50MHz TEP and the prospects for cycle 22. The TE Path passes through Namibia and the QTHs of ZS3E and ZS3AT. I explained why we would be more likely to have contacts with these stations, rather than with stations further East (except under exceptional conditions). During September and the early days of October, this prediction was borne out in practice.

### New all-time first

On Tuesday 20 September at 1744, Chris Tran, GM3WOJ, had an historic QSO with ZS3AT. This was an all-time first between Namibia and Scotland. The Scottish GB3RMK was heard by ZS3AT for about 30 minutes. As far as I know, this was a selective opening as no other reports have been received to date, although both ZS3E and ZS3AT were contacted many times during this opening from various parts of the UK. This North-South path should remain open until the beginning of November, when the F2 DX season should be in full swing to other continents. More about this next month.

### All-time first to Argentina

The unexpected opening on Thursday 7 September was not repeated, although LU7DZ and other Argentinian stations have been having regular contacts with Portugal and stations in southern France. Other stations who reported contacts on 50MHz with Portugal include: LU3EX, 8DIO, 6DLB, 1DMA and 4DMX. They are all now looking forward to contacting UK stations. The mode for this unusual form of propagation has not yet been established, but this will probably be TEP, together with other sources of enhanced propagation.

### Solar flux sunspots increasing

Solar flux sunspots and F2 MUF are still increasing, according to Geoff Roberts, G3ENY, who has specialised in solar observations, (see *Figure 1*). The solar flux peaked to 202 on 4 October, the highest during this cycle so far. It all looks very promising for the future!

### Hal Lund reports

'Conditions continue to improve with good propagation into the Mediterranean area almost daily, but activity levels in the northern hemisphere are still low. ZS3E's AT, E and DM (JG87) have had good openings with several reported in the UK. ZS3E runs a beacon around 50.105. TR8DX has returned to France so there will not be any activity from Gabon for the time being.

'DX operating stations on the southern edge of TEP are having difficulty being heard in Europe, but those of us further north in ZS6 can help assuming:

1. That another station off "the back" of your beam is on frequency and anxiously waiting to contact the DX station.
2. That you cannot hear each other and that the band is about to change for the worse.

'After you have exchanged reports and other niceties with the DX station, pause for a few seconds when he turns it over to you before you transmit. The band sometimes changes very rapidly and can abruptly close during a long transmission. Nothing is more frustrating than listening to a DX station rapidly fading into the noise whilst talking about the weather!

'We in the ZS6 area often forget that openings may extend well south of us and stations such as ZS4AAB, ZS4NS and even ZS1's 2s and 5s may be trying to get the DX station's attention. *Don't be branded a DX hog* (this is very sound advice which also applies to the UK, as stations to the north have the same difficulty). The only beacon reported to be operating regularly is ZS6PW, which operates during the evening and beams north on 50.010 (KG44).

### Worked all continents (WAC)

Now that QSOs have taken place between the UK and South America, it is realistic to consider the probability of QSOs with Australasia during the current cycle to complete 'WAC'. This has not yet been achieved from the UK. During cycle 21 G4BPY, G3COJ and G5KW had crossband QSOs with VK6OX on 27 November between 0950 and 1010. G3COJ had not at that time had a complete QSO with South America. G5BY was the first to make crossband WAC and he was followed a few minutes later by myself. I had just managed to complete my QSO as the band faded out, with no repeat to date. It will be interesting to monitor events during this cycle, what with more crossband QSOs and even better 50MHz two-way WAC to come.

I received a letter from Gordon Pheasant, G4BPY, with some historic information. 'My first reception was VK6RTU in Perth on 27 October 1979 from 0858 to 0909 UTC (peaking RST 549). In 1980, I heard VK6RTT in Caernarvon on 26 November from 0959 to 1010 UTC (peaking 589) and I couldn't raise a soul on 28.885. The following day, I received some very weak signals from VS6BE at 1050 (RST 229). On the same day, I first logged VK6RTT at 0924 (RST 559) and finally logged it at 1001 (RST 429). There were no other receptions of VK on 50MHz despite careful monitoring.

' During the last couple of years, my main interest has been in keeping a careful check on 28MHz openings to VK. These seem to occur in the UK even down in the sunspot minimum. The peak time is always from about 25 October and gradually tails off through November and December.

'During 1986 sporadic openings continued into the spring, but only from VK6RWA in Perth for the later openings.

'Last year I logged VK6RTW in Albany, VK2RSY near Sydney, VK5WI and VK6TEN in Adelaide.

