JANUARY 1989 £1.85

Amateur RADIO

For all two-way radio enthusiasts

A User Review:
The SEM VHF to HF Converter

Construction:
An 80m Direct Conversion Receiver

Using Your Oscilloscope:
Measuring Current, Resistance and Time

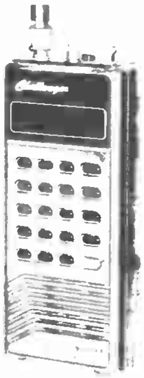
RAYCOM
COMMUNICATIONS SYSTEMS LTD

Raycom wish all customers a very happy New Year

New opening hours: 9.00am-5.30pm 5 Days, late night Friday (until 7.00pm). Closed all day Thursday

RAYCOM SPECIAL CHRISTMAS BOXES AVAILABLE DURING DECEMBER ONLY

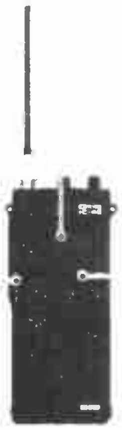
Challenger BJ 200 Mk2



HF/VHF Scanning Receiver
☆ 26-520MHz (with gaps)
☆ Included Civil and Most of Military Airband
☆ 16 memory channels
Search scan priority function and delay ☆ c/w Raycom Air Band antenna **FREE**

£189.00 P&P £10.00

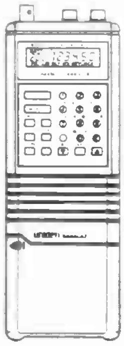
2m starter package



CTE1600 (same as IC2E)
★ Inc **FREE** 2m mag mount ant
★ 144-148MHz, c/w NiCad chrgr
★ 2.5W output
★ Ideal mobile/portable use

£149.00. P&P £10.00 (while present stocks last)

Bearcat BC 200XLT



The super new scanning receiver
★ C/w **FREE** mobile antenna
★ 29-956MHz (with gaps)
★ 200 memory channels
★ Detachable NiCad
★ C/w NiCad/charger

£239.00. P&P £10.00

Dual-band mobile package

Icom IC3200 144-430 transceiver
★ C/w **FREE** dual band mobile ant
★ 25W on both bands, 10 memories
★ Built-in duplexer
£399.00. P&P £10.00 (while stocks last)

The ultimate receiving stations

Icom ICR7000 V-UHF receiver
★ Inc **FREE** Royal 1300 discone ★ 25-1300MHz (2GHz)
£925.00. Carr £10.00 (limited stocks)

Icom ICR71 SW receiver

★ **FREE** long wire receiving ant
★ Covers all short wave bands
£825.00. Carr £10.00 (limited stocks)

HF station package

Yaesu FT747GX all band/mode transceiver
★ C/w **FREE** 20A metered PSU
★ Inc Raycom Mk2 Rx mod ★ 120W RF output
★ Continuous coverage receiver
£725.00. Carr £12.50 (limited supplies)

Our famous Yaesu FRG9600 packages

★ **FREE** Royal 1300 25-1300MHz discone
★ Supplied with **FREE** mains PSU ★ Improved receiver specification ★ Wide choice of options
Mk2 60-950MHz £545.00
Mk5 100kHz-950MHz £699.00 P&P £10

Raycom news box

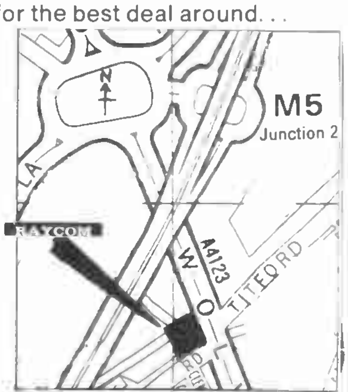
Just in. . .professional antennas from TCL, HF multiband dipole kits with balun. . .colinear antennas, dipoles, groundplanes. . .all at silly low prices. . .Ten-Tec transceivers. . .MFJ accessories. . .Butternut antennas. . .latest Icom mobile and hand-held transceivers. . .new range of 2/70 dual band mobile antennas. . .Sony receivers and accessories. . .super deals on Standard C500 transceivers. . .Royal 1300 antenna (same as Icom AH7000) now £59.50. . .full Bearcat-Uniden scanner range in stock. . .new range of mobile scanning antennas available. Remember we now close on Thursdays. . . by the time you read this, Uniden 2830s should be available again. . .please phone ASAP for details. . .73 es 88

New Icom super rigs

★ Icom IC2GE £265.00
★ Icom IC32E £399.00
★ Icom IC3210E £499.00
Expandable Rx POA
Call us for the best deal around. . .

Raycom Communications Systems Ltd
International House, 963 Wolverhampton Road
Oldbury, West Midlands B69 4RJ
Telephone 021 544 6767. Fax 544 7124. Telex 336483 Identi-G

Call in easy to get to, easy parking



Raycom gives you more purchasing power!

For fast service phone in your order with any major credit card, or in most cases we can offer you instant credit of up to £1,000.00 (subject to status). Raycom are licensed credit brokers. APR 29.8% subject to variation. Free credit on certain products at MRP prices, 50% deposit and six monthly payments. Please telephone for more details and application forms.

PLEASE TEL:
021 544 6767

RAYCOM COMMUNICATION SYSTEMS LIMITED

FOR THE BEST IN AMATEUR RADIO

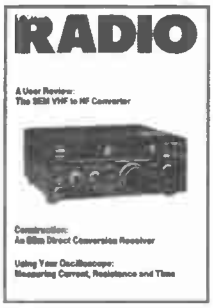
Ordering information

All products we advertise are normal stock items, our new mail order department can now dispatch many items same day but please allow up to 14 days delivery time if subject to carriage method. If ordering by mail, please include carriage and state your daytime telephone number. All products over £750.00 carriage free. Please allow time for personal cheques to clear. Please call **before ordering** and for more information

New Infoline 0836 282228 available 5-9pm (weekdays only)

Full range of Icom, Yaesu, Bearcat-Uniden, MFJ, Butternut, Jaybeam, Tonna, Welz in stock. Most products available in this magazine available at Raycom, plus our special package deals. Call now for details.

Amateur RADIO



Editorial:
Iain Mackenzie
Penny Phillips

Advertisement Manager:
Marian Vidler

Advertisment Executive:
Maria Smith

Subscriptions:
01-684 9542

Publisher:
Peter Williams

On sale:
Last Thursday of the month preceding cover date

Next issue:
Cover date February on sale 26 January 1989

Published by:
Amateur Radio Magazines, Sovereign House, Brentwood, Essex. CM14 4SE, England
(0277) 219876

Printed: In England

ISSN: 0264-2557

News Trade Sales by:
S M Distribution, 6 Leigham Court Road, Streatham, London. SW16 2PG
Tel: 01-677 8111

Cover:
Icom IC-725 HF all band transceiver

SERVICES

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

Don't worry, Sony haven't stooped to making bogus claims.

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

As you can see, the widest range of shortwaves is only available in a narrow range of shops.

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.

It does everything an enthusiast could want. And quite a few things he didn't know he wanted but will soon swear he couldn't do without. Like a synchronised detection system for instance, something you'd only expect in professional equipment.

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.

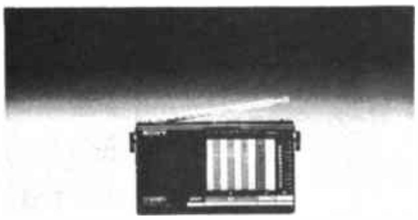
Tru-Fi Sound & Vision, 10-12 Grosvenor Road, Aldershot, Hants.

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

WA 8800

ICF

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.

Tom Molland Ltd., 110 Cornwall Street, Plymouth, Devon PL1 1NF.

Visibly Sounder, 100 Union Street, Torquay, Devon.

Moss of Bath, 45 St. James Parade, Bath BA1 1UQ.

Upton Electronics, 31 Torquay Road, Paignton, Devon TQ3 3DT.

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.

Fenhams, 119 Grainger Street, Newcastle-upon-Tyne.

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 CF34 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.

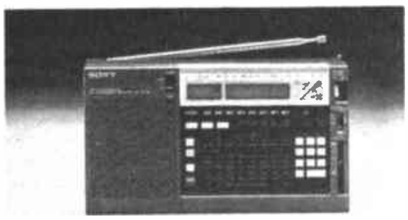
Soundtrack, 1 Church Square, St. Peter Port, Guernsey, C.I.

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

7600DA

ICF 7601L

ICF 7600DS



ICF 2001D

STRAIGHT & LEVEL

NEW DUAL BANDER

Yaesu announce a new boot-mountable, high-power dual band VHF/UHF FM transceiver. The FT-4700RH is capable of providing 50 watts of power on 144MHz and 40 watts output on 70cm, with a switchable low-power setting of 5 watts on both bands.

Dual receive is provided with independent squelch and mixing balance, so you can listen for calls on both bands at the same time, or transmit on one band while you are free to listen and tune on the other. Twenty memories, ten for each band, are provided for storing independent transmit and receive frequencies. Frequency display is provided by twin LCD displays, which show operating frequency and other vital information.

True full-duplex crossband operation is provided and the FT-4700RH has a new detachable front panel which is connected to the main control unit via the optional control cable YSK-4700. This means that the main body of the transceiver can then be installed under a seat or safely hidden in the boot.

For more information regarding the FT-4700RH contact: *South Midlands Communications Ltd, SM House, School Close, Chandlers Ford Industrial Estate, Eastleigh, Hants SO5 3BY. Tel: (0703) 255111.*

BEGINNERS' GUIDE

In response to the demand for an inexpensive guide to packet radio, BARTG has published **Beginners' Guide to Packet Radio** by Mike Martin G4VRQ.

The guide is aimed at taking the mystery out of packet radio and enabling the beginner to put together a packet radio station and operate it on air.

Topics covered include: the history of packet radio; the radio equipment, computers and TNC needed; the software and protocols involved; how to connect up the components of your packet radio station; how to set up the parameters of the TNC, ie how to customise it for your use; how to use it on the air; digipeaters, beacons and bulletin board systems, and a glossary of terms.

The guide has twenty-one pages and costs 95p plus 20p postage and packing from: *Mr J Beedie GW6MOK, BARTG Components Manager, 'Ffynnonlas', Salem, Llandeilo, Dyfed SA19 7NP.*

INFORMATION RADIO

If you are interested in the latest developments in the world of radio and electronics then a radio station based on the east coast of Ireland should be of interest to you. Broadcasting under the name of 'Radio Fax' it carries information on broadcasting and electronic developments. Recent items have included DXing, amateur radio, hi-fi and audio news, satellite TV and general electronics.

Radio Fax can be heard on 6205kHz during the daytime and 1611kHz after dark. Their programmes change every Monday, Wednesday, Friday and Saturday and to break them up about four records are played each hour. Reception is generally good and a variety of items should ensure something of interest to all amateurs or short wave listeners.

AMIGA PACKET PROGRAM

For those of you who are using the Commodore Amiga then there is news of a new packet radio terminal program from Italy. Amiga Packet version 4.0 is now available from IW0BRH who can also supply a number of other radio related programs including CW and RTTY software. Shortly to be released is Amiga Packet version 5.0 which is completely written in machine code for speed and reliability.

The software offered is absolutely free but to be on the safe side send a formated 3.5in disc and a couple of IRCs to cover return postage. The program is available from: *Silvano Funghi (IW0BRH), via Coli di Rienzo, 3 00047 Marino Laziale, Rome, Italy.* Don't forget to mention the type of TNC you are using and include the model of Amiga computer.

NEW AGENT

VHF Communications, the magazine specially devoted to the VHF, UHF and microwave enthusiast, has appointed a new UK agent. This means that it is now easier to obtain this quarterly publication along with the many kits which are featured within its pages.

Owing to the UK appointment the subscriptions will now be cheaper as there are no currency exchanges to pay. If you would like more information regarding **VHF Communications**, then send an SAE to: *Mike Wooding G6IQM, 5 Ware Orchard, Barby, Nr Rugby CV23 8UF. Tel: (0788) 890365.* If you have access to packet radio you may like to contact Mike at GB7AAA.

NAME CHANGE

At BARTG's recent AGM the members present voted in favour of the proposed name change for the Group. 'Teleprinter' is to be replaced with 'Teledata'.

The change does not mean that BARTG is dropping its interest in the mechanical teleprinter but rather emphasises the fact that it also caters for AMTOR, packet and fax.

BARTG encourages the use and development of all these modes through its quarterly magazine, **DATACOM**, by operating a regular news service, GB2AATG; running contests and awards; developing and marketing specialist components, products and software; running an annual rally; attending amateur radio events and working with other specialist groups, both within the UK and abroad.

For further information about membership contact: *Mrs Pat Beedie GW6MOJ 'Ffynnonlas', Salem, Llandeilo, Dyfed SA19 7NP. Tel: (0558) 822286.*

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

RUSSIAN SPACE STATION ON 144MHZ

On 20 October 1988 the Russian cosmonauts based on the space station MIR made a four hour space walk to repair the Dutch/British telescope. Besides this repair job they successfully mounted a quarter-wave antenna for 2 metres on the side of the MIR spacecraft.

A 2m transceiver was brought to them via the Progress 38 freighter, and reports suggest that this equipment is capable of running about 2 watts of FM on 144/145MHz. The planned operator is Mousa Manarov, who has been living on board the MIR since December 1987 along with Vladimir Titov. Unfortunately, Mousa has no experience in making amateur radio contacts, so he will initially only be active over the USSR until he has gained enough experience to call other radio hams.

By the time this appears in print, test transmissions over the USSR will have already been made and Mousa will have worked split frequency, as did the astronauts from the US Space Shuttle, using the callsign U1MIR. He plans to operate only until the arrival of the Soyuz-TM7 on 21 November 1988, which will bring another two Russian cosmonauts and one Frenchman to the space station. Titov and Manarov are scheduled to return to earth by late December, together with the French astronaut and it is not clear if the new crew will immediately continue the amateur radio activities from MIR.

Any operators following Mousa Manarov will probably use the callsigns U2MIR, U3MIR, etc until U0MIR is reached. More information is shortly to be released, but it seems likely more transmissions are planned with the possibility that their 2W transmitter is to be replaced with a 10W version.

The frequencies are 145.550MHz (S22) transmit, and receive between 145.500-145.600MHz. Operations are thought to take place only on Saturdays and Sundays after the cosmonauts' work period finishes.

COMMODORE 64 TNC

What must be the cheapest and simplest TNC on the market is now available for owners of the Commodore C64 and C128 computers. The circuit is the brainchild of John Krohn KJ4GP, Sam Baine W4KUM and Mike Zinicola WD4PVS and is designed to run in conjunction with the Digicom software which is available for both the Commodore machines.

The circuits consist of only three transistors, one IC and a handful of other discrete components. The heart of this simple TNC is a TCM-3105JL modem chip available from Texas Instruments. The printed circuit board is only 6 x 4cm and when complete the whole thing plugs into the computer's cassette port making a very neat unit indeed.

A five-page manual is available which contains a schematic diagram, PCB layout, setting-up and testing details, plus a simple test program. If you would like a copy of the instructions then send a medium sized SAE and a cheque or postal order for 50p to: *Ian Pomfret, 30 Clarence Avenue, Whitefield, Manchester M25 6DW.*

CANADA DISCONTINUES DIGITAL CERTIFICATE

It is true to say that Canada's digital amateur certificate has never been very popular. Out of the 23,000 amateurs in Canada only around 1,000 digital certificates have been issued since 1978, and most of these were to people already in amateur radio.

The prospective digital amateur is supposed to pass the same radio regulations test as everyone else, plus the advanced amateur technical examination on power supplies, receiver and transmitter circuits, antennas and propagation, and test equipment. Finally, the candidate is given a ten-question, essay-type examination on digital modulation techniques.

The exam is not particularly difficult for someone with a technical background and the average person with some electronics experience could pick up the required knowledge within a few months. So why then, wasn't the digital certificate more popular?

In the opinion of David Michelson VE7TSX, there appears to have been some hostility from the old timers. In the ten years the certificate has been available, neither the CARF or the CRRL made any effort to publish a study guide. Because of this lack of support the Department of Communications has announced its intention to discontinue the digital certificate in mid-1989.

SCOUTS ON PACKET

David Hutchinson GI4FUM, the Assistant District Commissioner for Venture Scouts in Antrim, Northern Ireland, is interested in hearing from any other scout group which is operational on packet radio.

His intention is to publish a network of Scout packet users by mid-October next year, with the idea of making packet contacts between different groups much easier during the JOTA event. He also plans to publish a list of Scout packet users in the 'Scout Radio Newsletter' published by Duncan Wheelhouse G8TRP.

If you have any news for him and are active on packet radio, please forward a message to GB7TED. David can also be contacted on Saturday morning on the UK 80m Scout net.

GUEST LICENCES IN SW AFRICA

If you intend to operate amateur radio transmission equipment while in South West Africa you must be in possession of a valid amateur licence issued by the Director of Posts and Telecommunications, PO Headquarters, Windhoek, South West Africa.

Visitors must apply in writing for a temporary licence to the above address at least sixty days before the intended date of arrival and length of stay should be supplied. No fee is payable by applicants from South Africa and the TCBV countries. Visitors from countries without bilateral agreement may also apply for a permit but a fee of 12 rand (US$5.50) is payable on arrival in SWA. Visitors intending to temporarily import radio amateur communications equipment must declare this on arrival to customs and produce their guest licence.

South West Africa has two licence classes. These are CEPT I and CEPT II compatible. A repeater in Windhoek operates on R2 but VHF activity is generally low. IARU Region I bandplan applies.

For further information write to: *SARL HQ, PO Box 3711, Cape Town 8000.*

RAIBC HELP LINE

The Radio Amateur Invalid and Blind Club is pleased to announce the introduction of a new telephone help line. The RAIBC is an organisation set up to encourage and help blind and invalid people of all ages to become active in the hobby of amateur radio and short wave listening.

The new help line will provide help, advice and assistance to RAIBC members and supporters and will be open between 10am and 5pm and between 8pm and 10pm daily. The line will be manned as much as possible during these hours, but due to the lack of volunteers there will be the odd occasion when a telephone answering machine will be active. If you need help or any advice tel: 01-346 5372.

ERRATUM

It has been brought to my notice by G4WLA that there were several minor typographical errors in the print-out of the program included with my article 'Tuning the Wire' published in the

November issue of ***Amateur Radio***.

The corrected lines are:
Line 240: IF F> 21.5 GOTO270;
Line 500: IF F> 21.5 GOTO540;
Line 510: S=(INT (100* (Q-R))/100

It has also been brought to my notice that some computers (and in particular the 32K Dragon) will not accept a comma in the "INPUT" instruction and that on these machines, the comma should be replaced with a semicolon.
Ken Williams

THE BANDEDGE 'TRISTAR' A Vertical with a Difference

Publisher's Correction and Apology

We refer to the above article that appeared in our December issue, contributed by Trevor Morgan GW4OXB. In this article, specific references were made to the AQ6-20 antenna in the context of a comparison between the Tristar, a G5RV and the AQ6-20. The manufacturers of the AQ6-20 have drawn our attention to the fact that references to this product were misleading, untrue and derived from erroneous test procedures that totally invalidated all of the data presented in the article. They rightly point out that the publication of such invalid data concerning the performance of the AQ6-20 will have left many of our readers with an untrue and misleading view of this product, and that this could in turn be expected to have a damaging effect upon their sales.

It is now clear that the author, GW4OXB, had set up a number of antennas close to each other, all resonant on the same frequency, and had failed to take into account the electrical detuning effect that would have been mutually induced. This detuning will have degraded the performance of the antennas in question, and in particular that of the AQ6-20. Any results obtained from 'tests' conducted in such a situation would be worthless. In order to minimise the effect of mutual coupling, these antennas should have been physically separated by a minimum distance of four wavelengths of the lowest frequency. Clearly this was not done.

It is equally evident that the substantially differing characteristics of the three antennas were not taken into account: the AQ6-20 is horizontally polarised, the Tristar vertically polarised, and the G5RV has both components depending on frequency. The conclusions tabulated in the form of 'signal reports' were based on S meter readings, which would have had no validity at all in terms of accuracy, since each 'radio' will have had different AGC reference voltages.

It is not always realised that the performance of any antenna can be adversely affected by its height above RF ground (not always physical ground), and by the proximity of other metal structures such as aerials, wires, masts and guy wires. These are factors that will alter the angle of radiation as well as the overall radiating pattern of an antenna and will thereby alter its performance. Finally, prevailing conditions of propagation can vary considerably, resulting in inaccurate and inconsistent results.

It is clear that no proper test equipment or procedures were used, and that none of the above factors were taken into account by Trevor Morgan GW4OXB, when carrying out these comparative tests and submitting his findings. These were therefore inaccurate, misleading and prejudicial to the good name and future sales of this product. A separate apology from the author Trevor Morgan GW4OXB, follows.

Amateur Radio apologises unreservedly to the manufacturers of this highly reputable product, the Altron AQ6-20 Spacesaver Antenna, for the considerable embarrassment and inconvenience that they have suffered as a result of the publication (albeit in good faith) of the data which it is now clear was false and technically invalid. ***Amateur Radio*** further regrets that the technical validity of the results was not checked, and that the manufacturers of the AQ6-20 were not consulted before publication.

An Apology by Trevor Morgan GW4OXB

Within my article in the December issue of ***Amateur Radio***, comparative signal reports were published which gave the impression that the Altron AQ6-20 antenna was inferior in performance.

I deeply regret that such an impression was made, particularly as I have used the AQ6-20 very successfully for over a year, and I have always received good service and advice from Allweld Engineering.

So, what happened? To start off with, the very success that I had been enjoying with the AQ6-20 gave me no reason to question any readings. I erected the vertical aerial some twenty feet away on a separate mast and checked that both aerials were working. I also had the G5RV in position, which I now realise was going to cause problems. It was at this point that I made the mistake that was to leave me severely embarrassed and cause a lot of bad feeling.

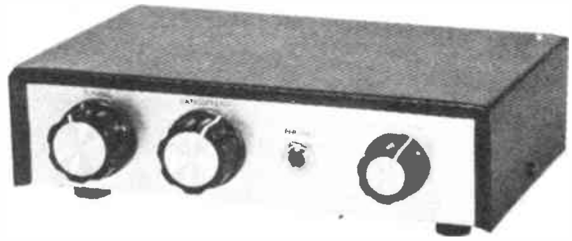
While I was clamping the cables to the mast supporting the AQ6-20, I decided to replace the current nylon ropes with some new galvanised guy lines, which I had cut to a suitable length. Unfortunately, this length just happened to be a half-wave at twenty metres!

The consequence of these actions, although carried out in innocence, was to completely detune the AQ6-20 and to destroy its directional properties. My results therefore never stood a chance of being accurate.

The lesson that should be learned, and should be understood by anyone contemplating an assessment of aerials, is that their performance is very much dependent on their surroundings. It is difficult for many amateurs to obtain 'clear air' space for aerials and most of us use more than one aerial. If you are in any doubt about interaction between aerials, check with the manufacturer, who will certainly be happy to advise you on how to get the best from his product.

I may add that the AQ6-20 is now operating as it should, and loggings of VK4CFA, ZL2BPG, VK5AKY, VK5BOL, ZS6CE, PT2ZDR, VK7GK and HH2BN, with reports from 5/5 to 5/8, have verified its manufacturer's claims.

THE 80m DIRECT CONVERSION RECEIVER



by R A Penfold

Although amateur radio seems to have been dominated for some years now by the so-called 'black box' approach to setting up a station, it is still possible to obtain a lot of fun from constructing and using relatively simple types of equipment. Also, by building your own equipment you can pursue the hobby of amateur radio or short wave listening without having to arrange a mortgage before buying the necessary parts.

This simple amateur band radio was designed for beginners to short wave listening, or for those who have only used the ready-made 'real thing' in the past and would like to try their hand at a DIY project. It is a single band set covering the 80m band. The receiver will provide reasonably good results while using an earth connection and an indoor aerial of modest length.

The 80m band is mainly restricted to local reception during the hours of daylight, but reception over longer distances is usually possible during the evening. Reception from most of Europe is then possible, with signals from the USA and further afield being received when conditions are favourable. The main advantage of the 80m band for a simple single band receiver, is that it will provide at least a few stations at virtually any time of the day or night, and is not prone to fading out completely over long periods of time.

Direct conversion

In the interests of simplicity and economy, this receiver is of the direct conversion type rather than the more common superheterodyne (superhet) variety. Normal broadcast band-type AM and FM transmissions are virtually non-existent on the amateur short wave bands. The normal system of 'phone' transmission is single sideband (SSB) which is a mode of reception that can be resolved properly using a direct conversion receiver. Normal AM and FM transmissions cannot be properly received on a direct conversion receiver, incidentally.

It is not essential to have a basic understanding of single sideband signals before trying to receive them but it is more than a little helpful. Tuning in a single sideband signal is more difficult than tuning to a broadcast station. The tuning must be very accurate to give an intelligible audio output, and it is generally accepted that the tuning error needs to be no more than about 50Hz for good results. Inaccurate tuning affects the pitch of the audio output signal or, in the case of a large tuning error, can totally scramble the output!

There are various methods of generating single sideband signals, one of which is the 'filter' method. This consists basically of generating an ordinary AM signal which comprises three parts. There is the carrier-wave of course, together with the sidebands which are generated symmetrically around this when it is modulated. If, for example, the audio modulation consists of a 2kHz sine-wave, and the carrier-wave is at a frequency of 1MHz, the sidebands will be at frequencies of 1.002MHz (the upper sideband) and 0.998MHz (the lower sideband). In other words, the sidebands are spaced from the carrier-wave by an amount which is equal to the audio input frequency that generated them. The strength of sideband components is proportional to the audio input signals that produced them.

With the filter method of single sideband generation, the modulator is generally a type that largely suppresses the carrier-wave. A narrow bandwidth filter is then used to severely attenuate one of the sidebands and to further attenuate the carrier-wave. This is acceptable in that each sideband carries all the information needed to produce a demodulated output, and removing one sideband reduces the bandwidth of the signal so that (in theory) twice as many stations can be fitted into a given frequency range. The carrier-wave is also a non-essential, in that it can effectively be replaced by an oscillator in the demodulator circuit at the receiver. Its suppression enables more effective use of the available output power, since no significant power is allocated to the carrier. Its suppression also results in a further (but small) reduction in the signal's bandwidth.

With a direct conversion receiver the single sideband signals are demodulated using a simple mixing process. **Fig 1** helps to explain how this system operates. Here, an upper sideband signal is being demodulated by tuning a variable frequency oscillator (VFO) to a frequency just below the minimum frequency in the sideband. The VFO and sideband signals are mixed in a balanced modulator to produce 'sum' and 'difference' output frequencies. The sum signal is of no interest as it will be at radio frequencies and will be filtered from the output by a filter capacitor. The difference frequency signal is the important one as it constitutes a demodulated audio output signal.

If we return to our earlier example, a 1.002MHz upper sideband component will give the correct audio output frequency of 2kHz if the VFO is tuned to a frequency of 1MHz (1.002MHz to 1MHz = 0.002MHz, or 2kHz in other words). It should be apparent from this that the correct frequency for the VFO is always equal to the frequency of the suppressed carrier-wave. Unfortunately, there is no way of knowing for certain exactly what is the frequency of the suppressed carrier-wave! Therefore, tuning has to be done 'by ear' to give what sounds like the most natural pitch for the audio output signal. Being practical about it, a small amount of tuning error is unimportant if the audio signal sounds right and is easily understood.

Setting the VFO frequency too low will result in the difference between the VFO frequency and the sideband component's frequencies being too high. This produces an audio output that is too high in pitch and is generally referred to as the 'Donald Duck' effect! Setting the VFO too high in frequency has the opposite effect, with the pitch of the audio output being too low. In fact, more than a minor error in this direction is more serious (with the carrier-wave moving in amongst the sideband components). The audio output then becomes totally scrambled and unintelligible.

The easiest mistake to make when tuning in a single sideband signal is to place the VFO on the wrong side of the signal. This gives an output at the correct pitch, but with the low notes converted to high ones and vice versa. This is clearly a voice signal, but without even the occasional word being understood. It should be obvious when this error has been made, and it is then just a matter of tuning right through the signal to place the carrier-wave on the correct side of the transmission.

There is a slight flaw in the direct conversion type of receiver when compared to a good superhet design. In our example of **Fig 1**, there are a couple of signals just below the VFO frequency which are in the next channel and should not produce any co-channel interference. They would not do so with a good superhet design as they would be excluded by intermediate frequency (IF) filtering. With a direct conversion receiver, the selectivity of the set is provided entirely by filters in the audio stages. The drawback is that signals of a few kilohertz either side of the VFO will produce audio signals within the passband of the receiver's audio stages. The two interfering signals will therefore be received just as well as the single sideband signal.

A superhet communications receiver normally has upper and lower sideband modes. In theory, with upper and lower sideband transmissions on the same carrier frequency, a superhet receiver could receive one or the other by selecting the appropriate sideband reception mode. In practice, even a good receiver would probably show some signs of adjacent channel interference, but the signals could probably be perfectly reproduced. This contrasts with a direct conversion receiver, where both signals would be received simultaneously and equally well! This limitation has to be accepted as the price to be paid for the comparative simplicity of a direct conversion design. Good results can still be obtained and direct conversion sets often seem to outperform many of the more down-market superhet designs.

Direct conversion sets are not restricted to reception of single sideband transmissions. CW (continuous-wave or Morse code) signals can also be received and simply consist of a carrier-wave which is keyed on and off. Tuning the VFO close to the carrier frequency produces an audio tone and the VFO control can be adjusted to give an output of the desired pitch. RTTY transmissions are normally in the form of an FSK (frequency shift keyed) carrier-wave. This can be received by tuning the VFO control for the appropriate two-audio output tones.

System operation

Fig 2 shows the general make up of the receiver in block diagram form. In theory, a direct conversion receiver does not require any RF selectivity and has no spurious responses. In practice, problems with strong signals overloading the front-end circuitry and breakthrough to the output have to be combated, as do spurious responses due to harmonics on the VFO signal. A reasonably effective bandpass filter must therefore be included at the input of the circuit. Although most of the gain in this type of receiver is obtained in the audio stages, some RF amplification is useful. A single RF amplifier stage is therefore included ahead of the demodulator.

The latter is a standard, balanced modulator/demodulator which combines the input and VFO signal in order to generate the sum and difference signals. An RF filter removes the sum signal, plus any breakthrough of the two input signals. This leaves the difference signal, which is the demodulated audio output. A high-gain audio amplifier boosts this signal which is then fed through low-pass and high-pass active filters, thus reducing adjacent channel interference. These also substantially reduce 'background hiss' on the output due to noise generated in the early stages of the receiver. Finally, the signal is boosted by another high-gain audio amplifier which is fed to the headphones.

Circuit operation

Refer to **Fig 3** for the full circuit diagram of the receiver. The input filter is a simple two-stage parallel resonant type based on T1 and T2, with loose coupling between the two stages provided by C2. Of several input filters tried, this simple configuration seemed to give the best results. TR1 acts as the basis of the RF amplifier stage which is a common-source type. This gives about 20dB of gain.

IC1 is the balanced mixer chip which is a well known device from the Plessey range. It is by no means the cheapest of balanced mixer-integrated circuits but it seems to give excellent results in this application, and it does not require any manual balancing adjustments. C9, R3 and C10 form the RF filter, and the first audio amplifier is a common emitter stage based on TR2. This provides over 40dB of gain.

The two filters are conventional active low-pass and high-pass designs which have IC2 and IC4 (respectively) as the buffer amplifiers. These filters have roll-off rates of 24dB per octave (low-pass) and 18dB per octave (high-pass) but they are partially aided by other filter and coupling capacitors in the circuit which give higher overall attenuation rates. The cut-off frequencies are approximately 3kHz and 250Hz.

About 46dB of gain is provided by the output amplifier which is a simple inverting-mode circuit built around operational amplifier IC3. This will drive most types of headphone and earphone at good volume but it cannot drive a loudspeaker. Headphones are better for DXing, but the output signal could be used to drive an external amplifier and loudspeaker if desired. However, this could cause problems with microphony and acoustic 'howlaround'.

The VFO uses TR3 as an emitter follower, with T3 providing positive feedback and a voltage step-up to sustain oscillation. The coupling to the balanced mixer is via the secondary winding on T3 and dc blocking capacitor C6. This is a very basic type of oscillator, but it gives a reasonably 'clean' output signal and is quite stable in use. Although ceramic tuning capacitors are adequate for the bandpass filter, in the interest of good tuning stability it is advisable to use a polystyrene or

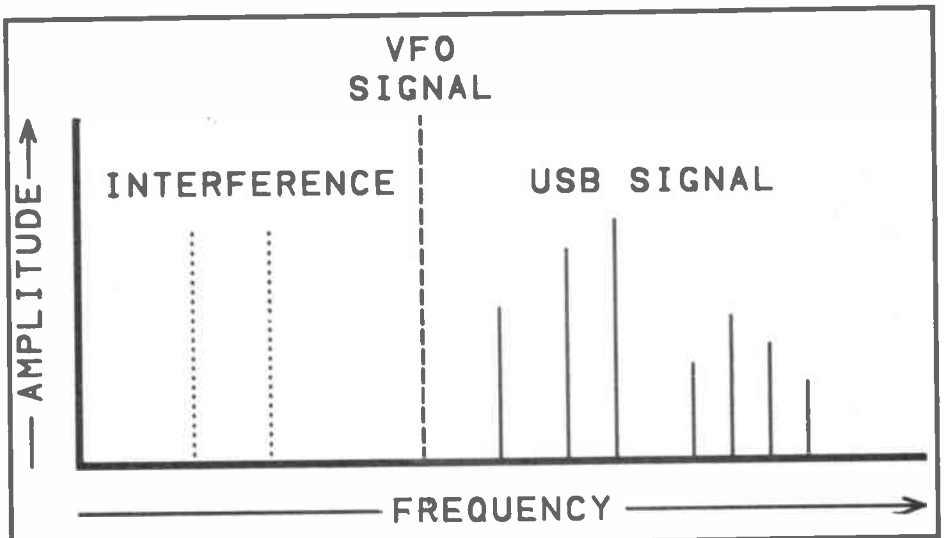


Fig 1: *Resolving an upper sideband signal*

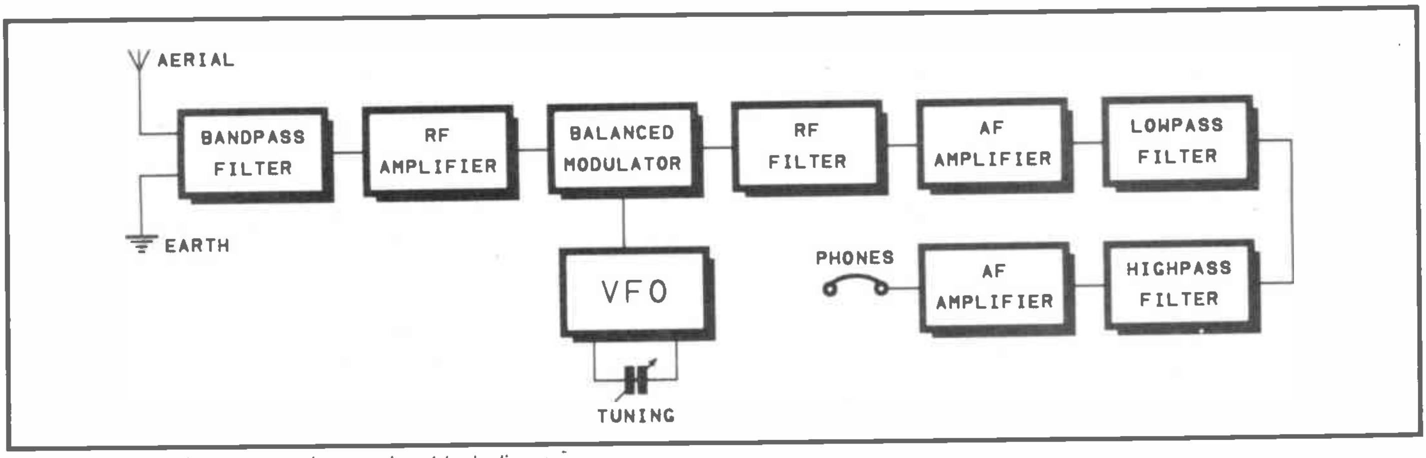


Fig 2: *The 80m direct conversion receiver block diagram*

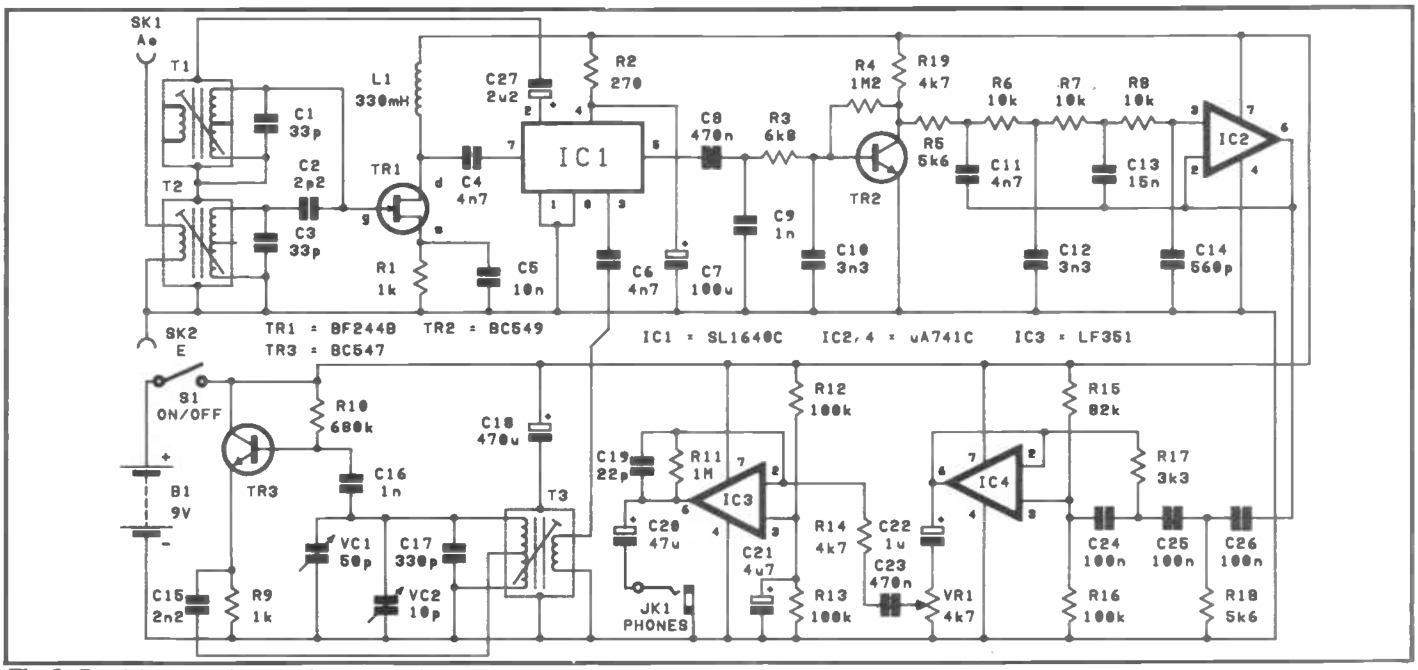


Fig 3: *The full circuit diagram for the receiver*

silvered mica type for C17 in the VFO.

VC1 is the main tuning capacitor and VC2 is the 'bandspread' control. The lower value of VC2 means that it covers a relatively restricted range of frequencies. This makes fine tuning with this control much easier than using VC1, although careful adjustment is still required. The specified value for VC1 just about provides full coverage of the 3.5 to 3.8MHz range. A higher value of about 150p must be used if coverage up to the 4MHz limit (used in the USA and some other countries) is required.

Power is obtained from a 9V battery and the total current consumption of the receiver is about 17 milliamps. It is advisable to use a fairly high-capacity battery, such as six HP7 cells mounted in a plastic holder.

Construction

Apart from the controls, sockets and battery, all the components are mounted on the printed circuit board (PCB). Details of the board are provided in **Fig 4**.

The semiconductors are not MOS types, but as the SL1640C is not a particularly cheap component I would recommend the use of a socket for this device – even if the other integrated circuits are mounted directly on to the PCB. Note that IC1 has the opposite orientation to the other three integrated circuits.

The BF244B seems to be available with at least two encapsulations (**Fig 5** gives base views for these). Check the connections carefully before soldering this component into place as the obvious method of connection is probably the wrong one. Some preforming of the leadout wires might be needed, but it should be possible to fit any version of the BF244B on to the PCB without difficulty.