'It should be remembered that it is probably not a good thing to compare 28MHz under low sunspots, with 50MHz under high ones. In the event, you may recall how hard PY2XB tried unsuccessfully to work crossband with us. I have never heard an LU, CX, or CP on 50MHz to this day. That's what makes it so interesting, because you never know

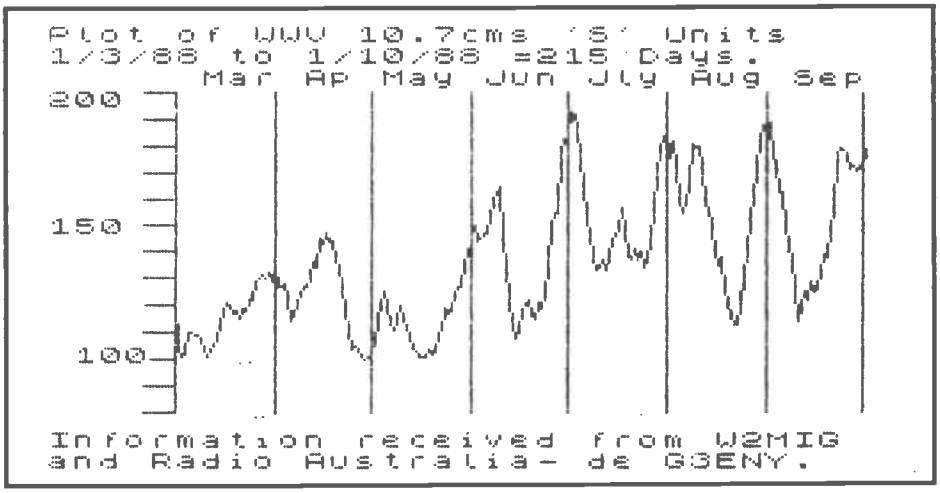


***Fig 1:*** *Graphic representation of Solar flux sunspot activity*

what you might hear next time you switch on the rig!' (This interesting letter is, of course, topical just now and will help us all when monitoring for that elusive 50MHz WAC).

### Longest two-way opening on record

Over the last few weeks, we have had an indication of the big opening which is reported to be 'just around the corner'.

Shortly after 1100 on 27 September, I had a telephone call from Mike Walters, G3JVI, Hayling Island, giving news that the ZS6PW beacon on 50.009 had been S9 at his QTH since 1056 and that the ZSs were in. I went to my shack and switched on to 50.110. I put out a call and contacted ZS4TX 6/599/579, this was followed by an SSB QSO (57/57) at 1130. Then I contacted ZS6LN (59/56), ZS6LW (57/55), ZS6XJ (ZS6ANK heard 59 but did not make contact) and finally ZS6WB (58/54) at 1220. A two hour fade-out followed as propagation moved west.

ZS3AT started to break through at 1425 with CW QSO 339/529. I called ZS3E after hearing him 3/5, but he did not reply. ZS3E eventually came in again at 1850 57/529. 28.885 was open to Canada and the USA at S9. ZS6LN worked twenty-eight UK stations in one hour and G3MY heard the ZS6PW beacon 559 from 1050 to 1135. Geoff, GJ4ICD, also had a field day on the 27th and the ZS6PW beacon was heard from 1100 for most of the day. The ZS3E keyer was heard intermittently until 2145. The first QSO was heard at 1130 with ZS4ATX/6, this was followed by: ZS6AWP, ZS6LN, ZS6XJ, ZS6LW and ZS6HS. ZS6ANK QSOd ZS3E at 1625. At 1628, another ZS opening occurred, so I worked ZS6XJ, ZS6CE, ZS6BMS, ZS6SS and ZS6ANZ. I heard ZS3E and ZS3AT until 1750 (S5/9+++). From 1830, I heard ZS3E keyers until 2145 and worked ZS3AT at 2040, experiencing TEP flutter in the process. See 'From the mailbag' for the remainder of GJ4ICD's DX report.

### From the mailbag

Ray Cracknell, G2AHU, has sent in this report which details some of the interesting openings on 50MHz during August 1988. 'The ZD8VHF beacon was heard in the UK on various days from 1-29 September between 2050-2300. The consistency of the times when openings occurred were highly significent, as the mean mid-point of the openings was at 2138. This accords very well with the time for the TEP MUF.

'ZS6 amateurs in the UK worked: ZS6XJ, KG33, G3SED, G8HVY, G3JVL, G8XZO, G8VR, GJ4ICD, PA0RDY and SZ2DH.

'The ZS6W bands were also active, but Johannesburg appeared to be the optimum location for the opening. In Britain, the opening extended from Devon to Broadstairs and included practically the whole of the south coast and as far south as the Channel Islands.

'The northern limit is not known, although we know the opening extended east into Holland, Denmark and Germany. The signals were clear, without flutter, therefore multipath propagation was not in operation. Chordal hop TEP was probably in operation, hence onward propagation would have been possible. It could have been expected to reach further north, but the signal definitely did not reach the Midlands. F-type TEP is therefore the most probable mode, with a one hop E's extension. All Z2Js, with the exception of novices, are allowed to use 50-54MHz (150 carrier, 400W pep) with the proviso of "No interference with Zimbabwean TV".

'We can anticipate many more openings and further latitude extensions, as well as TEP (plus Es) into Scotland, northern England and Ireland.

'November is the best month for openings from Britain to South America and North America to Africa. Exceptional F-layer enhancement might even open the North America to Europe path.'

Geoff, GJ4ICD, from St Helier in Jersey, recently sent in this report. 'Many QSOs were made during September by GJ stations with ZS3 and ZS6. On 9 September, GJ6TMM-ZS3AT was heard at 1732. Other QSOs included: GJ0FTZ/GJ6TMM-ZS3AT and GJ4ICD-ZS3AT. 15 September saw the biggest 50MHz opening to date. I tried CW tests every five minutes with ZS3AT from 1425 and the breakthrough finally came at 1516 with ZS3AT/SSB/S3. The 516 ZS3E keyer was heard on S2 and ZS3AT was heard until 1607. ZS6XJ/SSB/S5, ZS6WB/SSB/S5, ZS3AT and ZS3E were still there up to S7. ZS4S S3/SSB and ZS3AT/S6/SSB were heard between 1629 and 1637, but they were lost at 1640. ZS6LN, ZS6LW, ZS6XL, ZS6OW, ZS6CE/SSB/S2 and ZS6XJ/S8 built up to S9++ at 1645 and then the band faded out.'

It is becoming quite clear that Jersey is in a good situation for these southerly openings and although I cannot sit by the radio all day, I have caught quite a few openings that were not previously heard in the UK. On 18 September, ZS3E was heard at 1420 calling CQ. On 20 September, I worked ZS3AT at S7. On 21 September, ZS6AXP heard me putting out test calls and the next day ZS3AT was heard at S9+20dBs with fade out at 1746. During 2 October, the ZS6PW beacon was heard from 1500-1800. I also heard the ZS3E beacon until 1800. QSOs were with: ZS6XJ, ZS3AT, ZS6LW, ZS6XL, ZS6PW, ZS6AXP, ZS4NS and ZS6CE.

CUL Ken Ellis, 18 Joyes Road, Folkestone CT19 6NX.

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SSTV (supplied boxed, with jack socket connections & constant level output) ..... £19.50
CONSTANT LEVEL AMPLIFIER ..... £8.00

When ordering above units; please state software supplier. This will enable us to supply correct filter!

**SPECTRUM 128 + 2**

CASSETTE PORT ADD ON. This unit enables owners of the Spectrum 128 + 2 to run existing decoding programmes which require the audio signal being fed into the cassette port. The guarantee is not affected, as there is no need to open the computer, simply connect to the expansion port **£19.50.**

***For further details of these and our other products, send a SAE, or see earlier advertisements.***

**J & P ELECTRONICS LTD**
**Unit 45, Meadowhill Est, Dixon Street, Kidderminster DY10 1WW**
**Tel: (0562) 753893**

## JAPANESE Ic's (PART OF OUR RANGE)

AN7178 £2.95, BA5406 £2.20, HA1377 £2.20, HA1392 £2.50, HA1394 £2.95, HA1397 £2.75, HA1398 £2.75, HA13001 £2.95, LA4460 £1.80, LA4461 £1.80, LA4507 £4.25, LC7137 £4.50, M51517 £2.80, MB3705 £1.80, MB3712 £1.50, MB3722 £3.50, MB3730 £2.50, MB3731 £3.50, STK461 £7.50, STK463 £8.40, TA7205AP £1.00, TA7222AP £1.30, TA7240 £2.95, TA7241 £2.95, TA7270 £2.75, TA7271 £2.75, TA7274 £2.95, TA7280 £3.50, TA7281 £2.95, TA7282 £2.95, TA7283 £2.95, TA7288 £2.95, TA7611 £3.20, UPC575 £1.00, UPC1156 £2.95, UPC1181 £1.10, UPC1182 £1.10, UPC1185 £2.50, UPC1188 £2.75, UPC1230 £2.50, UPC1263 £2.50, UP1277 £2.75, UPC1278 £2.75, UPC1365 £3.60, UPC1394 £1.95.
ADD 60p POST AND PACKING AND THEN ADD 15% VAT TO TOTAL

**T POWELL 16 PADDINGTON GREEN LONDON W2 1LG**
**OPEN MON-FRI 10AM-5PM, SAT 9AM-12 NOON.**
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**ACCESS/VISA. TELEPHONE ORDERS ACCEPTED OVER £5.00**

Service sheets from £2.50/1sae c/v mus-c/combis £3.50/1sae. Sae Newnes & TV Technic books in stock. Thousands service & repair manuals. SAE Free review/Pricelists

IS (AR) 76 Church Street, Larkhall
(0698 883334), Lanarkshire

## MORSE CODE PREPARATION

Cassette A 1-12 wpm for amateur
Cassette B. 12-25 wpm for professional examination preparation
Each cassette is type C90
Price of each cassette (including booklets) £4.95
Morse key with separate batter (PP3) – driven solid-state oscillator and sound transducer produces clear tone for sending practice
Price of key with electronic unit £8.95
Price includes postage etc. Europe only

**MH ELECTRONICS (Dept AR)**
**12 Longshore Way, Milton, Portsmouth PO4 8LS**

## OMNI ELECTRONICS

stock a wide range of electronic components at

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**Tel: 031 667 2611**

Open: Mon-Fri 9am-6pm, Sat 9am-5pm.
Send 2×19p stamps for latest catalogue.