Miniature capacitors must be used if they are to fit on to the PCB properly. In particular, the electrolytic capacitors should be of the radial (vertical mounting) type, and the polyester capacitors should be printed circuit mounting-types having a pitch of 0.3in (7.5mm). Only two link wires are needed and these can be made from wires trimmed from resistor leadouts. Pins are fitted to the PCB at the points where connections to off-board components will eventually be made.

A metal instrument case measuring 203mm × 130mm × 50mm makes a neat and practical housing for this project. The two variable capacitors are mounted on the left of the front panel, with the volume control and headphone socket fitted on the right. On the prototype, the on/off switch (S1) is ganged with the volume control but obviously a separate on/off switch can be used if preferred. SK1 and SK2 are mounted on the rear panel, well towards the left-hand side of the unit. The PCB is mounted on the base panel of the case (well to the left of the unit) and must be

PARTS LIST

Capacitors

C1,3	33p ceramic plate	C17	330p polystyrene
C2	2p2 ceramic	C18	470u 10V radial elect
C4,6,11	4n7 polyester (3 off)	C19	22p ceramic plate
C5	10n polyester	C20	47u 16V radial elect
C7	100u 10V radial elect	C21	4u7 63V radial elect
C8,23	470n polyester (2 off)	C22	1u 63V radial elect
C9,16	1n polyester (2 off)	C24,25,26	100n polyester (3 off)
C10,12	3n3 polyester (2 off)	C27	2u2 63V radial elect
C13	15n polyester	VC1	50p air spaced (Jackson C804)
C14	560p ceramic plate	VC2	10p air spaced (Jackson C804)
C15	2n2 polyester		

Resistors (all ¼ watt 5% carbon)

R1,9	1k (2 off)	R10	680k
R2	270	R11	1M
R3	6k8	R12,13,16	100k (3 off)
R4	1M2	R14,19	4k7 (2 off)
R5,18	5k6 (2 off)	R15	82k
R6,7,8	10k (3 off)	R17	3k3

Semi-conductors

IC1	SL1640C	TR1	BF244B
IC2,4	uA741C (2 off)	TR2	BC549
IC3	LF351	TR3	BC547

Miscellaneous

T1,2	Toko KANK3333R (2 off)	Six HP7 cells in a plastic holder
T3	Toko KANK3337R	Printed circuit board (PCB)
SK1,2	4mm sockets (2 off)	Instrument case (203mm x 130mm x 50mm)
JK1	Standard jack socket	Battery connector (PP3 type)
S1	Part of VR1	8 pin DILIC plus pins, wire, solder, etc

Potentiometer

VR1	4k7 log with switch (S1)

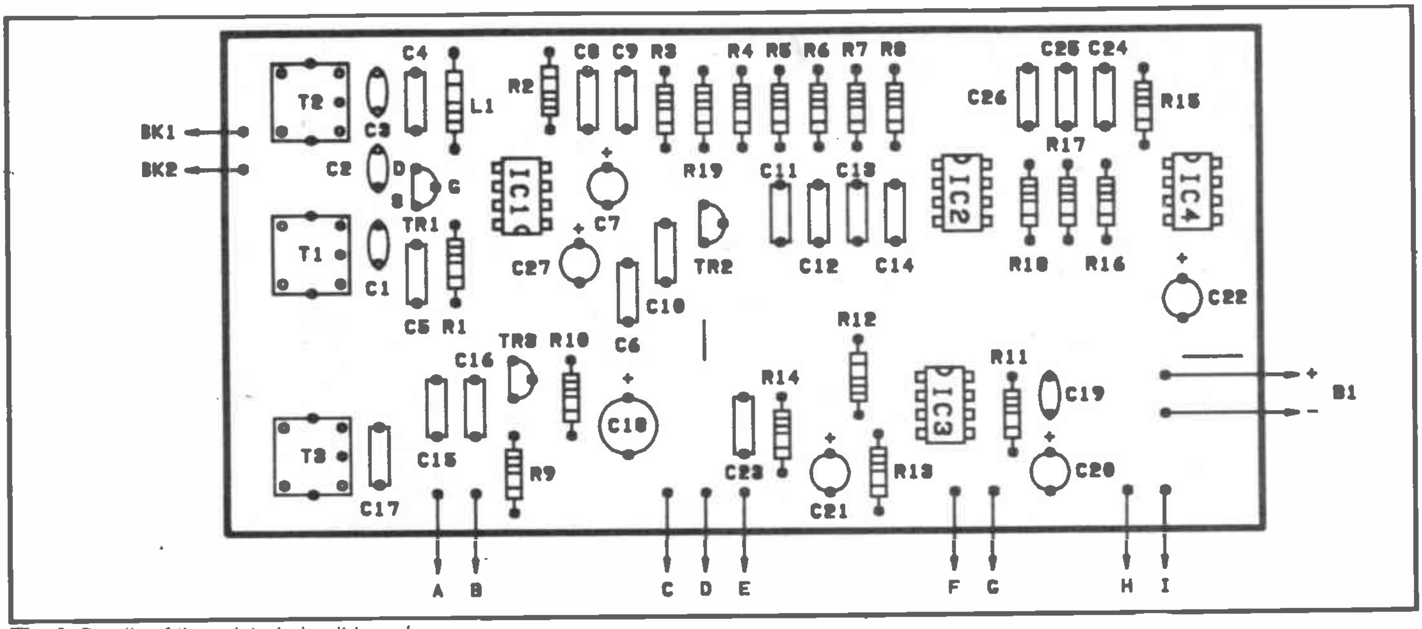


Fig 4: Details of the printed circuit board

mounted on stand-offs or spacers. There should be plenty of space for the battery to the right of the board. If HP7s in a holder are used, then connection to the holder is via a standard PP3 style battery connector.

To complete the unit, the point-to-point wiring is added (see **Figs 4** and **6**). In the interests of stability and good performance this wiring should be kept reasonably short and direct. In particular, the leads to VC1 and VC2 should be no longer than is really necessary.

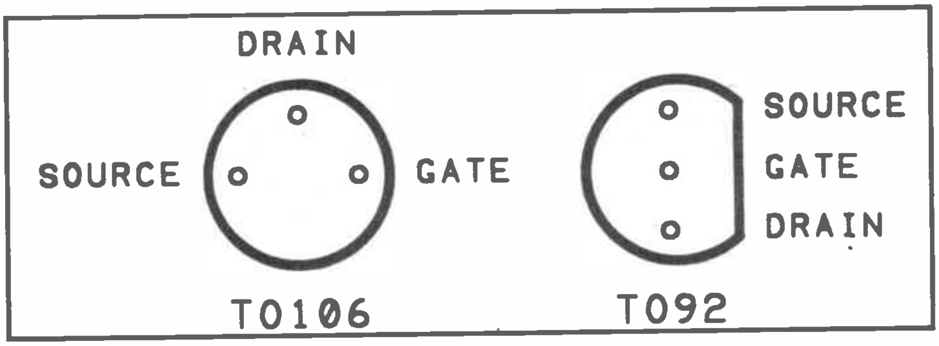


Fig 5: BF244B base views

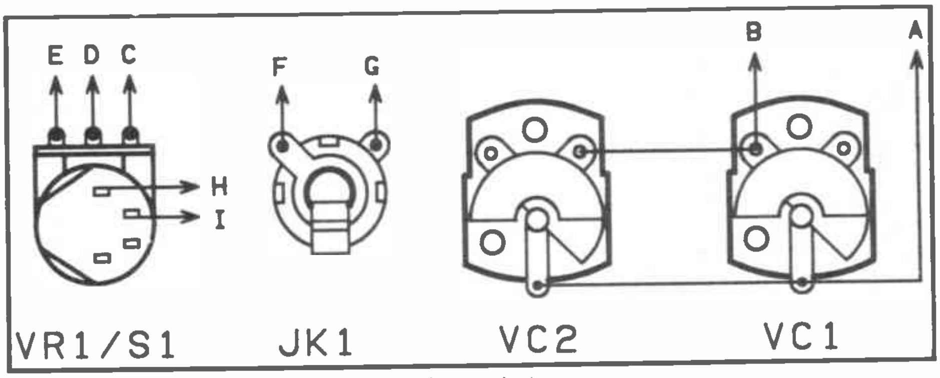


Fig 6: The connections to the controls and 'phone jack

Adjustment and use

The receiver requires an ordinary long-wire antenna, which is simply a piece of aerial wire which should be as long as possible and positioned as high as possible. While a long outdoor aerial is preferable, I obtained some reasonable results using about 6 to 7m of wire mounted in an upstairs room. An earth connection is often of little value, but this is not the case with a low-frequency band receiver, especially if a relatively short aerial is used. An earth can consist of a piece of metal rod or pipe of about half a metre long which is then pushed into moist soil and connected to the receiver with a short piece of fairly heavy-gauge wire. Even a simple and rather inefficient earth can greatly improve results.

Most types of earphone or headphone can be driven by the receiver. The only types that are likely to be unsuitable are low impedance earphones and headphones which are intended for direct connection to loudspeaker outputs. These are unlikely to give an adequate volume when used with this receiver. For high impedance headphones it is better to have the phones wired in parallel, but series connection will almost certainly be better for others. Good results were obtained with low impedance dynamic headphones, but only by using a 100 ohm series resistor to provide some attenuation and to reduce the level of loading on the receiver's output.

If an RF signal generator is available, there should be no difficulty in adjusting the core of T3 for the correct frequency coverage and the cores of T1 and T2 to optimise sensitivity. Use the proper trimming tool when adjusting the RF transformers.

Correctly adjusting the unit without suitable test equipment is largely a matter of trial and error. By turning the tuning control it should be possible to locate a few stations (adjusting T1 and T2 should peak them). If amateur transmissions cannot be found, try adjusting T3 to search for some (readjusting T1 and T2 will also maintain good sensitivity if T3 is moved well away from its initial setting). If you adopt this method, it makes sense to choose a time when there are likely to be plenty of amateur stations on the band. Evenings and weekends are best, while daytime (during weekdays) generally provides relatively few 80 metre amateur transmissions. During busy periods the band limits are fairly obvious and a suitable setting for T3 should be easily located. Once T1 and T2 are given a few final adjustments to peak sensitivity, the unit will be ready for use.

Virtually all single sideband transmissions on 80m are of the lower sideband variety. Searching for stations tends to be easier if you start at the high frequency end of the band (the vanes of VC1 unmeshed) and scan towards the low frequency end. This way, as you approach a station the audio pitch starts at a high level and gradually decreases to the correct pitch. Scanning the other way, it is necessary to tune right through the station and start tuning for the correct pitch. The first method is much easier, especially if you are new to single sideband reception and the band is crowded.

PROJECT BOOK

by Martin Williams

Last month we looked at the basic ideas behind attenuators, and I gave a table of values which would enable you to construct attenuators that give specific degrees of loss. This month we look at the best ways to construct the units.

Wideband

The most important thing to remember if you want to use the finished article on the VHF/UHF range is that all the leads between the various resistors must be kept as short as possible. By not doing so, you start to build in inductive reactance impedances. These impedances increase in value as the frequency is raised and, as they are effectively in series with the resistors, the actual loss through the attenuator will be unpredictable. A second cause for concern is that of capacitive impedance which is caused by the components being mounted too closely to the enclosing box or to each other.

Layout

These two conflicting requirements obviously mean that a certain amount of compromise comes into the final design. Possibly the best answer is to use a small box enclosure made up from tinplate with a suitable socket at each end. Construction is completed by suspending the resistors between the sockets (see **Fig 1**). In this form of construction, the earthed ends of the resistors can be soldered straight to the tinplate box.

High loss

It is possible to make a single attenuator with any degree of loss required, but this is not usually the best way to achieve high levels of attenuation. This is because, particularly at the higher frequencies, the signal tends to leak across the attenuator because of capacitive and inductive coupling between the various elements.

In practice, probably the highest level of loss that should be attempted in one step is 20dB. If higher levels are required it is better to use two, or even more, sections.

Cascading

Fig 2 shows an example of a 26dB 'T' type attenuator for a 50 ohm line built using a single 20dB and one 6dB unit in cascade. In fact, this uses one more resistor than is required to do the job. The best method is to combine the output resistor's first section with the input resistor of the second by simply adding the values and using a single component. This is shown as the dotted component in **Fig 2**. The same technique can also be used for cascaded sections that may be additionally needed to sort your requirements.

T and PI

The same idea can also be used when building 'M' or 'PI' type attenuators. In these cases, you should substitute a resistor which has the same value as the first and last sections of the PI or M type units combined. Incidentally, there is no reason why both of the PI and T sections cannot be cascaded.

Careful selection of both types, as well as selecting the most appropriate values of attenuation to build up the required loss, may well allow you to use resistors which are more readily available from the standard resistor ranges.

Power

When designing your attenuator the amount of power it will dissipate must be taken into account. Inserting a 3dB attenuator into a coax cable carrying 10W of RF will dissipate 5W of power. You will not get far if you build the attenuator with half watt resistors. Power dissipation becomes less of a problem if you spread the loss over several units, remembering to keep the lowest loss section at the end of the attenuator's input (you can work out why!). This is another strong argument in favour of using cascaded sections.

Development

You should now understand how to design and build single-loss units. Sometimes, though, it would be nice to have a magic box which, at the flick of a few switches, could provide any degree of attenuation required. You won't believe this, but that is the subject for next month's article.

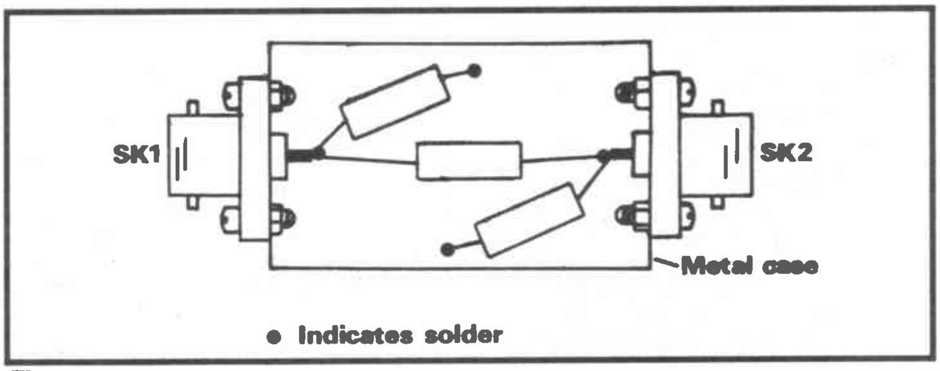


Fig 1

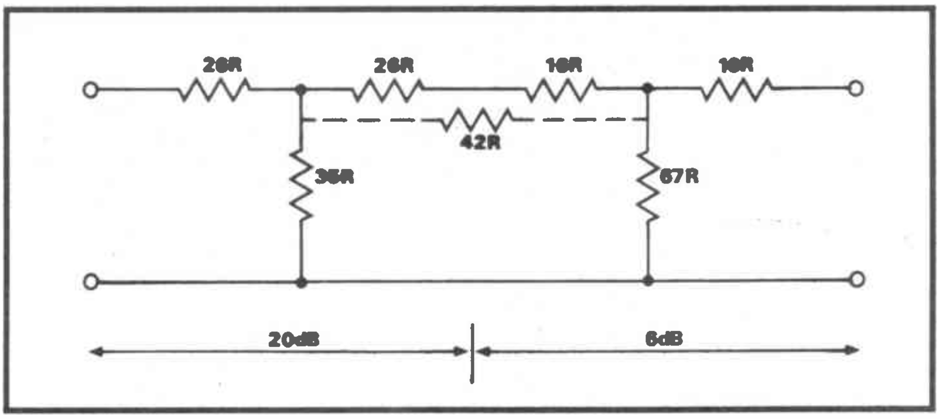


Fig 2

THE SEM VHF – HF CONVERTER REVIEW

by Steven Goodier G4KUB and John Goodier G4KUC

For those of you who are lucky enough to own either a receiver or transceiver with general coverage capabilities, then as far as the short wave bands are concerned, there seems to be little that one can not tune into. A problem arises when you wish to listen to frequencies above 30MHz – particularly the aircraft bands. Of course, it is always possible to purchase a scanner dedicated to these higher frequencies but these tend to be very expensive and can not really be justified for the occasional listener. Anyway, what is the point of having a sophisticated communications receiver without putting it to more use?

The obvious answer is to increase the coverage of your existing receiver by connecting some form of VHF converter. Indeed, many of the newer receivers such as the Kenwood R5000 and Yaesu FRG-8800, offer an accessory VHF module which gives an extended frequency coverage. For those of you who own equipment which does not offer such dedicated modules then all is not lost, as there is now a commercial VHF to HF converter available.

VHF converters – simple theory

Most converters are usually dedicated to covering a single amateur band such as 2m or 70cm, with the IF output usually being on the 10m amateur band. The receiver is then simply tuned across 28 to 29MHz for full coverage of the required VHF band. This method works extremely well and good sensitivity along with rejection of 'out of band' signals can be achieved by careful design and construction.

Fig 1 shows the block diagram of a simple VHF converter. Box 1 is a conventional RF amplifier which amplifies the incoming signal from the antenna. If the converter is only intended to receive a single amateur band, then this stage will also contain bandpass filters for the rejection of out of band signals. The amplified signal is then passed on to the mixer (box 2) where it is mixed with a fixed frequency from the local oscillator (box 3). The output frequency from the local oscillator is usually 116MHz for a 2m converter. The output from the mixer is taken to the receiver's antenna input and the required VHF band is usually tuned over 28 to 29MHz.

SEM VHF to HF converter

The SEM VHF to HF converter is not intended to cover any single amateur band, instead it is designed to increase the tuning range of a general coverage short wave receiver from 118MHz to 146MHz. This is achieved by tuning the receiver from 2MHz for reception on 118MHz, through to 29MHz for reception on 145MHz. More about this later.

The unit arrived well-packed in a padded bag. The converter was wrapped in polythene for extra protection on its journey from the Isle of Man. There was no circuit diagram or circuit description provided with the converter, but at a guess, I would suggest that the converter works in the same way as described above. The only difference is that the RF amplifier has a very wide bandwidth, and instead of the IF output being tuned for one particular frequency, say 28MHz, it is made to operate over a wide range: 2 to 29MHz, giving a coverage of 118 to 146MHz.

The VHF converter is housed in a metal box (measuring 2½in × 1½in × 3in). The front panel contains a single on/off switch. On the back there are three SO-239 connectors marked: 'VHF aerial', 'HF aerial' and 'receiver'. To one side of them is a single phone-socket which takes power to the unit. Removing the top cover reveals a double-sided roller-tinned PCB containing all the components necessary to convert from VHF to HF.