## IAN FISHER COMMUNICATIONS OF STANHOPE

**CB Works, The Market Shop, Market Place, Stanhope, County Durham**
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Main Distributors of 27MHz CB radios and the NEW CEPT models including UNIDEN and DNT.

Including U.K. and CEPT walkie talkies.

Large stocks of coaxial cable, plugs, sockets and adaptors.

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**AIRBAND RADIO**

Superb new SKIPTECH 9,000 airband and PMR band receivers £18.50
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Specialist Hand-compact VHF monitor receivers for 10/mid/hi band detection + 10/11m.

Hear Ham's, Aircraft, Public Service, Marine. Local 2-way and much more! All 53-180MHz signals. 100ch's HF. Squelch, VFO facilities etc. International series, special price; **£27.50** inc p&p

Prompt dispatch from:
**Taylor Radio**
**8 Emmerson Street, Crook**
**Co Durham DL15 8NF**
**Tel: 0388 763323**

**G2VF LOOP ANTENNAS COMPLETE WITH ATU FOR HIGH FREQUENCY HAM BAND TRANSMISSION** (SWR One to One 40, 15 and 10 and One Point Five to One 80 and 20) **AND SWLs, AND LONG AND MEDIUM WAVE BANDS FOR BCLs.** Loops 21 inches square or triangle DIY projects. No special skills required. Circuits. Parts Lists with sources of supply and full assembly data. **HIGH FREQUENCY LOOP** 80 to 10 Metres **£5. LONG AND MEDIUM WAVE LOOP** for BCLs **£3. LONG WAVE, MEDIUM WAVE AND SHORT WAVE LOOP** 1500 to 10 Metres **FOR THE BCL AND SWL £8. SHORT WAVE ATU FOR USE WITH EITHER A LOOP OR LONG WIRE ANTENNA £4. FIELD STRENGTH METER £2. DIY** pre-amp LW, MW and SWave **£2.** SAE for details. Photocopy HRO Manual **£4.**

**F G Rylands, 39 Parkside Avenue**
**Millbrook, Southampton SO1 9AF. Tel. (0703) 778064**

## MICROMAX RF SYSTEMS

**23/24CM LOOP YAGI AERIALS** Single 39 element complete with mounting frame and clamp ..... **£60**
Double 39 element complete with integral power divider, mounting frame and two clamps ..... **£105**
**13CM LOOP YAGI AERIALS** Single 49 element complete with mounting frame and clamp ..... **£90**
Double 50 element complete with integral power divider, mounting frame and clamps ..... **£160**
Bay of four 49 elements complete with mounting frame, integral power divider and clamps ..... **£300**
**23/24CM 2C39 VALVE CAVITY AMPLIFIERS** Supplied less valves but complete with fan, filament transformer, bias circuit and base plate ..... **£110**
Twin valve PA, complete on base plate ..... **£200**
**23/24CM INTERDIGITAL BANDPASS FILTERS** 3-pole, adjustable from 1250 to 1320MHz N type or BNC connectors. . . **£35 inc p&p**
**RF POWER LEVEL INDICATORS** Non calibrated in line devices for tuning PA stages, complete with panel meter, useful from 2m to 13cm ..... **£30**
**HP THERMISTER MOUNTS** Type 478A 200Ω 10MHz to 10GHz for use with HP 432 A/B/C RF power meters. Write for price etc
**DUAL RANGE 432MHz CONVERTERS** Input frequency range 432 to 434MHz amateur band 435-437MHz satellite band IF output 144MHz ..... **£40**
**TV EQUIPMENT** A comprehensive range of high grade used monitors, cameras and accessories
Also a wide range of used precision measuring equipment, including RF power meters, frequency meters, digital multimers EMI 20001 TV Equipment in stock. For further details write or phone 5 Pinfold Crescent, Penn, Wolverhampton WV4 4ET. Tel. 0902-343746

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2000 sq ft of surplus equipment and components

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## PSSS....

## ALL THE SUPER BARGAINS ARE ON THE INSIDE FRONT COVER

## SUPERB

Trio 9.30 HF all band transceiver and SP930 extension speaker ..... **£1,250**
Trio 711E 2 metre base/mobile TX/RX station. **£650**
Capco SPC300 ATU ..... **£130**
BNOS 100 watt 2 metre amplifier ..... **£115**
Alinco electronic power supply 230/240 volts 13.8DC 30amp ..... **£115**
WELZ SP300 SWR/power meter 1.5MHz-500MHz range ..... **£70**
**This Amateur Radio equipment is all in mint condition, boxed and complete with manuals, microphones and leads. Cost new £3,200, will sell complete for £2,250 ono**
**G4UBS Marden 01-640 0281**

USED AMATEUR EQUIPMENT?

**I buy, sell and exchange**

For the deal you've been looking for, phone Dave, G4TNY, anytime on Hornchurch (040 24) 57722 or (0836) 201530
9am-7pm Mon-Sat or send SAE
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**G4TNY Amateur Radio**
**132 Albany Road, Hornchurch, Essex RM12 4AQ**

## ETESON ELECTRONICS

E•E

***15B Lower Green, Poulton-le-Fylde, Blackpool***
***Tel: (0253) 885107***

*Open 9.30am - 12.30, 1.30 - 5.30 Closed Wed & Sun*
*Electronic Component Specialists.*

*A wide range of electronic components, IC's, capacitors, transistors, resistors, plugs and sockets etc.*

**Please mention *Amateur Radio* when replying to any advertisements**

Amateur RADIO

# ADVERTISING RATES & INFORMATION

## DISPLAY AD RATES

| depth mm x width mm | ad space | 1 issue | series rates for consecutive insertions: 3 issues | 6 issues | 12 issues |
|---|---|---|---|---|---|
| 61 x 90 | ⅛ page | £66.00 | £62.00 | £59.00 | £53.00 |
| 128 x 90 or 61 x 186 | ¼ page | £115.00 | £110.00 | £105.00 | £92.00 |
| 128 x 186 or 263 x 90 | ½ page | £225.00 | £210.00 | £200.00 | £180.00 |
| 263 x 186 | 1 page | £430.00 | £405.00 | £385.00 | £345.00 |
| 263 x 394 | double page | £830.00 | £780.00 | £740.00 | £660.00 |

## COLOUR AD RATES

colour rates exclude cost of separations

| depth mm x width mm | ad space | 1 issue | series rates for consecutive insertions: 3 issues | 6 issues | 12 issues |
|---|---|---|---|---|---|
| 128 x 186 or 263 x 90 | ½ page | £305.00 | £290.00 | £275.00 | £245.00 |
| 263 x 186 | 1 page | £590.00 | £550.00 | £530.00 | £470.00 |
| 263 x 394 | double page | £1,130.00 | £1,070.00 | £1,010.00 | £900.00 |

## SPECIAL POSITIONS

Covers: Outside back cover 20% extra, inside covers 10% extra
Bleed: 10% extra [Bleed area = 307 x 220]
Facing Matter: 15% extra

## DEADLINES

*Dates affected by public holidays

| issue | colour & mono proof ad | mono no proof & small ad | mono artwork | on sale thurs |
|---|---|---|---|---|
| Dec 88 | 27 Oct 88 | 2 Nov 88 | 4 Nov 88 | 24 Oct 88 |
| Jan 89 | 30 Nov 88 | 7 Dec 88 | 9 Dec 88 | 29 Dec 88 |
| Feb 89 | 21 Dec 88 | 4 Jan 89 | 6 Jan 89 | 26 Jan 89 |
| Mar 89 | 25 Jan 89 | 1 Feb 89 | 3 Feb 89 | 23 Feb 89 |

## CONDITIONS & INFORMATION

**SERIES RATES**
Series rates also apply when larger or additional space to that initially booked is taken.

An ad of at least the minimum space must appear in consecutive issues to qualify for series rates.

Previous copy will automatically be repeated if no further copy is received.

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

Display Ad and Small Ad series rate contracts are not interchangeable.

If series rate contract is cancelled, the advertiser will be liable to pay the unearned series discount already taken.

**COPY**
Except for County Guides copy may be changed monthly.

No additional charges for typesetting or illustrations (except for colour separations).

For illustrations just send photograph or artwork.

Colour Ad rates do not include the cost of separations. Printed – web offset.

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

**FOR FURTHER INFORMATION CONTACT**
Amateur Radio, Sovereign House, Brentwood, Essex CM14 4SE.
(0277) 219876

Commission to approved advertising agencies is 10%.

**CONDITIONS**
10% discount if advertising in both Amateur Radio and Radio & Electronics World.
A voucher copy will be sent to Display and Colour advertisers only.
Ads accepted subject to our standard conditions, available on request.

# ADVERTISERS INDEX

## No. 1 LIST BAKERS DOZEN PACKS

All packs are £1 each, if you order 12 then you are entitled to another free. Please state which one you want. Note the figure on the extreme left of the pack ref number and the next figure is the quantity of items in the pack, finally a short description.

BD1 5 13A junction boxes for adding extra points to your ring main circuit.

BD2 5 13A spurs provide a fused outlet to a ring main where devices such as a clock must not be switched off.

BD7 4 In flex switches with neon on/off lights, saves leaving things switched on.

BD9 2 6V 1A mains transformers upright mounting with fixed clamps.

BD11 1 6½in speaker cabinet ideal for extensions, takes our speaker. Ref BD137.

BD13 12 30 watt reed switches, it's surprising what you can make with these—burglar alarms, secret switches, relay, etc., etc.

BD22 2 25 watt loudspeaker two unit crossovers.

BD29 1 B.D.A.C. stereo unit is wonderful value.

BD30 2 Nicad constant current chargers adapt to charge almost any nicad battery.

BD32 2 Humidity switches, as the air becomes damper the membrane stretches and operates a microswitch.

BD34 48 2 meter length of connecting wire all colour coded.

BD42 5 13A rocker switch three tags so on/off, or change over with centre off.

BD45 1 24hr time switch, ex-Electricity Board, automatically adjust for lengthening and shortening day. original cost £40 each.