The PCB also contains a small and useful relay which provides automatic

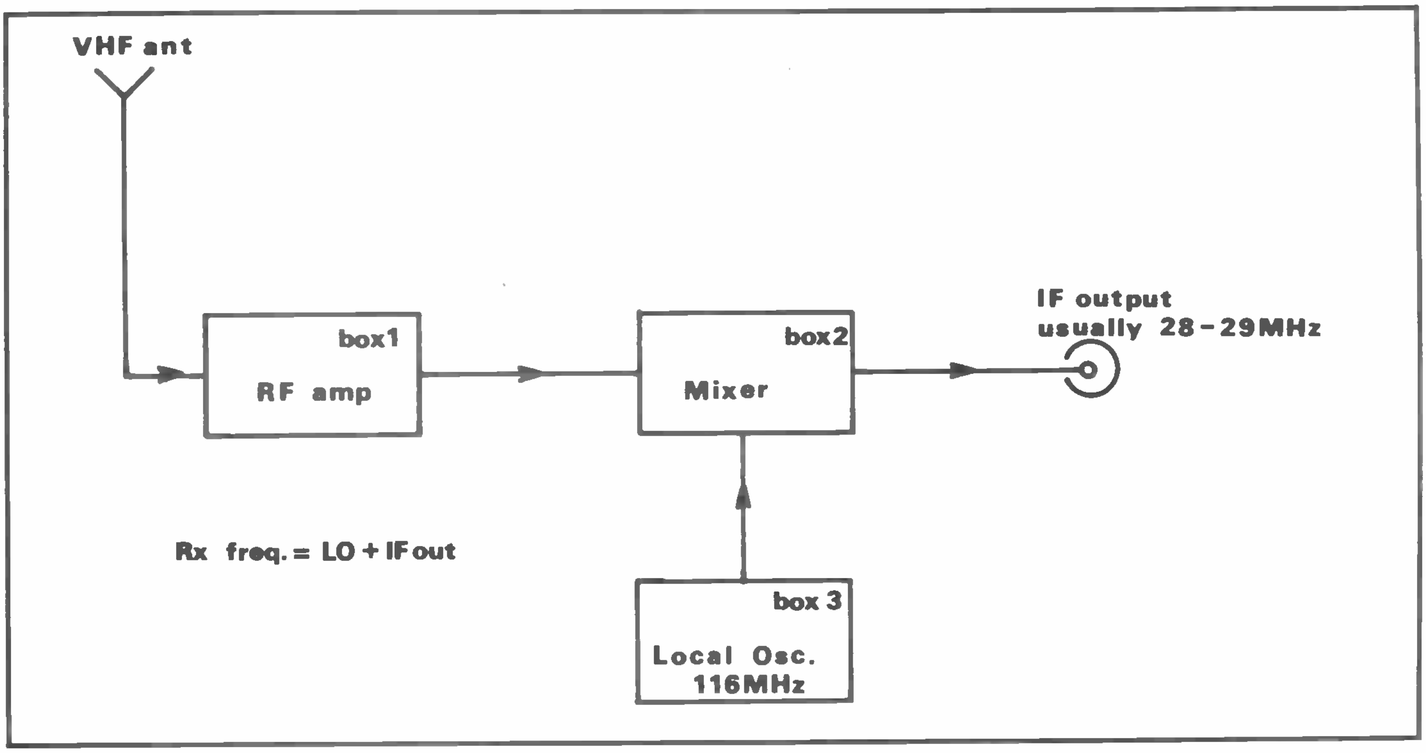
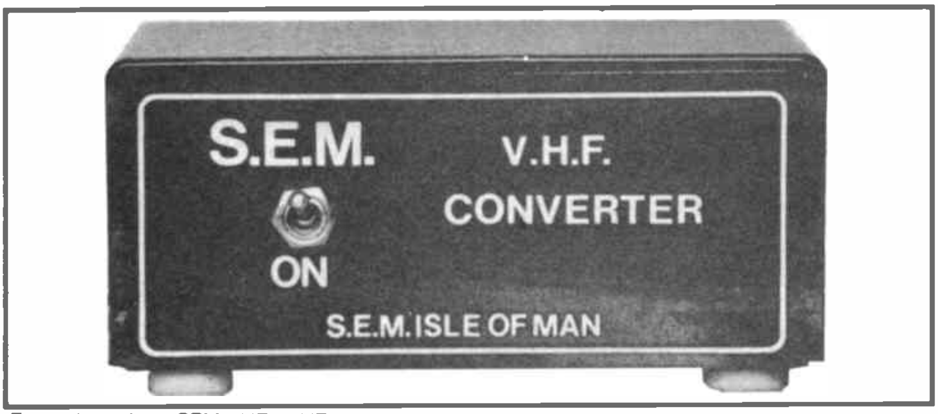
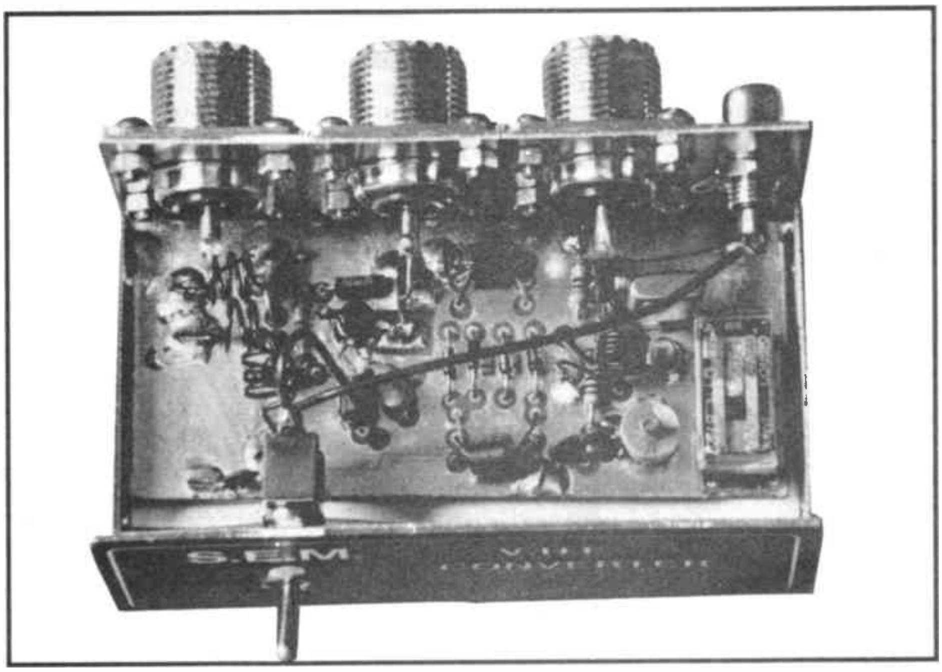


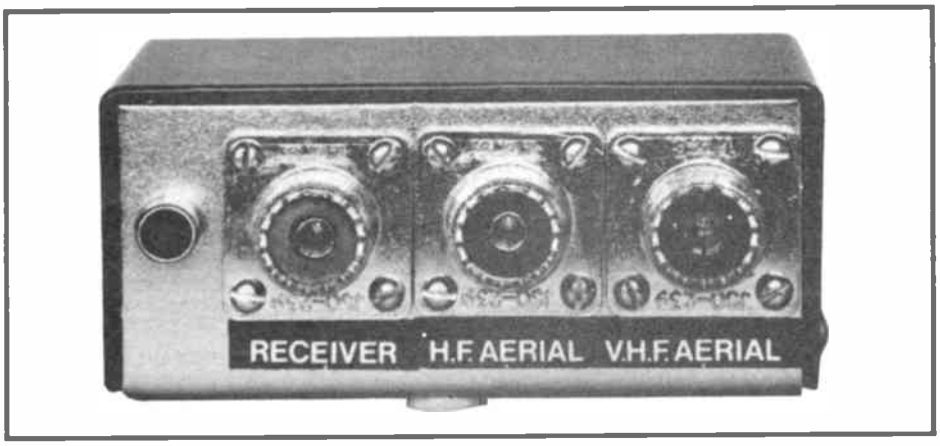
Fig 1: Block diagram of a simple VHF converter

changeover between VHF and HF antennas when the unit is switched on. The only problem with having the HF antenna connected to the unit when receiving VHF transmissions is the increased chance of short wave breakthrough, but this is something you will have to live with. The single-sheet instructions give details about the power supply and antenna connections, plus notes about calculating the received VHF frequency.



Front view of the SEM VHF to HF converter


Showing the converter's double-sided PCB



Rear view showing antenna and power supply connectors

Wiring the converter

The first job is to provide power to the unit which is done via the phono-socket on the back. The positive line is connected to the centre and the negative is connected to the outer of the phono. If you use the same supply which runs the receiver, then it will not be necessary to connect the negative line as this will be made via the coax braid from the receiver. I used a standard 13.8V PSU, but the converter will happily run from 9V. Current consumption is around 78mA which is a little high to run continuously from a battery. It is advisable to fit a 100mA fuse in line with the positive supply lead.

Connecting the antennas to the unit is very simple. If you do not intend to use an HF aerial then there are only two connections to make. The converter's IF output is labelled 'receiver' and feeds into the antenna's input on the receiver. The VHF antenna simply connects to the socket marked 'VHF aerial'. If you intend to use this converter with an HF transceiver, then I would advise you to connect the IF output to the 'aux aerial input' on the transceiver, if your rig is fitted with one. This is purely a safety precaution as it stops you accidentally transmitting into the converter.

As already mentioned, the unit incorporates an automatic changeover of HF to VHF aerials; this feature is only intended for use with a general coverage receiver, and the on-board relay is not intended to be transmitted through. When the unit is switched off, the HF antenna is taken directly to the receiver's input. As soon as power is applied to the converter the HF aerial is switched out and the converter's IF output is taken to the receiver, thus providing VHF coverage.

Using the VHF converter

The converter was used with a Kenwood TS-440S and a GPV-5 2m collinear antenna at about 30ft. The easiest way to check that the converter is working is to tune across 28 to 29MHz as this provides coverage of the 2 metre band. If all is working well you should hear any repeaters that are in range plus many local stations. The converter worked well on this part of the spectrum and there were no problems in receiving what could normally be heard with, for example, a Yaesu FT-209RH hand-held when connected to the collinear.

One of the problems you may encounter is calculating the VHF receive frequency when tuning across the bands. As the converter uses a local oscillator of 116MHz, then it is a simple matter of adding the receiver's displayed frequency to 116MHz, thus giving the correct VHF frequency. For example, if your receiver is tuned to 29.5MHz, adding 116MHz to this gives 145.5MHz which is indeed S20 on 2 metres. Another example is 3.4MHz, adding 116MHz to this gives 119.4MHz which is the approach frequency at Manchester Airport. The table on p16 shows a list of converted frequencies which should help you find your way around the VHF bands.

The converter could easily tune from 118MHz through to 146MHz. The transmissions from Manchester International Airport (located approximately twelve miles away) were easily received and transmissions from Woodford and Barton airports were also received. It was interesting to listen to Manchester ground on 121.7MHz and Manchester approach on 119.4MHz. Pilots could be heard many miles away requesting landing instructions, etc.

Other transmissions on the VHF bands included the Gas and Electricity Boards on 140MHz and PMR transmissions between 138 and 141MHz, as well as normal 2m transmissions on 144MHz. All this added to the interest of VHF listening during many hours of tuning about the bands.

Problems encountered

Although the converter worked extremely well, it is obvious with a design that uses such a wide front end that some breakthrough and out of band transmissions are going to be heard. The main problem was encountered from Radio 3, which could be heard in a number of different places across the band. Luckily, this breakthrough did not interfere with the part of the spectrum we wanted to listen to and on the whole did not cause too many problems. Another example of breakthrough came from a police relay situated on a large hill nearby.

The other problem you are bound to encounter is breakthrough from the short wave bands, especially if the VHF frequency you are listening to falls within a major broadcast or amateur band. The only real way to overcome this difficulty is to remove the HF antenna altogether. This reduced the problem by 95%, although slight breakthrough was encountered with very strong broadcast stations such as Radio Moscow. Fortunately, these stations did not fall upon the frequencies we wanted to listen to.

Conclusion

The SEM VHF to HF converter generally worked very well. Frequencies and transmissions which are normally unavailable on a general coverage short wave radio were easily heard. It is ideal for those who already own a receiver and would like to listen to VHF frequencies but can not afford the extra expense of a dedicated VHF/UHF scanner. Of course, it is limited in its frequency range, but remember, this converter is not intended to be a cheap substitute for a multi-band scanning receiver.

SEM informs us that they can supply a version of this converter with extended coverage up to 170MHz. This would enable one to listen to the emergency services on 152MHz; shipping and coastguard transmissions on 156 to 162MHz and radio telephones and mobiles on 163 to 165MHz. If you are interested in this version of the converter then contact SEM for more information.

We would like to thank SEM for the loan of the converter and for their help and advice with this review. Their address is: SEM, Unit B, Union Mills, Isle of Man. Tel: (0624) 851277. The converter costs £49.50 (including VAT and delivery).

SEM CONVERTER

HF frequency	VHF frequency	HF frequency	VHF frequency
2MHz	118MHz	16MHz	132MHz
3MHz	119MHz	17MHz	133MHz
4MHz	120MHz	18MHz	134MHz
5MHz	121MHz	19MHz	135MHz
6MHz	122MHz	20MHz	136MHz
7MHz	123MHz	21MHz	137MHz
8MHz	124MHz	22MHz	138MHz
9MHz	125MHz	23MHz	139MHz
10MHz	126MHz	24MHz	140MHz
11MHz	127MHz	25MHz	141MHz
12MHz	128MHz	26MHz	142MHz
13MHz	129MHz	27MHz	143MHz
14MHz	130MHz	28MHz	144MHz
15MHz	131MHz	29MHz	145MHz

VHF frequency = HF frequency + 116MHz

Example: HF frequency = 3.4MHz + 116MHz = 119.4MHz (Manchester Airport approach)

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

An archaic mode?

Many national radio societies, supposedly concerned with *all* aspects of amateur radio, appear to pay lip-service to CW. There seems to be little interest left centrally in what is considered an archaic and declining mode, despite the fact that many amateurs still use it. Within the RSGB the subject is dealt with by a number of different committees, each concerned with various other subjects, but there is no single point of reference for CW matters.

It can be argued that the Society has a lot to do with CW in terms of slow Morse transmissions, the Morse testing scheme and the new class B facility. None of these, however, is as effective in terms of promoting and increasing CW activity as it could be. They are not intended to encourage people to *take up* CW; their purpose is simply to help those who have passed the RAE to obtain their A licence irrespective of what mode(s) they subsequently intend to use.

In my November 1986 column I mentioned the view of G3GJW that Morse enthusiasts would serve themselves best by forming a special interest organisation, similar to BARTG and other specialist societies, to be concerned with CW education and training, etc. 'Instead of being just one minority interest within a national society, such an organisation would have the benefit of all its members' time, interest and effort'.

I have to agree with that, although I do feel that more could be done within the RSGB itself. I can't see them setting up a special CW committee, as every other mode would demand the same thing. But why not a CW Advisory Group, concerned exclusively with Morse operating, to undertake detailed work on a variety of matters intended to keep the mode alive and well in its own right?

It could have an advisory input to all RSGB committees whose terms of reference include any aspect of CW. It would lighten the load of those committees and at the same time ensure that the voice of CW was not lost in the tide of advancing technology.

What international language?

The sort of thing I mean is exemplified by the following. Last July I referred to the decreasing use of internationally understood abbreviations and codes and suggested that something ought to be done about it before one of the unique features of Morse communication is lost forever. I also posed the question, *'who* should do something about it'?

I then received a letter from Tom Mansfield G3ESH, who has compared fourteen published lists of CW abbreviations and settled on '100 English language CW abbreviations in common use.'

He says, 'At the request of the RSGB I forwarded this list for publication in the callbook. They then proceeded to marry my list with the one previously published which includes some Q-codes, plus abbreviations "in common use within amateur radio, in CW, correspondence, the spoken word and some literature". They completely ignored my argument that what was wanted was an easy reference to commonly used (or perhaps not so common) CW abbreviations.

'I protested but got nowhere; the gentleman at Potters Bar claiming that amateurs needed to know the abbreviations for International Telephone and Telegraph Committee (CCITT), County Emergency Planning Officer (CEPO), St John Ambulance Brigade (SJAB), etc...

'After hearing some very peculiar abbreviations on the air, and finding others in published lists...I feel that there is a need for a recognised list... I suggested to the RSGB that this might be a joint project with the ARRL thus getting world-wide acceptance. I also offered to help deal with all the paperwork, but my suggestions fell on deaf ears...'

Tom's experience illustrates my point. Just who (or what committee) at the RSGB is responsible for receiving such well-intentioned and helpful suggestions relating to CW operating? And even more to the point, is anyone there really *interested* in such a constructive offer which would surely help to strengthen and improve amateur CW standards and performance?

USSR QSLs

In my September column I asked for comments on the new-found freedom of Russian amateurs to QSL direct. A number of readers responded.

It seems to be quite common for letters in Russian to accompany the cards, which is not always very helpful! Although the Soviet operators can write direct to foreign addresses, apparently the PO box address they give is that of their club. Bob Hearn G0BTY comments, 'they are also allowed to send photographs and if you collect stamps why not let them know? You may have a pleasant surprise'. My thanks to all who wrote or phoned about this interesting new development.

Good timing

Ron Patchitt G6SZW, wrote to me about the problems of learning Morse. 'At slow speeds', he says, 'ie, with characters at 12wpm, but with a gap of three dits between letters, I can receive fair copy from my BBC computer. But at 8wpm with no extended gaps it is difficult to follow'.

In **Morsum Magnificat** (July 1987) Bill Pierpont N0HFF refers to learning to send by the same method. He quotes from the old Candler system which recommends sending letters with long spaces between them, gradually reducing the length of the spaces over a series of practice drills until normal spacing is achieved.

In receiving, the system of learning letters, etc, straight away at 12wpm, with extended spaces, has much to commend it since the right sound for each character is learned from the beginning. Then, continuous practice is required, as recommended by Candler, not so much to remember the characters but to reduce the spacings down to normal.

N0HFF says 'The heart of the telegraph code is timing...well-sent, properly proportioned signals stand out like landmarks of clarity... It is lack of proper spacing between letters and between words that causes most of our problems... Perhaps the commonest fault concerns the need to keep words separate. Without such separation the receiver is deprived of a key element in his reading and understanding – the point where each word begins'.

If it's any comfort to G6SZW and others learning Morse the same way, the emphasis they are having to give to the length of spacing at present may well help them to develop a good sending style when they finally pass the test and try their code on the air.

Rhythm method?

Heard on 2 metres, 'Yes, the RSGB book on Morse is by Margaret Mills, but I don't know whether she is the same Mrs Mills that plays the piano'. (From 'Groundwave' newsletter of the Wimbledon and District ARS, December 1987).

P.M. COMPONENTS LTD

PHONE 0474 60521
FAX NO.0474 333 762

SELECTRON HOUSE
SPRINGHEAD ENTERPRISE PARK, SPRINGHEAD ROAD
GRAVESEND, KENT DA11 8HD

TELEX 966371 TOS PM

A SELECTION FROM OUR STOCK OF BRANDED VALVES (Contd)

- DL35 2.50
- DL63 1.00
- DL70 2.50
- DL73 2.50
- DL91 3.95
- DL92 1.25
- DL93 1.10
- DL96 2.50
- DLS10 13.50
- DLS16 10.00
- DM70 3.95
- DM160 6.50
- DOD-006 79.50
- DY51 1.50
- DY86/87 0.75
- DY802 0.85
- E55L 49.50
- E80CC 19.50
- E80CF 12.50
- E80F 18.50
- E80L 29.50
- E81CC 5.50
- E81L 12.00
- E82CC 4.50
- E83CC 4.50
- E83F 5.50
- E86C 6.50
- E88C 7.95
- E88CC 3.50
- E88CC Mullard 4.95
- E88CC-01 6.95
- E90CC 7.95
- E90F 7.95
- E91H 4.50
- E92CC 3.95
- E99F 6.95
- E130L 18.50
- E180CC 9.50
- E180F 6.50
- E182CC 9.00
- E186F 5.50
- E188CC 7.50
- E235L 12.50
- E280F 19.50
- E283CC 12.00
- E288CC 17.50
- E810F 25.00
- E1148 1.00
- EA50 1.00
- EA52 65.00
- EA76 1.95
- EA79 1.95
- EABC80 1.50
- EAC91 2.50
- EAF42 1.20
- EB34 1.50
- EB41 3.95
- EB91 0.65
- EBC33 2.50
- EBC41 1.50
- EBC81 1.50
- EBC90 1.50
- EBC91 1.95
- EBF80 0.95
- EBF83 0.95
- EBF89 0.70
- EC95 7.00
- EBL1 4.50
- EBL21 4.50
- EC52 0.75
- EC70 1.75
- EC81 7.95
- EC86 1.95
- EC88 1.95
- EC90 1.50
- EC91 5.50
- EC93 1.50
- EC95 7.00
- EC97 1.10
- EC8010 12.00
- ECC32 3.50
- ECC33 3.50
- ECC35 3.50
- ECC81 1.50
- ECC81 Special quality 2.25
- ECC82 0.85
- ECC82 Philips 1.95
- ECC83 0.95
- ECC83 Brimar 2.15
- ECC83 Philips 1.95
- ECC83 Siemens 2.50
- ECC83S 3.50
- ECC85 1.00
- ECC86 2.75
- ECC88 1.00
- ECC89 1.50
- ECC91 2.00
- ECC189 2.50
- ECC801S 6.95
- ECC803S 6.95
- ECC804 0.60
- ECC2000 7.95
- ECF80 1.15
- ECF82 1.15
- ECF86 1.70
- ECF200 1.65
- ECF202 1.65
- ECF801 0.85
- ECF804 6.50
- ECF805 2.50
- ECF806 10.25
- ECH3 4.50
- ECH4 4.50
- ECH35 3.50
- ECH42 1.50
- ECH81 1.75
- ECH83 1.00
- ECH84 1.00
- ECH200 1.50
- ECL80 0.60
- ECL82 1.00
- ECL83 2.50
- ECL84 0.74