BD49 10 Neon valves, with series resistor, these make good night lights.

BD56 1 Mini uniselector, one use is for an electric jigsaw puzzle, we give circuit diagram for this. Dne pulse into motor, moves switch through one pole.

BD59 2 Flat solenoids—you could make your multi-tester read AC amps with this.

BD67 1 Suck or blow operated pressure switch, or it can be operated by any low pressure variation such as water level in water tanks.

BD91 2 Mains operated motors with gearbox. Final speed 16 rpm, 2 watt rated.

BD103A 1 6V 750mA power supply, nicely cased with mains input and 6V output leads.

BD120 2 Stripper boards, each contains a 400V 2A bridge rectifier and 14 other diodes and rectifiers as well as dozens of condensers, etc.

BD122 10m Twin screened flex with white pvc cover.

BD128 10 Very fine drills for pcb boards etc. Normal cost about 80p each.

BD132 2 Plastic boxes approx 3in cube with square hole through top so ideal for interrupted beam switch.

BD134 10 Motors for model aeroplanes, spin to start so needs no switch.

BD139 6 Microphone inserts—magnetic 400 ohm also act as speakers.

BD148 4 Reed relay kits, you get 16 reed switches and 4 coil sets with notes on making c/o relays and other gadgets.

BD149 6 Safety cover for 13A sockets—prevent those inquisitive little fingers getting nasty shocks.

BD180 6 Neon indicators in panel mounting holders with lens.

BD193 6 5 amp 3 pin flush mounting sockets make a low cost disco panel.

BD196 1 in flex simmerstat—keeps your soldering iron etc. always at the ready.

BD199 1 Mains solenoid, very powerful, has 1in pull or could push if modified.

BD201 8 Keyboard switches—made for computers but have many other applications.

BD210 4 Transistors type 2N3055, probably the most useful power transistor.

BD211 1 Electric clock, mains operated, put this in a box and you need never be late.

BD221 5 12V alarms, make a noise about as loud as a car horn. Slightly soiled but OK.

BD242 2 6in x 4in speakers, 4 ohm made from Radiomobile so very good quality.

BD246 2 Tacho generators, generate one volt per 100 revs.

BD252 1 Panostat, controls output of boiling ring from simmer up boil.

BD259 50 Leads with push-on ¼in tags—a must for hook-ups—mains connections etc.

BD263 2 Oblong push switches for bell or chimes, these can mains up to 5 amps so could be foot switch if fitted into pattress.

BD268 1 Mini 1 watt amp for record player. Will also change speed of record player motor.

BD275 1 Guitar mic—clip-on type suits most amps.

BD283 3 Mild steel boxes approx 3in x 3in x 1in deep—standard electrical.

BD293 50 Mixed silicon diodes.

BD296 3 Car plugs with lead, fit into lighter socket.

BD305 1 Tubular dynamic mic with optional table rest.

Most other packs still available and you can choose any as your free one.

**VERY POWERFUL 12 VOLT MOTORS**—⅓rd **HORSEPOWER** Made to drive the Sinclair C5 electric car but equally adepable to power a go-cart, a mower, a rail car, model railway, etc. Brand new. Price £15.00 plus £2.00 postage. Our ref 158.

## OVER 400 GIFTS YOU CAN CHOOSE FROM

**There is a total of over 400 packs in our Baker's Dozen range and you become entitled to a free gift with each dozen packs.**

**A classified list of these packs and our latest "News Letter" will be enclosed with your goods, and you will automatically receive our next news letter.**

## NEWLY ADVERTISED ITEMS

**FET CAPACITOR MICROPHONE** Eagle Cl.200 Electret type microphone. An FET amplifier is built in for obtaining an output equivalent to a high class dynamic microphone while retaining the characteristics of a capacitor microphone. External influence by magnetic and electrostatic noise is minimised since no magnets or coils are used. The small size of this microphone and the low power supply needed for its operation makes this microphone a very versatile unit. Electrical specifications are as follows: Output impedance: 500ohms ±30% at 1kHz. Sensitivity: −65dB ±3dB (0dB = 1V/ubar at 1000Hz). Frequency response: 50-8000Hz. Price £1 each. Order Ref. BD646.

**SUB-MIN TOGGLE SWITCH** Body size 8mm x 4mm x 7mm SBOT with chrome dolly fixing nuts. 4 for £1. Order Ref. BD649.

**Ex GPO MULTI-RANGE TEST METER 12/C1** Complete in real leather case with carrying handle—this is a 20,000 OPU instrument, with 19 ranges including AC and OC volts—dc current 5mA to 1A, 4ohms ranges up to 20meg— the low ohms range is particularly useful, you will be able to read right down to one ohm and below. This meter also has provision for reading dc current 0-5 amp and 0-25 amp. Meter size 6" long × 3" wide ×2" deep. Leather case has compartment for test leads, prods, and croc clips all of which are included. Can be used in the case. Not new but are in first class condition—tested and guaranteed. Price is £7.00. Order ref 7P5.