- ECL85 0.95
- ECL86 0.95
- ECL805 0.95
- EF37A 2.50
- EF39 1.50
- EF40 4.50
- EF42 3.50
- EF50 2.50
- EF54 4.50
- EF55 4.95
- EF70 1.20
- EF73 3.50
- EF80 0.55
- EF83 3.95
- EF85 0.50
- EF86 2.25
- EF86 Mullard 4.50
- EF86/CV4085 5.00
- EF89 1.50
- EF91 1.95
- EF92 2.15
- EF93 1.50
- EF94 1.50
- EF95 1.95
- EF86/CV4085 5.00
- EF97 0.90
- EF98 0.90
- EF183 0.75
- EF184 0.85
- EF731 4.50
- EF800 11.00
- EF804S 19.50
- EF805S 25.00
- EF806S 25.00
- EF812 0.65
- EFL200 1.50
- EFP60 3.50
- EH90 0.72
- EK90 1.50
- EL32 0.95
- EL33 5.00
- EL34 2.95
- EL34 Siemans 4.50
- EL36 2.50
- EL36 Mullard 3.95
- EL37 5.00
- EL38 9.00
- EL41 3.50
- EL42 2.00
- EL509 Mullard 7.50
- EL71 4.50
- EL81 8.95
- EL83 7.50
- EL84 Mullard 3.50
- EL84 Siemans 2.50
- EL85 4.50
- EL86 1.75
- EL90 1.75
- EL91 5.00
- EL95 1.75
- EL152 15.00
- EL360 8.75
- EL500 1.95
- EL504 1.95
- EL506 5.95
- EL509 5.25
- EL519 6.95
- EL802 3.95
- EL821 6.95
- EL822 12.95
- ELL80 22.50
- EM34 12.50
- EM83 1.65
- EM84 1.65
- EM85 3.95
- EM87 2.50
- EN32 15.00
- EN91 1.95
- EN92 4.50
- EY51 0.80
- EY70 7.50
- EY81 2.35
- EY82 1.15
- EY83 1.50
- EY84 5.95
- EY86/87 0.50
- EY88 0.85
- EY91 5.50
- EY500A 1.50
- EY802 0.70
- EZ35 1.00
- EZ40 2.75
- EZ41 2.75
- EZ80 0.75
- EZ81 0.75
- EZ90 1.50
- FW4-800 2.95
- G55/1K 9.00
- G180/2M 6.95
- G240/2D 9.00
- GC10B 17.50
- GC10D 17.50
- GC10/4B 17.50
- GC10/4E 17.50
- GC12/4B 17.50
- GD86W 6.00
- GDT120M 5.00
- GN4 6.00
- GN10 15.00
- GR10G 4.00
- GS10C 16.50
- GS10H 12.00
- GS12D 12.00
- GT1C 14.00
- GU20 35.00
- GU50 17.50
- GXU1 13.50
- GXU3 24.00
- GXU50SS 14.50

- GY501 1.50
- GY802 1.50
- GZ32 2.50
- GZ233 4.50
- GZ234 2.50
- GZ237 4.50
- HBC90 1.95
- HF93 2.50
- HL41 3.50
- HL90 3.50
- HL13DD 3.50
- KT8C 7.00
- KT33C 3.50
- KT36 2.00
- KT44 4.00
- KT45 4.00
- KT61 5.00
- KT63 2.00
- KT66 USA 9.95
- KT66 GEC 25.00
- KT67 9.00
- KT77 Gold lion 11.95
- KT81 7.00
- KT88 USA 10.95
- KT88 Selectron 15.00
- KT88 GEC 22.50
- KTW61 2.50
- KTW62 2.50
- KTW63 2.00
- KTZ63 2.50
- LB7-20 95.00
- LS9B 6.95
- M508 195.00
- M5143 155.00
- M5199 295.00
- M8079 6.00
- M8082 7.50
- M8083 3.25
- M8091 7.50
- M8096 3.00
- M8098 5.50
- M8099 6.00
- M8100 5.50
- M8136 7.00
- M8137 7.95
- M8161 6.50
- M8162 5.50
- M8163 5.50
- M8190 4.50
- M8195 6.50
- M8196 5.50
- M8204 5.50
- M8223 4.50
- M8224 2.00
- M8225 3.95
- ME1400 3.50
- ME1401 29.50
- ME1402 29.50
- MHLD6 4.00
- MS4B 5.50
- MU14 3.50
- N37 12.50
- N78 9.85
- OA2 1.50
- OA2WA 2.50
- OA3 2.50
- OB2 1.50
- OB2WA 2.50
- OC3 2.50
- OD3 2.50
- OM4 2.50
- 10.95
- KT88 Selectron 17.50
- KT88 Gold lion 15.95
- KTW61 2.50
- KTW62 2.50
- KTW63 2.00
- KTZ63 2.50
- LB7-20 95.00
- LS9B 6.95
- M508 195.00
- M5143 155.00
- M1599 295.00
- M8079 6.00
- M8082 7.50
- M8083 3.25
- M8091 7.50
- M8096 3.00
- M8098 5.50
- M8099 5.00
- M8100 5.50
- M8136 7.00
- M8137 7.95
- M8161 6.50
- M8162 5.50
- M8163 5.50
- M8190 4.50
- M8195 6.50
- M8196 5.50
- M8204 5.50
- M8223 4.50
- M8224 2.00
- ME1400 3.50
- ME1401 29.50
- ME1402 29.50
- MHLD6 4.00
- MS4B 5.50
- MU14 3.50
- N37 12.50
- N78 9.85
- OA2 1.50
- OA2WA 2.50
- OA3 2.50
- OB2 1.50
- OB2WA 2.50
- OC3 2.50
- OD3 2.50
- OM4 2.50

- DM5B 3.00
- OM6 1.75
- ORP43 2.50
- ORP50 3.95
- P61 2.50
- P41 2.50
- PABC80 0.75
- PC86 0.75
- PC88 0.75
- PC97 1.10
- PC900 1.25
- PCC84 0.40
- PCC85 0.55
- PCC88 0.70
- PCC89 0.70
- PCC189 0.70
- PCC805 0.70
- PCC806 0.80
- PCE82 0.80
- PCF80 0.65
- PCF82 0.60
- PCF84 0.65
- PCF86 1.20
- PCF87 1.25
- PCF200 1.50
- PCF201 1.50
- PCF801 1.35
- PCF802 0.85
- PCF805 1.25
- PCF806 1.00
- PCF808 1.25
- PCH200 1.50
- PCL82 0.85
- PCL83 2.50
- PCL84 0.75
- PCL85 0.80
- PCL86 0.85
- PCL805 0.90
- PD500 5.95
- PE1-100 69.00
- PEN25 2.00
- PEN40DD 3.00
- PEN45 3.00
- PEN45DD 3.00
- PEN46 2.00
- PFL200 0.95
- PL36 1.75
- PL38 1.50
- PL81 1.25
- PL82 0.60
- PL83 0.52
- PL84 0.78
- PL500 1.10
- PL504 1.15
- PL508 1.75
- PL509 4.85
- PL519 4.95
- PL802 6.00
- PL202T 3.50
- PL820 2.95
- PY32 0.60
- PY33 0.50
- PY81 0.70
- PT82 0.70
- PY83 0.70
- PY88 0.65
- PY500A 1.95
- PY800 0.79
- PY801 0.79
- QB3-300 72.00
- QB3-1750 139.50
- QB5-3500 595.00
- QE03-10 4.95
- QQE02-5 19.50
- QQE03-12 7.95
- QQE03-20 35.00
- QQE06-40 45.00
- QQV02-6 19.50
- QQV03-10 5.50
- QQV03-10 Mullard 18.00
- QQV03-20 25.00
- QQV06-40A 27.50
- QQV06-40A Mullard 39.50
- QQV07-50 55.00
- QQZ03-20 42.50
- QQZ06 40 45.00
- QS75/20 1.50
- QS75/40 3.00
- QS92/10 5.00
- QS95/10 4.85
- QS108/45 4.00
- QS150/15 6.95
- QS150/30 1.15
- QS150/40 7.00
- QS1200 3.95
- QS1202 3.95
- QS1203 4.15
- QS1205 3.95
- QS1209 3.15
- QS1212 3.20
- QS1213 5.00
- QS1218 5.00
- QU37 9.50
- QV03-12 6.50
- QV06-20 29.50
- QV08-100B 145.00
- QY3-125 72.00
- QY4-250 72.00
- QY4-400 85.00
- R10 4.00
- R11 4.50
- R16 12.00
- R17 1.50
- R18 2.50

- R19 2.50
- R20 1.20
- R1169 55.00
- R5559 9.50
- RG1-125 4.95
- RG1-240A 14.50
- RG3-250A 6.50
- RG3-1250A 35.00
- RK2K25 62.50
- RPY18 2.50
- RPY43 2.50
- RPY82 2.50
- RR3-250 16.00
- RR3-1250 35.00
- S6F17 5.95
- S6F33 28.95
- S11E12 38.00
- S3C/2K 8.50
- S104/1K 10.00
- S109/1K 15.00
- S130P 5.95
- SC1/600 5.00
- SC1/1100 5.00
- SC1/1200 5.00
- SC1/1300 5.00
- SC1/1400 5.00
- SP41 5.00
- SP61 3.50
- ST11 5.00
- STV280/40 11.95
- SU42 4.95
- TB2-5/300 96.00
- TB2-300 195.00
- TB3-750 115.00
- TB3-2000 450.00
- TBL2-300 395.00
- TBL2-500 495.00
- TC04/10-02 45.00
- TD03-10E 35.00
- TD03-10F 35.00
- TDD2A 4.95
- TH328 850.00
- TH2321 4.95
- TP2620 5.50
- TT11 1.50
- TT15 45.00
- TT21 45.00
- TT22 39.50
- TT100 69.00
- TTR-31MR 65.00
- TY2-125A 85.00
- TY4 400 85.00
- TY7-6000A 600.00
- TY8-600W 365.00
- TYS2/250 375.00
- U18-20 2.75
- U19 11.95
- U24 2.00
- U25 0.90
- U26 0.90
- U35 3.50
- U37 9.00
- U41 6.95
- U50 2.00
- U82 3.00
- U191 0.70
- U192 1.00
- U193 1.00
- U251 2.50
- U801 3.50
- UABC80 1.00
- UAF42 1.95
- UBF80 0.60
- UBC41 3.95
- UBC81 1.50
- UBF89 1.00
- UBL21 1.75
- UC92 1.20
- UCC84 0.70
- UCC85 0.60
- UCF80 1.00
- UCH21 2.50
- UCH41 2.50
- UCH42 3.95
- UCH81 1.00
- UCL82 1.75
- UCL83 2.50
- UF41 2.25
- UF42 2.25
- UF80 1.75
- UF85 1.20
- UF89 2.00
- UL41 10.00
- UL44 3.50
- UL84 1.50
- UL85 0.85
- UU5 3.50
- UU6 6.00
- UU7 8.00
- UU8 9.00
- UY41 3.50
- UY85 0.70
- V235A/1K 250.00
- V238A/1K 295.00
- V246A/2K 315.00
- V2406/1K 225.00
- V241C/1K 195.00
- V453 12.00
- VLS631 10.95
- VP4B 9.50
- VP41 4.95
- VR7-30 3.00
- VR101 2.50

- VR105/30 2.50
- VR150/30 2.50
- VU29 4.50
- VU39 2.50
- W21 4.50
- W61 4.50
- W77 6.00
- W81M 4.50
- W729 1.00
- W739 1.50
- X24 4.50
- X41 4.50
- X66/X65 4.95
- X76M 1.95
- XC24 1.50
- XC25 0.50
- XFW47 1.50
- XFW50 1.50
- XG1-2500 75.00
- XL626FT 7.50
- XNP12 2.50
- XR1-1600A 49.50
- XR1-3200A 79.50
- XR1-6400A 149.50
- Y65 6.95
- YD1100 75.00
- YJ1020 42.50
- YJ1060 265.00
- YL1060 195.00
- YL1070 195.00
- YL1071 195.00
- YL1290 65.00
- YL1440 450.00
- Z77 1.20
- Z300T 8.00
- Z302C 12.00
- Z359 9.00
- Z520M 4.00
- Z700U 9.50
- Z759 19.85
- Z803U 18.95
- ZA1000 12.50
- ZA1001 1.50
- ZM1001 12.00
- ZM1005 5.00
- ZM1020 6.00
- ZM1021 5.00
- ZM1023 7.95
- ZM1041 14.00
- ZM1082 9.00
- ZM1084 10.00
- ZM1175 6.50
- ZM1177 9.00
- ZM1202 55.00
- ZM1263 4.00
- 1A3 4.50
- 1AE4 3.50
- 1AX2 3.50
- 1B22 10.00
- 1B27 55.00
- 1B35A 45.00
- 1B63A 75.00
- 1K3 2.50
- 1N5GT 2.50
- 1P28 25.00
- 1R5 0.90
- 1S5 1.50
- 1T4 1.00
- 1U4 1.75
- 1U5 1.00
- 1X2B 2.50
- 2A3 16.50
- 2AS15A 11.50
- 2B7 2.50
- 2B22 69.50
- 2C36 70.00
- 2C39A 32.50
- 2C39BA 39.50
- 2C40 37.00
- 2C42 29.50
- 2C43 60.00
- 2C51 2.50
- 2CY5 1.50
- 2D21 1.95
- 2D21W 3.15
- 2E22 49.00
- 2E26 7.95
- 2J55 295.00
- 2K25 35.00
- 2K25 Raytheon 75.00
- 2K26 95.00
- 2K29 250.00
- 2K48 140.00
- 2K56 250.00
- 2X2A 5.00
- 3A/107B 12.00
- 3A/108A 9.00
- 3A/109B 11.00
- 3A/110K 12.00
- 3A/141K 11.50
- 3A/146J 7.50
- 3A/147J 7.50
- 3A167M 10.00
- 3A3A 3.95
- 3A4 1.10
- 3A5 4.50
- 3AT2 3.35
- 3B22 25.00
- 3B24 12.00
- 3B26 24.00
- 3B28 15.00
- 3BZ6 1.50
- 3C45 39.50
- 3CX3000A7 650.00
- 3CY5 1.50
- 3D21A 29.50
- 3E22 49.50
- 3E29 39.50
- 3EJ7 1.95
- 3H 0.40
- 3J 170E 1450.00
- 3L 0.40
- 3Q4 2.50
- 4-65A 75.00

- 4-250A 85.00
- 4-400A 87.50
- 1000A 425.00
- 4B32 35.00
- 4B/551B 125.00
- 4BQ7A 1.75
- 4BZ6 1.95
- 4C28 25.00
- 4C35 145.00
- 4CX125C Eimac 150.00
- 4CX250B 45.00
- 4CX250BM 65.00
- 4CX250K 115.00
- 4C250R 125.00
- 4CX350A 100.00
- 4CX350F 95.00
- 4CX1000A 425.00
- 4CX1500B 475.00
- 4CX5000A 1000.00
- 4D21/4-125A 85.00
- 4D32 125.00
- 4GS7 2.25
- 4GV7 2.25
- 4JC6A 2.95
- 4KT6 1.50
- 4X150A 35.00
- 4X500A 350.00
- 5A/102D 9.50
- 5A152M 9.00
- 5A163K 10.00
- 5A170K 6.25
- 5A-180M 9.00
- 5A-206K 10.00
- 5AM8 2.15
- 5AN8 1.20
- 5B-110M 10.00
- 5B-254M 14.50
- 5B-255M 19.50
- 5B-256M 15.00
- 5B-257M 19.00
- 5B-258M 14.50
- 5C22 125.00
- 5CL8A 2.50
- 5J180E 1950.00
- 5LJ8 2.95
- 5R4GB 5.50
- 5R4GY 4.95
- 5TA 5.95
- 5T8A 1.95
- 5U4G 4.50
- 5U4GB 4.50
- 5V4G 2.50
- 5X4 4.95
- 5Y3GT 1.95
- 5Z3 4.50
- 5Z4GT 2.50
- 6/30L2 0.70
- 6A203K 9.00
- 6A7 4.95
- 6A8 1.50
- 6AB7 4.50
- 6AC7WA 2.00
- 6AG5 2.50
- 6AG7 1.95
- 6AH6 3.50
- 6AJ4 3.50
- 6AJ7 2.00
- 6AK5 1.95
- 6AK6 2.50
- 6AL5 0.85
- 6AM4 3.25
- 6AM5 6.00
- 6AM6 1.95
- 6AN5 4.50
- 6AN8A 4.50
- 6AQ5 1.75
- 6AQ8 1.00
- 6AR5 5.95
- 6AS5 1.50
- 6AS6 2.50
- 6AS7G 4.50
- 6AT6 1.95
- 6AT8 1.75
- 6AU4GT 2.00
- 6AU5GT 4.50
- 6AU6 0.95
- 6AV6 1.95
- 6AW8A 3.50
- 6AX4GT 1.95
- 6AY3B 1.95
- 6AZ8 4.50
- 6B8G 1.50
- 6B10 1.95
- 6BA6 1.50
- 6BA7 4.50
- 6BA8A 3.50
- 6BC8 0.85
- 6BE6 1.50
- 6BG6G 3.00
- 6BH6 1.95
- 6BH8 1.50
- 6BJ6 1.50
- 6BK4 6.50
- 6BL6 65.00
- 6BL8 1.15
- 6BM6 115.00
- 6BN6 1.65
- 6BN8 3.95
- 6BQ5 0.95
- 6BQ7A 1.50
- 6BR7 4.95
- 6BS7 5.50
- 6BW6 5.35
- 6BW7 1.50
- 6BZ6 2.50
- 6BZ7 2.95
- 6C4 1.50
- 6C5 1.95
- 6C6 3.50
- 6C8G 1.50
- 6C9 4.95
- 6CA4 4.95

- 6CA7 3.50
- 6CB5 3.95
- 6CB6 1.95
- 6CD6GA 4.50
- 6CF6 1.95
- 6CG7 4.50
- 6CH6 6.95
- 6CL6 3.25
- 6CL8A 1.50
- 6CM7 2.95
- 6CS6 0.75
- 6CS7 0.95
- 6CW4 8.00
- 6CX8 2.50
- 6DC6 2.35
- 6DJ8 1.00
- 6DK6 1.50
- 6DQ5 6.50
- 6DQ6B 2.50
- 6DT6A 1.50
- 6DW4B 3.50
- 6E5 3.95
- 6EA7 2.50
- 6EA8 2.50
- 6EB8 1.75
- 6EJ7 0.85
- 6EM5 2.50
- 6EM7 2.50
- 6EV8 1.75
- 6EV7 2.95
- 6EW6 1.50
- 6F1 2.00
- 6F5 5.50
- 6F6G 2.50
- 6F7 6.50
- 6F13 3.00
- 6F14 1.00
- 6F17 2.75
- 6F23 0.60
- 6F24 1.25
- 6F25 1.25
- 6F28 1.25
- 6F32 1.25
- 6F33 12.50
- 6FH5 6.50
- 6FH8 5.95
- 6FL2 4.50
- 6FQ7 4.50
- 6GE5 3.95
- 6GH8A 2.50
- 6GK6 3.95
- 6GJ7 0.85
- 6GM6 2.65
- 6GS7 2.15
- 6GV8 0.95
- 6GW8 2.50
- 6GY5 4.95
- 6GY6 2.50
- 6H1 9.50
- 6H6 2.50
- 6H6GT 1.95
- 6HB7 1.95
- 6HF8 2.50
- 6HM5 2.50
- 6HQ5 3.50
- 6HS6 4.95
- 6HS8 2.95
- 6HZ6 3.50
- 6J4 2.15
- 6JAWA 3.15
- 6J5GT 2.50
- 6J6 2.00
- 6J7 4.15
- 6J7G 4.15
- 6JB6A 7.95
- 6JE6C 7.50
- 6JM6 7.50
- 6JU8A 2.50
- 6JS6C 8.50
- 6K7G 2.00
- 6K8G 3.00
- 6KD6 8.95
- 6KG6A 6.95
- 6KM8 2.50
- 6L1 2.50
- 6L6GC 2.95
- GL6GC USA 6.50
- 6L6GT 2.95
- 6L6WGC 5.50
- 6L7 3.50
- 6L15 3.15
- 6L19 3.95
- 6LJ8 2.50
- 6LD20 1.15
- 6LF6 7.50
- 6LQ6 7.50
- 6P28 2.00
- 6Q7GT 1.50
- 6R7 3.15
- 6RHH8 10.00
- 6S4A 1.50
- 6SA7 1.35
- 6SC7 1.50
- 6SH7 1.35
- 6SJ7GT 1.20
- 6SK7 1.35
- 6SL7GT 1.95
- 6SN7GT 1.95
- 6SQ7GT 1.50
- 6SS7 1.95
- 6T8 1.50
- 6U6GT 3.50
- 6U7G 3.50
- 6U8A 1.50
- 6V6G 1.25
- 6V6GT 1.95
- 6W4GT 1.95
- 6Y6G 3.95
- 6X2N 1.00
- 6X4 1.50
- 6X5GT 1.00
- 6X5GTY 1.00
- 6X8A 2.25
- 7A6 4.50
- 7AU7 1.50
- 7B6 3.50
- 7B7 2.50
- 7D8 4.50
- 7J7 5.50
- 7K7 7.50
- 7L 1.50
- 7Q7 4.50