**RE-CHARGEABLE NICADS 'D' SIZE**

These are tagged for easy joining together but tags, being spot welded, are easy to remove. Virtually unused, tested and guaranteed. £2.00 ref 2P141 or 6 wired together for £10.00 ref 10P47.

**8 TRACK CASSETTE DECK** Complete with cassette holder. In fact, if you have any 8 track cassettes, then with the addition of 2 speakers this unit would play them. As 8 track cassettes are no longer made the units have become surplus, however, they do contain lots of useful parts: motor, tape head and drive, pulley wheels, etc. and a stereo amplifier. Mains operated. Brand new in makers packing. Only £3.00 each plus £1.00 additional postage. Order ref 3P46.

**COMPUTER BARGAIN—MEMOTECH MTX 512 64K RAM** Full size QWERTY keyboard with 57 professional keys and additional 12 dual function keys arranged as a separate key pad with cursor control and editing keys. Auto repeat is standard on all keys. This is a very superior home computer and comes complete with power supply, cassette lead, TV lead and 3 cassette programmes. Brand new in manufacturer's original packing with 250 page Operator's Manual. Price £45.00 plus £4.00 postage.

**STEREO SPEAKERS** Each 10 watts 8 ohm and twin speakers mounted in Walnut-finish cabinets, size 16" high × 10" wide × 6" deep. Front is black Dacron and the finish is very pleasing. Price £7.00 per pair. Extra postage and packing £3.00.

**UNUSUAL MAINS MOTOR** Quite small, measures only 2"×2"×1" approx., but is surprisingly powerful. it revs at 3,000rpm and is reversible. It has good length ⅛" diameter spindle. Price £1.00. Our order ref BD640.

### LASER TUBE

Made by Philips Electrical. New and unused. This is helium-neon and has a typical power rating of .9mW. it emits random polarised light and is completely safe provided you do not look directly into the beam when eye damage could result. Do not use in the presence of children unless a diverging lens is fitted. DON'T MISS THIS SPECIAL BARGAIN! Price £29.95 plus £3 insured delivery.

**PAPST AXIAL FAN—MANUFACTURERS REF NO. TYP4580N.**

This is mains operated. 15 watt rating and in a metal frame with metal blades so OK in high temperatures. Body size approx. 4¾" square x 1⅝" thick. £6.00 each, plus £1.00 postage. Our ref 6P6.

**VERY POWERFUL MAGNETS** Although only less than 1" long and not much thicker than a pencil these are very difficult to pull apart. Could be used to operate embedded reed switches, etc. Price 50p each, 2 for £1.00. Ref BD642.

**FLIP-OVER DIGITAL CLOCK** Quite an eyecatcher, this is mains operated. The figures flip-over per minute and per hour and give a larger than usual visual display. Supplied complete with front and perspex panels to glue together to make its case. £2.00 each. Our ref 2P205.

**STABILISED 15V 2A PSU** kit which mounts on SRB panel. Mains operated. Ideal to drive monitor, etc. Price only £6. Our Ref. 6P7.

**SMOOTHING CAPACITOR** 230uF 63V 10A at 50 deg. C. Can type with mounting bracket. Price £2. Our Ref. 2P206.

**SMOOTHING CAPACITOR** 2200uF 63V 5.8A at 50 deg. C. Can type with mounting bracket. Price £1. Our Ref. BD644.

**10A 100V BRIDGE RECTIFIER ASSEMBLY** comprising 4 diodes mounted on two 4in x 3in sinks with bottom insulators. Price £2. Our Ref. 2P207.

**DO YOU WANT TO MEASURE AC AMPS?** We have found a few more of the 50Hz 0-40A AC 2½in diameter panel meters, made for RAF equipment these are very reliable and robust. Price £5 each. Our Ref. 5P105.

**20A DOUBLE POLE RELAY WITH 12V COIL** complete with mounting brackets. made by the Japanese Omron Company. Price £2 each. Our Ref. 2P173A.

**TORROIDAL MAINS TRANSFORMER** with twin outputs. 6.3V 2A and 12V 600mA, so ideal for FDD power supply. Price £5. Our Ref. 5P122.

**DOUBLE MICRO CASSETTE DECK** made by the Japanese ABS company. This takes two micro cassettes and is complete with motors, solenoids to select the deck to use and record and playback heads. Price £10. Our Ref. 10P49.

**QUICK FIX MAINS CONNECTOR** A must for your workshop. Saves putting on plugs as you just push the wires under the spring clips. Automatically off when lid is up. Price £7.50. Our Ref. 7P5/1.

**BT HANDSET** with curly lead terminating with flat BT plug. Colour cream. Price £5. Our Ref. 5P123.

**NEW ARRIVALS, FIRST TIME OFFERED**

**EPSON MINI PRINTER 15011** This is a till roll size pnnter and uses plain paper. £15 each. Order Ref. 15P14.

**2764 EPRON** 65K bits. BBC micro compatible. £3 each. Order Ref. 3P48.

**PIEZO SOUNDER.** Reference PKM11 3-30V operation, 90dB output. 2 for £1. Order Ref. BD647.

## J & N BULL ELECTRICAL

**Dept AR, 250 PORTLAND ROAD, HOVE BRIGHTON, SUSSEX BN3 5QT**

**MAIL ORDER TERMS:** Cash, PO or cheque with order. Orders under £20 add £1.50 service charge. Monthly account orders accepted from schools and public companies. Access and B/card orders accepted.

**Brighton (0273) 734648 or 203500**

## POPULAR ITEMS

**Some of the many items described in our current list which you will receive if you request it**

**3½in FDD CHINON** 80 track 500k. Shugart compatible interface. Standard connections, interchangeable with most other 3½in and 5¼in drives. Brand new. £28.50 plus £3 insured post.

**3in FDD HITACHI HFD305SXA** Shugart compatible interface. 500k on 3in disc. Recommended for many Amstrads but interchangeable with most drives. £29.50 plus £3 insured post.

**FDD CASE AND POWER SUPPLY KIT** for the 3in or 3½in. £11.00. Ref 11P2 for the Chinon, 11P3 for the Hitachi.

**9in MONITOR** made for ICL, uses Phillips black and white tube. Brand new and complete but uncased. £16.00 plus £5.00 post.

**ACORN COMPUTER DATA RECORDER REF ALF03** Made for the Electron or BBC computers but suitable for most others. Complete with mains adaptor, leads and handbook. £10.00. Ref 10P44.

**POWERFUL IONISER** Uses mains transformer. Generates approx. 10 times more ions than the normal diode/cap ladder circuits. Complete kit £11.50 plus £3.00 post.

**3 INCH FDD** Hitachi ref. HFD 305SXA. Ideal replacement or second drive in most computers, especially Amstrad 6128, etc. Price £30 plus £3 post.

**FREE POWER!** Can be yours if you use our solar cells—sturdily made modules with new system bubble magnifiers to concentrate the light and so eliminate the need for actual sunshine—they work just as well in bright light. Voltage input is .45—you join in series to get desired voltage—and in parallel for more amps. **Module A** gives 100mA, Price £1, Our ref. BD631. **Module C** gives 400mA, Price £2, Our ref. 2P199 **Module D** gives 700mA, Price £3, Our ref. 3P42.

**SOLAR POWERED NI-CAD CHARGER** 4 Ni-Cad batteries AA (HP7) charged in eight hours or two in only 4 hours. It is a complete, boxed ready to use unit. Price £6. Our ref. 6P3.

**50V 20A TRANSFORMER** 'C' Core construction so quite easy to adapt for other outputs—tapped mains input. Only £25 but very heavy so please add £5 if not collecting. Order Ref. 25P4.

**15A PANEL METER** These have been stripped from Government surplus battery charger units made originally for army use. Unused, tested but of course rather old, diameter 2in can be surface or flush mounted. £3 each. Our Ref. 3P40.

**SWITCH AC LOADS WITH YOUR COMPUTER** This is easy and reliable if you use our solid state relay. This has no moving parts, has high input resistance and acts as a noise barrier and provides 4kW isolation between logic terminals. The turn-on voltage is not critical, anything between 3 and 30V, internal resistance is about 1K ohm. AC loads up to 10A can be switched. Price is £2 each. Ref. 2P183.

**METAL PROJECT BOX** Ideal size for battery charger, power supply etc.; sprayed grey, size 8in x 4¼in x 4in high, ends are louvred for ventilation other sides are flat and undrilled. Order Ref. 2P191. Price £1.

**BIG SMOOTHING CAPACITOR.** Sprague powerlytic 39,000uF at 50V. £3. Our ref. 3P41.

**4-CORE FLEX CABLE.** Cores separately insulated and grey PVC covered overall. Each copper core size 7/0.2mm. Ideal for long telephone runs or similar applications even at mains voltage. 20 metres £2. Our ref.2P196 or 100 metres coil £8. Order ref. 8P19.

**6-CORE FLEX CABLE.** Description same as the 4-core above. Price 15 metres for £2. Our ref. 2P197 or 100 metres £9. Our ref. 9P1.

**BULK-HEAD MOUNTING LOUDSPEAKER.** Metal case with chrome grill front and with mounting lugs for screwing to ceiling, 8in. speaker. £10 each. Order ref. 10P43 add £2 post.

**TWIN GANG TUNING CAPACITOR.** Each section is .0005uF with trimmers and good length ¼in spindle. Old but unuse3d and in very good condition. £1 each. Our ref. BD630.

**13A PLUGS** Good British make complete with fuse, parcel of 5 for £2. Order ref. 2P185.

**13A ADAPTERS** Takes 2 13A plugs, packet of 3 for £2. Order ref. 2P187.

**20V-0-20V** Mains transformers 2½ amp (100 watt) loading, tapped primary. 200-245 upright mountings £4. Order ref. 4P24.

**BURGLAR ALARM BELL**—6" gong OK for outside use if protected from rain. 12V battery operated. Price £8. Ref. 8P2.

**24 HOUR TIME SWITCH**—16A changeover contacts, up to 6 on/offs per day. Nicely cased, intebnded for wall mounting. Price £8. Ref. 8P6.

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