- 7Y4 2.50
- 8B8 2.50
- 8B10 2.50
- 8BQ5 1.95
- 8CW5 1.50
- 8EB8 1.50
- 8FQ7 1.97
- 10D2 1.25
- 10DE7 2.50
- 10DX6 2.50
- 10EB8 1.95
- 10EW7 2.95
- 10F1 0.75
- 10GK6 1.95
- 10P14 2.50
- 11E3 55.00
- 11R3 5.50
- 12A6 3.95
- 12AD6 1.50
- 12AE6 5.50
- 12AH7GT 4.95
- 12AL5 1.00
- 12AT6 1.25
- 12AT7 1.15
- 12AT7WA 2.50
- 12AU6 1.50
- 12AU7 0.85
- 12AV6 1.95
- 12AV7 2.50
- 12AX4GTB 1.50
- 12AX7 0.95
- 12AX7WA 2.50
- 12AX7S 7.95
- 12AY7 3.95
- 12B4A 4.50
- 12BA6 2.50
- 12BE6 1.95
- 12BH7A 3.50
- 12BL6 1.75
- 12BR3 1.95
- 12BY7A 3.50
- 12C8 2.50
- 12CA5 1.95
- 12CX6 1.20
- 12DQ6B 3.50
- 12DW4A 3.50
- 12DZ6 3.95
- 12E1 19.50
- 12E14 38.00
- 12FX5 1.95
- 12GN7 3.95
- 12HG7 3.95
- 12J5GT 3.95
- 12J7GT 3.50
- 12JZ8 2.95
- 12K7GT 1.50
- 12K8Y 1.95
- 12KU7 1.95
- 12PE13A 53.00
- 12S7GT 1.50
- 12SA7GT 1.95
- 12SG7 4.75
- 12SK7 1.95
- 12SJ7 1.50
- 12SN7GT 1.85
- 12SW7 3.50
- 12SY7 4.50
- 12X4 1.95
- 13D7 3.20
- 13D9 3.20
- 13DE7 2.50
- 13DR7 2.95
- 13E1 145.00
- 13EM7 3.50
- 14B6 4.50
- 14R7 3.50
- 15E 6.50
- 16AQ3 1.95
- 16GY5 2.95
- 16H 0.40
- 16L 0.40
- 17A8 3.50
- 17AX4GTA 1.95
- 17BE3 2.50
- 17DW4A 2.95
- 17EW8 0.95
- 17JZ8 4.50
- 18D3 6.00
- 18GB5 3.50
- 19AQ5 3.50
- 19AU4GT 2.50
- 19BG6 3.50
- 19G3 19.50
- 19G6 9.00
- 19H4 35.00
- 19H5 33.50
- 20CV 9.50
- 20D1 0.70
- 20LF6 7.95
- 20L1 0.95
- 20P1 0.55
- 20P4 1.95
- 20P5 1.15
- 21JZ6 4.95
- 21KQ6 4.95
- 21LU8 3.75
- 24B1 39.50
- 24B9 39.50
- 25BQ6 1.75
- 25DQ6B 2.95
- 25L6GT 1.75
- 29C1 19.50
- 29KQ6 6.50
- 30C15 0.50
- 30C17 0.40
- 30C18 1.49
- 30FL2 1.35
- 30FL12 0.95
- 30FL13 1.10
- 30FL14 1.25
- 30L1 0.49
- 30L15 0.60
- 30L17 0.60
- 30P4MR 1.00
- 30P12 1.00
- 30P18 0.60
- 30P19 1.00
- 30PL1 2.50
- 30PL13 0.60
- 30PL14 1.75
- 31JS6C 5.50
- 33A/158M 19.50

- 35A3 3.95
- 35A5 4.50
- 35C5 4.50
- 35L6GT 2.00
- 35Z3 1.95
- 35Z5GT 3.50
- 38HE7 5.95
- 40KD6 5.50
- 42 6.95
- 47 8.00
- 50A5 1.50
- 50B5 1.95
- 50C5 0.95
- 50CD6G 1.95
- 50EH5 1.50
- 50JY6 2.95
- 53KU 4.50
- 75B1 3.50
- 75C1 4.50
- 80 4.50
- 83 8.50
- 83A1 7.50
- 85A1 6.50
- 85A2 2.95
- 90AV 17.50
- 90C1 3.50
- 90CG 17.50
- 90CV 17.50
- 91AG 9.00
- 92AG 19.50
- 92AV 19.50
- 95A1 6.50
- 100E1 10.00
- 108C1 2.50
- 150B2 6.50
- 150C1K 9.00
- 150C2 2.50
- 150C4 2.50
- 185BT 1.50
- 211 33.50
- 230D 15.00
- 231D 15.00
- 250TH 150.00
- 307 5.00
- 328A 15.00
- 404A-10 0.95
- 425A5 8.00
- 436A 35.00
- 572B 65.00
- 705A 12.50
- 708A 8.00
- 713A 25.00
- 723A/B 75.00
- 724A 275.00
- 725A 275.00
- 726A 75.00
- 7027A 7.50
- 801A 15.00
- 802 25.00
- 803 14.95
- 805 59.00
- 807 5.50
- 808 5.95
- 810 85.00
- 811 15.00
- 812A 35.00
- 813 27.50
- 813 Philips 35.00
- 829B 14.50
- 833A 95.00
- 843 7.50
- 866A 8.50
- 872A 20.00
- 873 60.00
- 954 1.00
- 955 1.00
- 958A 1.00
- 1299A 0.60
- 1626 3.00
- 1768 95.00
- 1849 315.00
- 1927 25.00
- 2040 25.00
- 2050 5.95
- 2050W 6.95
- 4004A 11.50
- 4212E 250.00
- 4212H 250.00
- 4313C 4.00
- 4328D 9.00
- 4471 35.00
- 4687A 9.50
- 5544 79.50
- 5636 5.50
- 5642 9.50
- 5651 2.50
- 5654 1.95
- 5670 3.25
- 5672 4.50
- 5675 28.00
- 5678 7.50
- 5687 4.50
- 5696 4.50
- 5702 3.50

- 5704 3.50
- 5718 6.15
- 5725 2.50
- 5726 2.50
- 5727 2.50
- 5749 2.50
- 5750 1.85
- 5751 2.95
- 5763 6.50
- 5814A 3.25
- 5823 8.50
- 5829WA 8.50
- 5840 3.50
- 5842 11.00
- 5863 95.00
- 5886 13.95
- 5894 39.50
- 5899 4.50
- 5963 1.75
- 5965 2.15
- 6005 1.85
- 6021 3.65
- 6057 3.75
- 6058 3.95
- 6059 3.75
- 6060 2.25
- 6062 4.50
- 6063 2.00
- 6064 3.25
- 6067 7.00
- 6072 6.95
- 6080 8.50
- 6080WA 9.50
- 6132 10.50
- 6136 2.50
- 6146B 9.50
- 6146W 12.50
- 6155 72.00
- 6156 72.00
- 6157 2.50
- 6158 3.20
- 6189 4.50
- 6201 6.45
- 6205 6.95
- 6211 2.50
- 6267 4.50
- 6299 250.00
- 6350 3.50
- 6360 4.50
- 6386 14.50
- 6442 75.00
- 6443 7.00
- 6463 7.50
- 6550 RCA 15.00
- 6550 GE 10.95
- 6688 6.50
- 6761 12.50
- 6870 11.50
- 6883B 9.95
- 6973 7.95
- 7025 2.50
- 7025S 6.95
- 7027A 8.50
- 7032 2.00
- 7036 4.95
- 7044 6.95
- 7054 3.95
- 7059 2.50
- 7119 9.00
- 7167 3.95
- 7189 5.50
- 7193 7.50
- 7199 7.50
- 7247 4.95
- 7475 5.00
- 7486 155.00
- 7527 85.00
- 7551 5.50
- 7558 9.45
- 7581A 9.95
- 7586 15.00
- 7587 19.50
- 7591A 6.95
- 7609 47.00
- 7698 75.00
- 7699 25.00
- 7788 25.00
- 7815 59.50
- 7868 7.50
- 7895 17.50
- 7963 7.95
- 8005 95.00
- 8020 45.00
- 8136 2.15
- 8156 7.95
- 8417 6.95
- 8844 25.00
- 8874 215.00
- 8950 10.50
- 9001 1.50
- 18042 10.50
- 18045 10.00
- 18046 11.50

OVER 4 MILLION VALVES IN STOCK
4,000 - Different Types
Please enquire for types not listed
Specially selected and matched valves available on request

CALLERS WELCOME

OPEN MON-THUR 9AM-5.30PM
FRI 9AM-5.00PM
'24-HOUR ANSWERPHONE SERVICE'

ACCESS & BARCLAYCARD PHONE ORDERS WELCOME

UK ORDERS P&P £1
PLEASE ADD 15% VAT
EXPORT ORDERS WELCOME
CARRIAGE AT COST
PLEASE SEND YOUR ENQUIRIES FOR SPECIAL QUOTATIONS FOR LARGE REQUIREMENTS.

DX DIARY

News for HF operators compiled by Don Field G3XTT

Once again it's been quite a month on the bands. During November the Hungarian group active from Hanoi in Vietnam put in a terrific effort. They were even strength nine on 80 metres and UK stations running just 100 watts on that band were able to work them with ease. A few UK stations also made it on top band. The result was that, despite the tremendous pile-ups in the early days of the operation, everyone had a good chance of one or more contacts by the end of the day. I know of one QRP enthusiast who managed CW contacts on 10, 15 and 20 while running just 3 watts! If you did miss them, then look out for the Russian group who plan to be there in late January. They have also said that they will have a good top band signal in the CQWW 160 metre contest.

As for the CQWW CW Contest, propagation was once again very favourable and there should be some high scores from the UK. The table shows the results from last year's contest.

Congratulations are due especially to Dennis G3MXJ and Dave G4BUO, who came fourth and eighth respectively in Europe in the single-operator all-band category; to G4CP, who was second in Europe on 28MHz; to G3HCT and G4CNY who were fourth and fifth in Europe on 21MHz and to the G0AAA team who operated multi-single from Luxembourg to come sixth in Europe in their category.

G4BUO also took top UK honours in the 1988 ARRL CW Contest with a score of 1,209,528, while GW4BLE took top place not just for the UK but for Europe on SSB with 1,447,068 points. Also in these events, G3FXB, G3SXW and GM4CXM were world first, third and fourth on 20 metres, and G3MXJ world fifth on 15 metres, all on CW, while G4AMT was world sixth on 80 metres in the SSB leg. Last but not least, G4FDC was world fourth in the CW event in the QRP category.

All these results show that UK amateurs are truly a force to be reckoned with in major international contests. These scores are just the tip of the iceberg, as many participants don't actually send in their logs. Looking through G4JVG's CQWW SSB contest logs recently (Steve was operating as VK9YG from remote Cocos Keeling Island) I was delighted to see that he had worked almost ninety UK stations on 10 metres alone. Many made it through the pile-up with modest power and wire antennas and no doubt got a big thrill from making the contact.

Incidentally, the P40V operation from Aruba in the CQWW SSB Contest netted a massive 21,000 contacts for a new multi-multi record of 58,000,000 points. Not bad for one weekend's operation!

Computer programs for DXers

Just a few days after the contest I got my hands on a copy of the K1EA Contest Log Program. I can only say that I wish I had had it to use during the contest itself. This remarkable piece of software can handle the CQWW, CQWPX, WAE and ARRL contests. It is intended for real-time use during the contest. All you do is enter the callsign and the program does the rest (assuming the report is 59 or 599), entering time and zone, telling you instantly if it is a country or zone multiplier or a dupe. What I find particularly fascinating is that the program continuously displays various information in windows on the screen, including a full display of zones worked per band, your QSO rate for the last ten QSOs, last 100 QSOs and contest so far, a running summary of total QSOs, countries, zones and dupes per band, a running calculation of your total score and a calculation of the relative benefit of chasing QSOs or new multipliers so you can make a continual assessment of which option to follow. For the WAE Contest, the program will look after the QTCs, which is an aspect of the contest which I always find confusing.

The program has a built-in CW keyer facility, so if you want it will handle much of the QSO for you once you have entered the call. It can also interface directly to the TS-940 (and will, in future versions, work to other radios) for frequency input and output. Finally, it will interwork with the AK1A packet-spotting software. What this means is that you can put out a 'spot' to other AK1A users in the area (much as UK DXers often use a 2m FM frequency for passing HF DX information) just by hitting a function key. It will ask you to enter the frequency or, if you are using a TS-940 with interface, will take it directly from the radio. Similarly it will work the other way round. An incoming spot can be displayed in a window on the screen. You can then choose to call that station for a multiplier, in which case the frequency can be forwarded to your radio automatically. I believe the use of incoming spots for single-operator contest stations is against the rules and spirit of the contest, but it would appear to be acceptable in a multi-op situation.

All this may be horrifying, but many US operators are already using the software. In fact, looking at K1EA's example log which comes on the disc, and which is his own log from last year's CQWW CW contest, I found my own callsign there for our top band QSO! The K1EA program has its limitations. It thought CR3MI and CT9MZ were both in Portugal (whereas they are in CT3) and S01A fooled it completely, but it had no trouble at all with K4YT/4I (DU, zone 27).

As for the AK1A packet software, this is now being used very heavily indeed in the USA. In a write-up in the latest W6GO/K6HHD QSL Manager list it is reported that in a three-month period in northern California, the system was used to report 3049 different DX stations in 245 DXCC countries. There were 157 stations who input information to the network during this time, K6PBT on no less than 476 occasions! The most reported DX station was T31JS with eighty-five announcements, followed by CY9DXX with fifty-five and T5GG with forty-two. Whether this is what DXing should be about is an open question, but I suspect aids such as the two I have just described are here to stay. We hope to demonstrate some of this software at the 1989 HF Convention, which will give you an opportunity to make your own judgement.

DX news

By now RA0AD/JT5 should be active from Mongolia. He is there for two years and promises to make a special effort on the lower bands.

Lloyd and Iris Colvin are on their travels again. Unfortunately there wasn't any advance notice, but they appeared on the bands as W6KG/5B4 from Cyprus for the October SSB contest and then as ZC4ZR from the British base areas on the island in late November. Presumably by the time you read this they will be operating from elsewhere in that general neck of the woods.

Incidentally, Lloyd and Iris recently celebrated their fiftieth wedding anniversary. Lloyd, seventy-one years of age, got his first amateur licence in 1929, while Iris was licensed in 1945. Over the years they have made over a million QSOs from over 140 countries, although political constraints mean that they will never realise their original dream of operating from every country in the world. Their operations have resulted in a collection of over 500,000 QSL cards, all carefully filed away by the YASME team of volunteers which handles all their QSLing.

K4LTA and friends are off to the Caribbean once again in February. They will be on St Vincent from 16 February through to the first full week in March. This will be their eleventh successive trip to the Caribbean. From past experience, check the low bands (especially on CW) at European dawn and also look for them on the WARC bands. In last year's operation from Grenada the group made around 20,000 contacts, though they did complain about the number of duplicate QSOs made by some operators.

An interesting point this because, on the face of it, few of the Caribbean islands can be described as rare in DX terms so making the occasional repeat QSO shouldn't deprive anyone else of a much-needed contact. However, talking to people who have operated from there, it is surprising how many of the people they work say the contact has given them a new country. I suppose with so many amateurs in the USA the demand must be almost insatiable. No doubt the local amateurs on these islands are pleased when visiting operators come along and help to take some of the heat out of the pile-ups.

Incidentally, the same may be said about some spots much closer to home such as GJ, GD and GU. They may be relatively common to us, but are much sought after by amateurs in more distant parts of the world. Making an appearance on the HF bands from there can be a daunting experience as the pile-up starts to grow!

The world of RTTY

If you are able to copy RTTY, don't forget the various news bulletins that go out regularly on this mode. The ARRL headquarters station W1AW has a host of transmissions, but the easiest copy in the UK are those on 14095kHz and 21095kHz on Mondays, Wednesdays and Fridays, starting at 1600 and 2300, beamed at Europe. The Monday and Wednesday transmissions contain general information, the Friday transmission carries a DX bulletin. GB2ATG, the BARTG station, puts out bulletins on the first and third Sunday of each month at 1230GMT on 3590kHz.

At the IARU Region 3 conference in Seoul recently, the decision was made to modify the 20 metre bandplan to allow packet operation up to 14112kHz. This leaves Region 1 as the only IARU Region yet to approve packet operation above 14100kHz. For my own part, although I am keen on experimentation with data modes, I am yet to be persuaded that the case for packet on HF is proven, especially as AMTOR copes much better with the QRM, fading, etc, to be found on the HF bands, and therefore I believe that any major changes to bandplans are premature. However, I feel that all IARU Regions should actively encourage experimentation with these modes and I am confident that the RSGB will be doing

UK SCORES IN 1987 CQWW CW CONTEST

Callsign	Category	Score	QSOs	Zones	Countries
G3MXJ/	All-band	2,233,868	1,998	129	347
G4BUO	All-band	1,935,810	1,758	126	344
G3UFY	All-band	717,060	1,116	90	233
GM3RAO	All-band	550,824	1,118	62	174
G4ODV	All-band	410,913	852	79	188
GW4RHW	All-band	387,276	792	68	168
G3NKS	All-band	380,205	815	66	189
GW3JI	All-band	380,014	758	64	187
G3ESF	All-band	304,410	643	65	154
GM4VJV	All-band	250,860	1,067	45	140
G3XVR	All-band	212,676	440	55	167
GI4BBV	All-band	185,922	415	57	141
GM3CFS	All-band	184,576	501	59	147
G3GGS	All-band	142,680	352	52	122
G6QQ	All-band	111,941	367	48	109
G6NK	All-band	6,802	86	15	23
G4ZME	All-band	6,683	95	13	28
G4CP	28MHz	92,105	355	28	81
G3VMY	28MHz	15,960	116	16	40
G3HCT	21MHz	375,310	1,134	32	97
G4CNY	21MHz	323,520	1,119	33	87
GM4CXM	21MHz	209,253	793	29	84
G3YDV	21MHz	146,902	653	27	71
GM0IIO	21MHz	21,268	198	16	36
GM4ENF	14MHz	10,752	124	16	26
G3IGW	7MHz	94,570	551	21	71
G4UOL	7MHz	58,650	452	17	68
G4OBK	3.5MHz	104,120	878	18	58
G4ARI	3.5MHz	14,880	268	8	40
G3DYY	3.5MHz	12,349	126	11	42
G4XTM	3.5MHz	10,947	192	7	34
G3XTT	1.8MHz	47,808	451	13	59
GM3VLB	1.8MHz	8,695	183	7	40
GW3GWX	1.8MHz	1,125	39	5	20
G4ELZ	QRP, All	359,883	733	63	180
G4ETJ	QRP, All	59,520	298	26	94
G3LHJ	QRP, All	13,176	108	14	47
G3CWL	QRP, 21MHz	5,611	88	13	18
G3DOP	QRP, 14MHz	4,806	112	7	6

its bit by supporting HF packet mailbox applications to complement the existing VHF and UHF network. Whether the DTI will play ball and allow unmanned stations on the HF bands remains to be seen.

Once upon a time the BARTG RTTY contest stood out as the major international contest for data enthusiasts. Two years ago **CQ Magazine** introduced a RTTY contest and now the ARRL is getting in on the act. The first ARRL round-up will take place from 1800 on 7 January until 2400 on the 8th. The contest exchange is signal report plus serial number (North American stations send signal report plus state or province) and contacts can be made on 80-10 metres. RTTY, ASCII, AMTOR and packet may be used, but contacts must be direct (ie not via digipeaters). There are various categories and special log sheets are available from ARRL HQ. I will try to get hold of a supply and can certainly help readers with a photocopy of the full rules.

WARC bands

The recent upsurge in HF conditions, together with the fact that ARRL now gives award credit for contacts on 24MHz, has led to a considerable increase in activity on that band. A number of KH6 stations were worked in October, DJ6SI appeared on all three WARC bands with his 5UV386 callsign, and a number of people have managed to work over 100 countries on 24MHz during 1988. I note also that there is now a beacon operational from Italy on 24915kHz, with the callsign IK6BKK.

Incidentally, having just mentioned 5UV386, this was a very unusual one for the prefix hunters. I have seen a photocopy of Baldur's 5U licence and there is no question that this call was issued by the authorities specifically for operation on the amateur bands. I can only assume that they were totally unaware of the normal conventions for the issue of amateur radio callsigns. Of course, quite a lot of other unusual prefixes have been apparent recently in the various contests, so the prefix hunters have had a field day. As always, you should be able to track the location of a station by looking in the full list of ITU callsign allocations, even if the prefix is one which hasn't previously appeared on the amateur bands.

ARRL Diamond Jubilee Award

The American Radio Relay League (equivalent to our RSGB) celebrates its seventy-fifth anniversary in 1989 and is offering a range of Diamond Jubilee awards for contacts made during 1989. There are three variants:

1. Work seventy-five of the seventy-six ARRL/CRRL Sections on any combination of bands or modes.
2. Work seventy-five different DXCC countries on 18 and/or 24MHz.
3. Work seventy-five US novice stations with exchanges of more than just the 'hello, goodbye' variety.

An application form for the awards is available from: ARRL, Diamond Jubilee Award, 225 Main St, Newington, CT 06111, USA. Remember to send a self-addressed envelope. You get a certificate for the first of the above three categories for which you qualify, plus a jubilee 'diamond' to add to it for either of the other categories. QSLs are not required. The fees are $5.00 or twelve IRCs for the base certificate and $1.00 or two IRCs for the additional diamonds.

Contests

Finally to contests for the coming few weeks. 27-29 January, of course, is the weekend for the CQWW 160 metre CW contest, and the French contest takes place the same weekend. Looking to February, the ARRL SSB and CW contests are coming up: 18 and 19 February for the CW leg and 4 and 5 March for the SSB leg. More details of these next time, but remember that, although entrants are only allowed to work the USA, many of the contest expeditions which go to the Caribbean and elsewhere for these events will work the rest of the world outside the contest proper. So there may well be some DXpedition operations turning up during mid- to late-February in addition to those I have mentioned already in this column. You just have to keep an ear tuned to the bands! 73 for now. Don.

USING YOUR OSCILLOSCOPE PART TWO

This month Joe Pritchard looks at measuring current, resistance and time

Last month, we saw how the 'scope can be used as a high impedance voltmeter. We will now go on to see how the 'scope can be used to measure or estimate current or resistance. We will then begin to examine how to use the 'scope for measuring frequency and the time between two events.

Given that we can accurately measure voltage, we should be able to measure current or resistance in a circuit by converting either of these two parameters into a voltage. This is easily done by using Ohm's law, V=I*R. Let's start by measuring current in a circuit. **Fig 1** shows a possible arrangement where we can estimate current by measuring the voltage across a component in a circuit. There are, of course, problems with this; especially where the 'scope's input impedance is a similar size to the circuit's impedance we are examining. This technique can be useful in situations where we don't want to break the circuit. When we do, though, a simple current adapter for the 'scope can be made (see **Fig 2**). The resistor must have a suitable power rating to withstand the current that will flow through it and for the circuit current being measured. A resistance value which is too high would cause problems by changing the voltage levels in the circuit which is attached to the current probe. Imagine a 10R resistor with a ½W rating. A current of 1mA through this would develop a voltage of 10mV across it – easily measurable on a 'scope. Similarly, a current of 100mA would give a voltage of 1V. The highest current that we could safely measure with this arrangement would be, say, 200mA, which would give a voltage of 2V and dissipate 0.4W. This is shown by the equation:

(I^2*R = 0.2*0.2*10 = 400mW)

Of course, multimeters can easily perform the same task but this is a useful alternative if you do not own one.

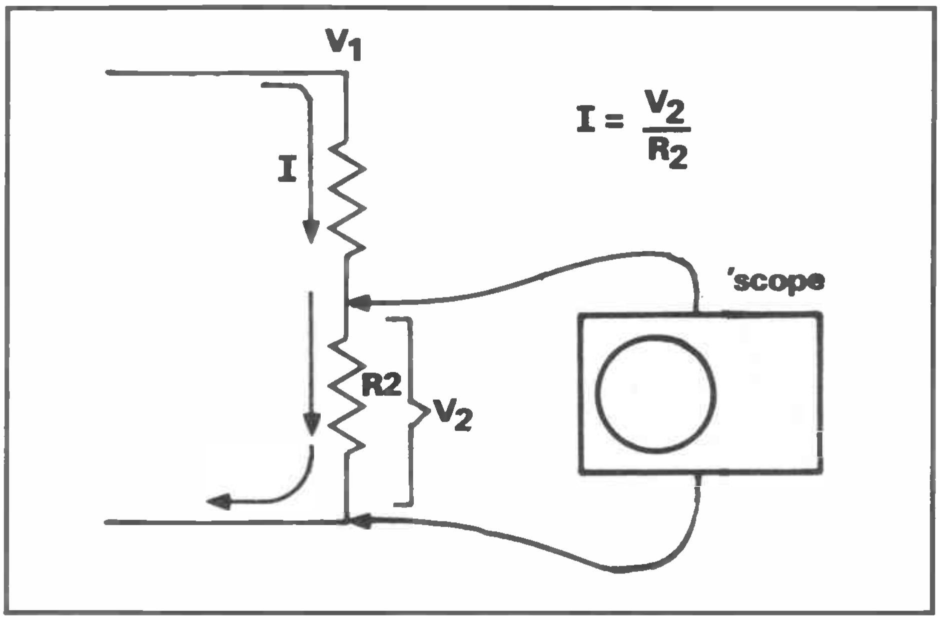


Fig 1

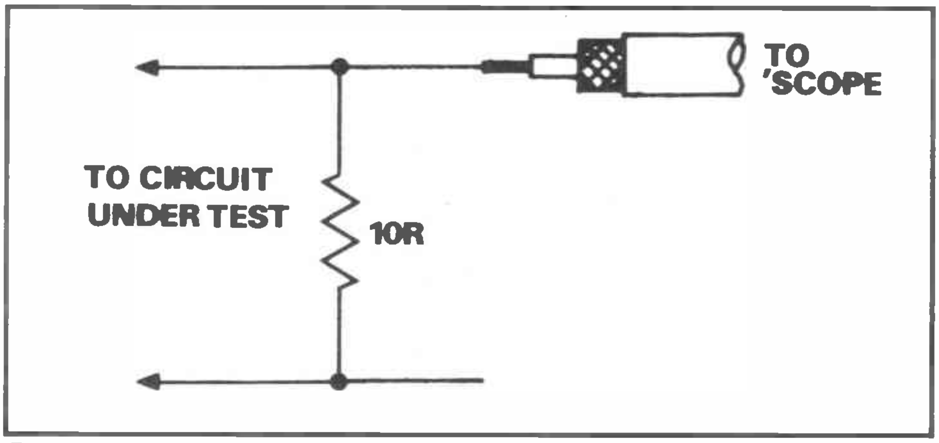


Fig 2

Resistance

We use a similar alternative to measure resistance. The basic principle is shown in **Fig 3**, where a constant current source is used to put a known current through the resistor under test. The voltage developed across this resistor is then measured on the 'scope. The resistance is calculated at the same time using R=V/I (where I is the known current). **Fig 4** shows a practical arrangement that you might like to try yourself. Again, the limiting factor is the loading applied by the 'scope to the resistance under test, as we would need to use the x10 probe for resistors of several 100k or more. However, this technique is very useful for low resistor values.

Ac signals, time and frequency measurement

We now move on to show where the 'scope is unparalleled in its usefulness – monitoring signals which vary with time. We can use the 'scope to see exactly what a signal looks like at a given point in time, and to measure its frequency or voltage at a specific moment in time. Additionally, we can check for distortion, phase distortion of signals and many other signal characteristics. Furthermore, any property that can be used to control the frequency of an oscillator (such as capacitance or inductance) can be indirectly measured by measuring the frequency of a generated signal and, from that frequency, the value of the component can also be calculated. Let's start by looking at the important characteristics of the 'scope when we are considering this type of measurement.

Bandwidth

The oscilloscope's bandwidth is actually the bandwidth of the Y amplifier which is specified by the frequency at which the amplifier's gain drops to 0.707 dc (or a low frequency). A 'scope with a bandwidth of 10MHz and a gain at dc of, say, 100, will only have a gain of 70.7 at 15MHz. The bandwidth is limited by the circuitry of the Y amplifier and the wider the required bandwidth – the more you will have to pay. In addition, the bandwidth of a 'scope will almost certainly decrease as the equipment ages. A 'scope will show some indication of signals outside the specified bandwidth, but *accurate* measurements can not really be made outside this. In fact, there are some circumstances where you cannot rely on certain types of measurements even *within* the quoted bandwidth!

In general, the 'scope's bandwidth should be at least three or four times that of the highest frequency you wish to accurately observe. You will be able to make measurements on signals of a greater frequency than this, but observations of signal waveform will become less accurate with the increase in frequency (see **Fig 5**). This is particularly so of signals with a high harmonic content such as square-waves or clipped sine-wave signals, and where the bandwidth may need to be fifteen or more times the highest frequency to be examined if the waveform is to be accurately observed.

If these harmonics fall outside the oscilloscope's bandwidth then they clearly will not be reproduced on the screen. You might then assume that a signal is distorted in some way, when it is actually your 'scope that is at fault! Alternatively, some problems, such as parasitic oscillation superimposed on a low frequency signal, may not be seen on the 'scope.

To see the effect, the following experiment with your own 'scope will determine the maximum frequency at which you can be sure that the waveform shape is accurate. You will require a source of square-waves, preferably variable over a wide range of frequencies. A simple TTL multivibrator (see **Fig 6**) will generate a suitable signal. Prepare the 'scope so that a couple of cycles are displayed on the screen (as large as possible). Start at a low frequency and gradually increase it. You should initially see square-wave signals with sharp corners, but as the frequency increases, the edges will become rounded and it will become impossible to resolve detail on the square-wave. The square-wave is used because it is easy to see when this problem starts by the rounding of the corners. This applies to all signals of this frequency. This frequency may also be quite low in comparison to the 'scope's bandwidth, so don't think that your 'scope is useless – just be aware of its limitations when making measurements.

Rise time

The rise time of a signal is the duration taken to go from 10% to 90% of its maximum value. A good square-wave has a very short rise time. In fact, in a perfect world this would be zero. However, all circuits have a finite rise time. This makes it impossible to measure its signal if the rise time of the circuit (into which the square-wave is flowing) is greater than that of the pulse itself.

Typical 'scope rise times can be in the 10 to 20nS range. If you intend doing a lot of pulse measuring work, you should choose a 'scope with as short a rise time as possible – certainly no more than a quarter of the shortest rise times to be measured.

In practice, you will find that the bandwidth and rise time of your 'scope will be partially degraded if you do not suitably connect the 'scope to the signal under examination. Any type of cable which is connected to the 'scope's input will have an effect on the rise time and hence the bandwidth of the scope's Y amplifier. Care must be taken when making frequency or short rise time measurements to ensure that the connections between the 'scope and circuit are not just a couple of multimeter leads with probes on the end!

Timebase

The electron beam which draws the image on the 'scope's screen moves across the screen at a rate which is set by the 'scope's timebase controls. This is usually measured in terms of 'time per division', where the division is the horizontal division on the screen. Thus, if we set the timebase to 100uS/Div, each division on the screen would represent 100uS of time. Many 'scopes will go down to a microsecond per division. The upper end of the range is usually a few tenths of a second per division, but the limitation here is the persistence of the phosphor used to coat the screen. Some 'scopes have a 'sweep magnifier' or 'sweep extender' switch which allows faster sweeps of the electron beam across the screen (ie much shorter timebases – down to a few tens of nanoseconds, for example) but with less accuracy of time per division. Also, don't forget that if the rise time is longer than the sweep-rate, then it is debatable if you will gain any benefit from the shorter sweep-rate! All 'scopes allow some variation between the switched timebase positions using a

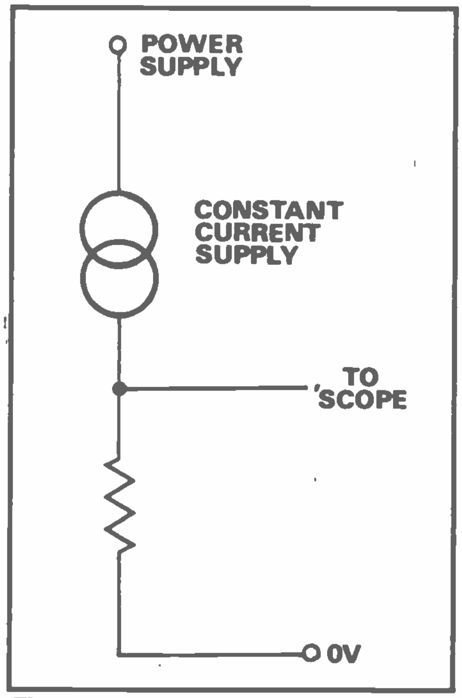


Fig 3

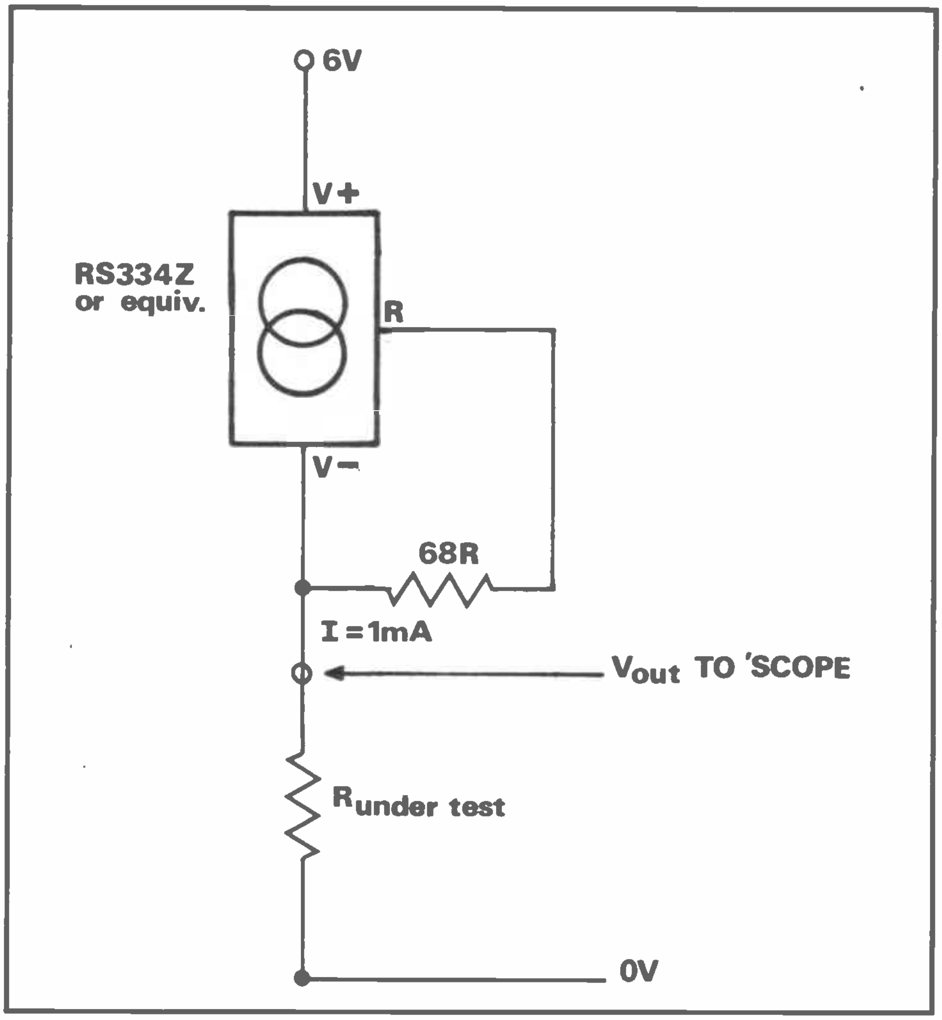


Fig 4

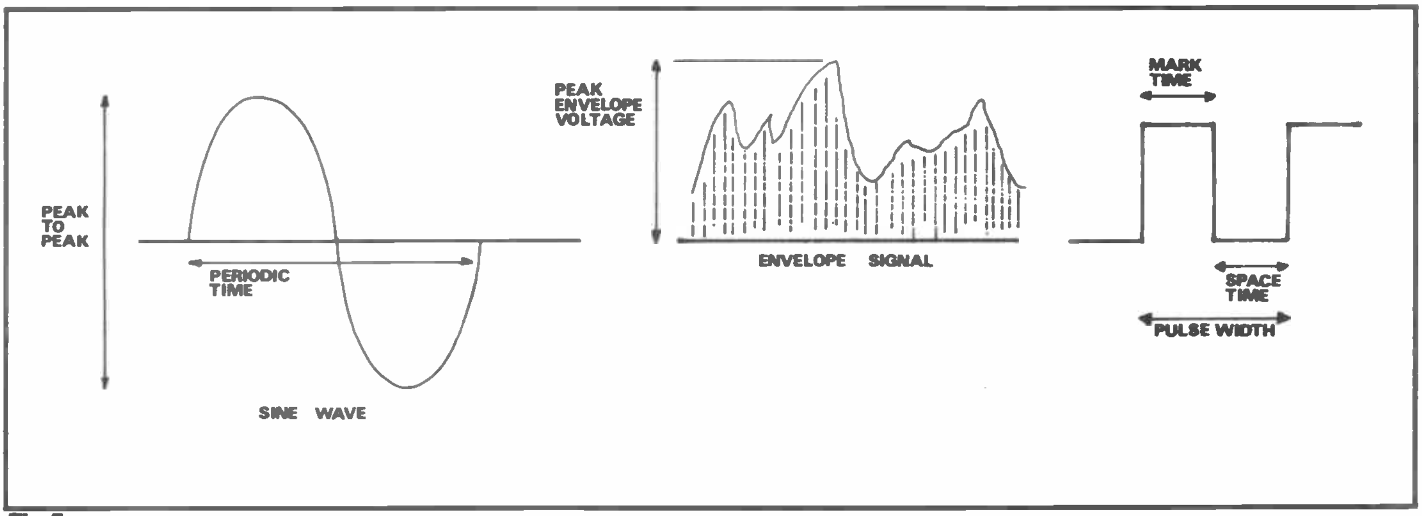


Fig 5

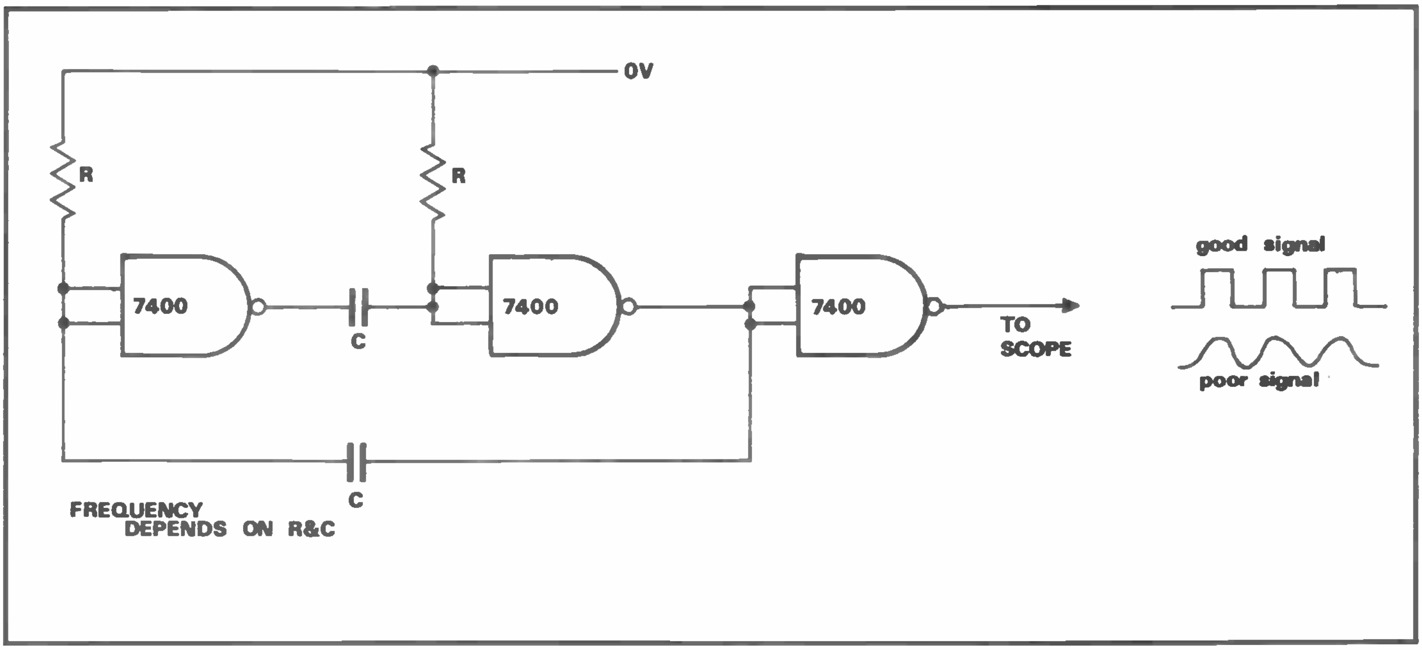


Fig 6

potentiometer which normally rests at a 'calibration' position. It is only here that the times per division are accurate, so set the control to this position before making measurements.

Types of signal

There are two types of signal that we may wish to make time measurements of, these are: transient events, where we might be interested in the time delay between, say, an input pulse occurring and an output pulse being generated, and periodic signals such as those generated by an oscillator. Unless the 'scope is a recording type, we usually need to make the events being recorded as repetitive as possible. For example, we might generate a string of input pulses and hence a string of output pulses, thereby allowing us to measure the time separation more easily.

Next month, we will examine the techniques of measuring frequency and time on a 'scope, and see how 'scopes can be used to check circuits for instability and distortion.

Glossary

Periodic signals

Mark time	For a pulse waveform, the amount of time for which the signal is 'high'
Peak envelope voltage	Useful for amateurs. This is the largest peak voltage assumed by a signal such as a modulated radio wave (where the peaks are of different sizes)
Peak to peak voltage	The voltage difference between signal peaks
Periodic time	A repetitive signal. This is the time taken for the completion of one full cycle of the signal
Peak voltage	Half the peak to peak signal
Pulse repetition rate	Where a series of pulses may be generated. The PRR is the number of pulses generated per second
Pulse width	For a single pulse. This is the duration of the pulse (can also be applied to the PRR)
Space time	For a pulse waveform. The amount of time that a signal is 'low'

ICOM

VHF/UHF FM Handhelds

If you want a handheld with exceptional features, quality built to last, and a wide variety of interchangeable accessories, take a look at the ICOM range of FM transceivers.

All ICOM Amateur handhelds are supplied with a flexible antenna, rechargeable nicad battery pack and an AC wall charger.

IC-2E 2 Metre Thumbwheel Handheld

This popular transceiver from ICOM is still available after eight years of production. If you're looking for a straightforward but effective handheld the IC-2E takes some beating. Frequency selection is by means of thumbwheel switches (with 5KHz up switch), with simplex and repeater operation possible. Power output is 1.5 watts or LOW 150 milliwatts (2.5 watts possible with BP5A battery pack).

MICRO 2E/4E

These micro sized 2 metre and 70 centimetre handhelds give the performance and reliability you expect from ICOM. Measuring only 148 x 50 x 30 the micro fits in your pocket as easily as a cassette tape. The micro features up/down tuning switches for quick frequency changing, 10 programmable memories, LCD readout and 1.5 watts output (2.5 watts possible with BP24 battery pack).

IC-02E/04E Keypad Handheld

These direct frequency entry handhelds utilise a 16 button keypad allowing easy access to frequencies, memories and scan functions. Ten memories store frequency and offset, a front panel LCD readout indicates frequency, signal strength and transmitter output. Power output is 2.5 watts or LOW 0.5 watt. (5 watt is possible with the BP7 battery pack or external 13.8v D.C.)

IC-2GE/4GE

The 'G' series of handhelds fulfills the most important criteria for a handheld transceiver, it is small, rugged and easy to operate. The 20 memory channels can store simplex and repeater frequencies and with the several scan functions there is no need to manually search for activity. The 3 watt output and power saver circuit ensures low battery drain. (7 watts is possible with the BP7 battery pack or external 13.8v D.C.)

IC-12E 23 Centimetres

Similar in style to the 02E/04E this 1296MHz handheld utilizes ICOM's experience in GHz technology, gained by the excellent IC-1271E base station. With the growing number of repeaters on 23cm the IC-12E makes it an ideal band for rag chew contacts. Power output is 1 watt from the standard BP3 battery.

IC-32E Dual Bander

This exciting new handheld offers 2 metres and 70 centimetres in one compact unit. Tough and splash resistant it offers many features including crossband duplex operation, 20 dual band memories and power saver circuit. The IC-32E utilises most existing ICOM accessories, ideal if you are upgrading from an existing ICOM handheld.

Also available for ICOM handhelds are a large range of optional extras including rechargeable nicad battery packs, dry cell battery cases, desk chargers, headset and boom microphones, leatherette cases and mobile mounting brackets. New products just released:- HM46 miniature speaker/microphone and HS51 lightweight headset/microphone complete with PTT and Vox unit.

Icom (UK) Ltd.
Dept AR , Sea Street, Herne Bay, Kent CT6 8LD. Tel: 0227 363859. 24 Hour.

Seasons Greetings to you all

Into '89 with Icom

IC-751A HF All-Band Transceiver

- **Amateur Bands 160m - 10m.**
- **General Coverage Receiver.**
- **105db Dynamic Range.**
- **100W Output (40w A.M.)**
- **32 Memories.**
- **Electronic Keyer.**
- **CW Semi/Full Break-in.**
- **HM36 Microphone.**

The ICOM IC-751A was created for the ham operator who demands high performance whether entering contests, chasing DX or just simply enjoying the shortwave bands. It is an all mode solid state transceiver with a host of features designed for the crowded HF bands of today.

Additional features include passband tuning, 9MHz notch filter, adjustable AGC, noise blanker, RIT and XIT. A receiver pre-amp and attentuator provides additional control when required. The FL32 9MHz/500Hz CW filter is fitted as standard with CW sidetone on Rx and TX modes. On SSB the new FL80 2.4Khz high shape factor filter is fitted.

The transmitter is rated for full 100% duty cycle with a high performance compressor for better audio clarity. With 32 memory channels and twin VFO's, scanning of frequency and memories is possible from the transceiver or the HM36 microphone supplied.

The IC-751A is supplied for 12v operation but can be used with either internal or external A.C. power supply. It is fully compatible with ICOM auto units such as the IC-2KL linear amplifier and the AT500/100 antenna tuners.

Options available:- PS35 internal AC power supply, PS15 external AC power supply, EX310 voice synthesizer, SM8 and SM10 desk microphones and SP3 external loudspeaker.

Helpline: Telephone us free-of-charge on 0800 521145, Mon-Fri 09.00-13.00 and 14.00-17.30. This service is strictly for obtaining information about or ordering Icom equipment. We regret this cannot be used by dealers or for repair enquiries and parts orders, thank you.
Datapost: Despatch on same day whenever possible.
Access & Barclaycard: Telephone orders taken by our mail order dept. instant credit & interest-free H.P.

MY FIRST RECEIVER

by Sylvia Blyth

In the beginning

There cannot be many people who can actually pinpoint the very second they realised they could build a complete receiver. I can tell you exactly where I was, who gave me the final clue and even what I was wearing!

First, a little bit of background information. I had built the odd kit and had made a simple regenerative receiver from plans in magazines, though that's not to imply that I understood them. The 'best' receiver I owned at the time was a domestic, medium wave valve radio tweaked down (or is it up?) to top band. I found it infuriating that I would be listening to a bunch of local amateurs, whom I could hear quite well, when a more distant station would break in and be inaudible to me. Advice given at the local club indicated that an RF (radio frequency) amplifier between the aerial and my receiver would help. With my knowledge at the time, incidentally, I would classify as halfway to the RAE.

The breakthrough

Looking through stacks of old magazines, I kept coming across an RF amplifier circuit roughly like that of **Fig 1**. In my ignorance, I built it like **Fig 1**.

Coils for top band (L_1 and L_2) were forty turns on a 1in former, ie, a bit of wooden broom handle, with the coupling coils about five turns. No problem. Everything else came out of old radios from jumble sales. It worked and well. Dead chuffed I proudly took it down to the radio club and caused a sensation. Not a dry eye in the house and laughter all round.

The final clue

What was the cause of the hilarity? What was the major breakthrough? VC_2. I'd hung it down from the rail, just like the circuit. It had caused me a lot of trouble to insulate it, what with yards of insulating tape and several plastic screws, not to mention the grommet where the shaft went through the front panel and a big plastic knob.

A kindly old amateur took me to one side and explained that, radio frequency wise, the HT rail (200 volts) and earth were both the same. This was due to the capacitor across the rail, C_2 in my diagram. KOA (kindly old amateur) suggested that I consider C_2 to be a short circuit as far as RF was concerned. The variable in the anode could thus safely be bolted down to the chassis and, to further increase safety, a 0.01μF capacitor could go down between the fixed bit of the variable and the anode, thus making it possible to have absolutely no volts across it (see **Fig 2**). KOA went on to explain that C_3 would also be an RF dead short.

Talk about the sun coming out from behind the clouds! Never had one concept caused so much to drop into place within my feeble brain. Suddenly I could 'read' circuit diagrams. It all made sense. A receiver just had to be built and I was going to design it, well, with some help and stacks of old magazines. The most important bit, however, was that I was going to understand all of it.

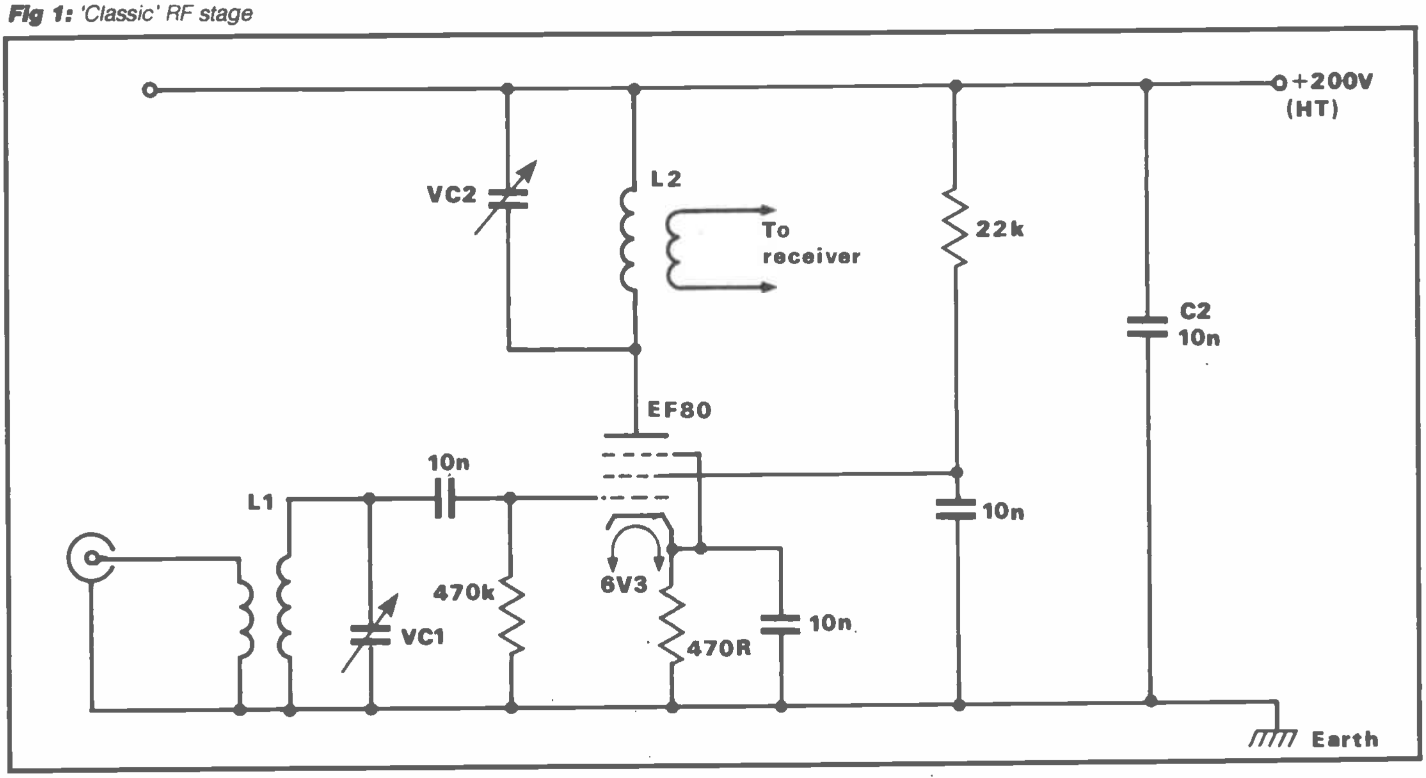
The design concept

It was fairly obvious that the first step was to build a power supply. I didn't really understand valve rectifiers; sure, I could see how electrons came off the cathode bit and would only go one way, but which bit, anode or cathode, did the positive come out of? The easy way out was a solid-state diode, and thus a standard half-wave rectified power supply was built up in one corner of a blank chassis. This was to be the way that the receiver was to be built. Build one stage, get it going, then on to the next. Since our local jumble sales sold old valve radios for pennies and transistor sets for pounds, it was going to have to be mainly valves. 'Chassis' is a very grand word to describe a 12in square bit of scrap aluminium bent into a 'U' shape to form a top area 8in × 12in with 2in high sides.

The audio stages

An old radio had yielded an ECL80 output triode pentode. This is a 6.3V heater valve and as the mains transformer had a 6.3V winding, we were in business. The audio output stage was more or less lifted whole from the donor (ex-jumble sale) radio: volume control, valve base output transformer and all components such as resistors and capacitors. All I did was draw out the circuit of the donor and rebuild it on the chassis. A crystal microphone was then connected

Fig 1: 'Classic' RF stage



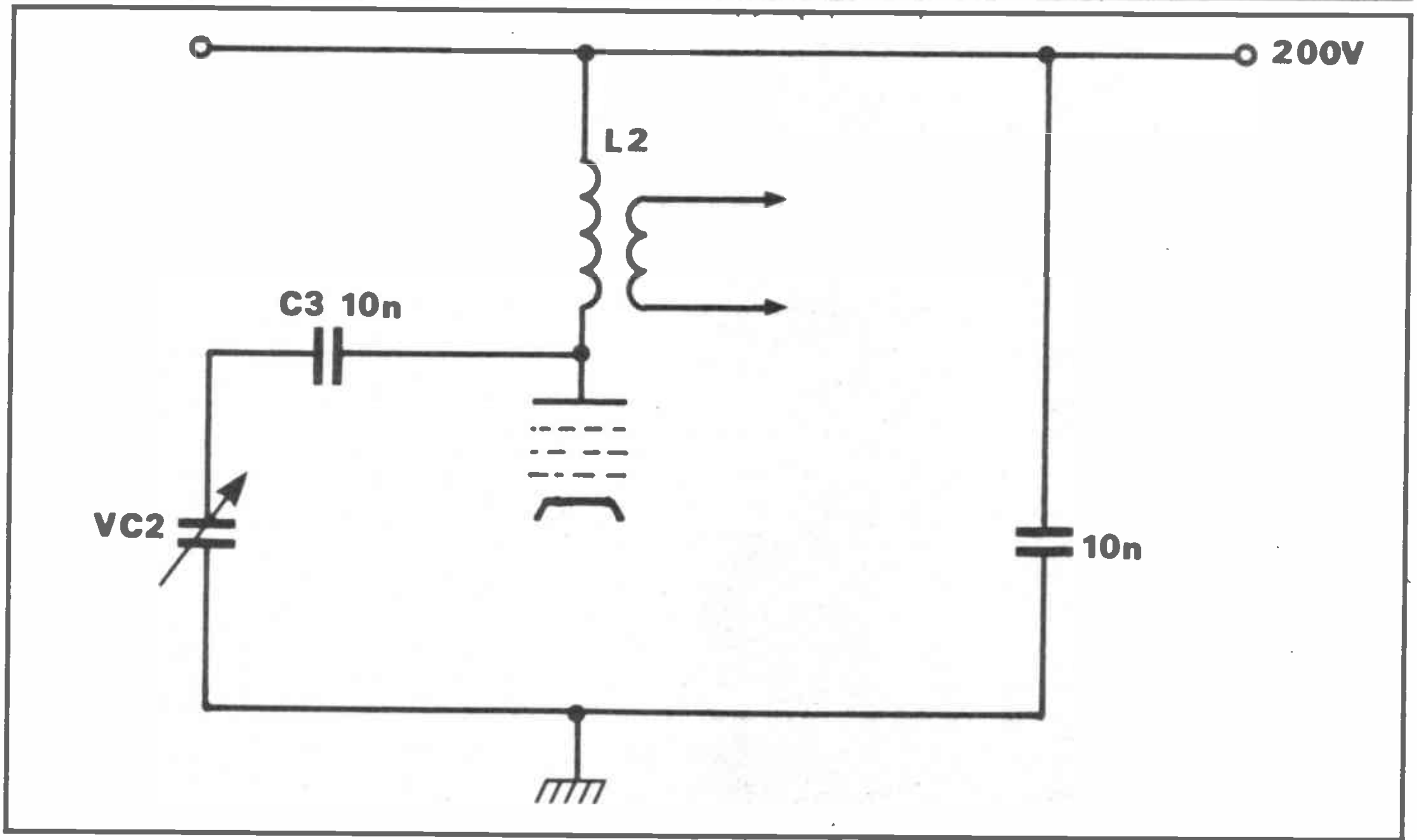


Fig 2: How it should have been built

to its input. It worked and we were on our way!

The IF amplifier/detector

My problem with the valve rectifier reared its head again with the detector, after all I reasoned, a detector stage is a detector stage, be it valve or solid-state, so in went an OA81 general purpose gemanium diode. It didn't matter which way round it went since AGC didn't yet feature in my design. The IF coils would be a problem since I knew I would be unable to set them up to 455kHz with any degree of accuracy. In the end a working valve radio was relieved of its coils. If the set worked then they had to be all right and more or less aligned. The IF circuitry was exactly the same as the RF stage described earlier.

Testing the IF stage was obviously another problem. There was a bit more noise coming out of the speaker with the IF stage connected up, and an aerial connected on to the grid of the IF stage produced loads of noise, so with almost childlike innocence I assumed it probably worked.

The mixer/local oscillator

I thought the oscillator was going to be no problem. The aim was to build something that received the medium wave and then work from there. I also left plenty of room on the chassis between the mixer/oscillator and the IF amplifier in case another IF stage was required.

KOA had told me how to set up a superhet to receive Radio 2, the strongest signal going. This is on 909kHz. If you have a superhet then the local oscillator has to be on 909 + 455kHz. That comes to 1364kHz or 1.364MHz. Using another radio it should be possible to hear the oscillator from the set you are building; 300 metres (which is what my domestic radio was calibrated in) is 1MHz and 200 metres is 1.5MHz, so if the oscillator tuned between them I was in business.

In the end the oscillator was the triode part of an ECH80 (guess where that came from?) tuned by half a twin gang variable capacitor. The mixer was the other bit of it, connected up following the directions from another magazine article. Coils were again on a broom handle. If forty turns on a 1in piece worked on top band, sixty was about right for medium wave,

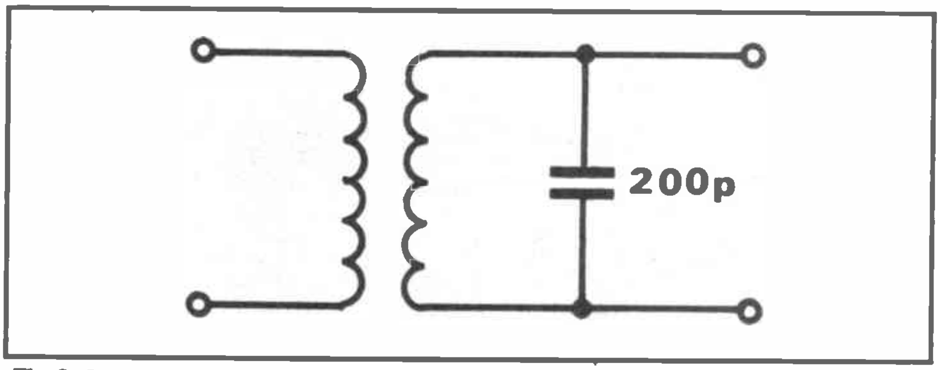
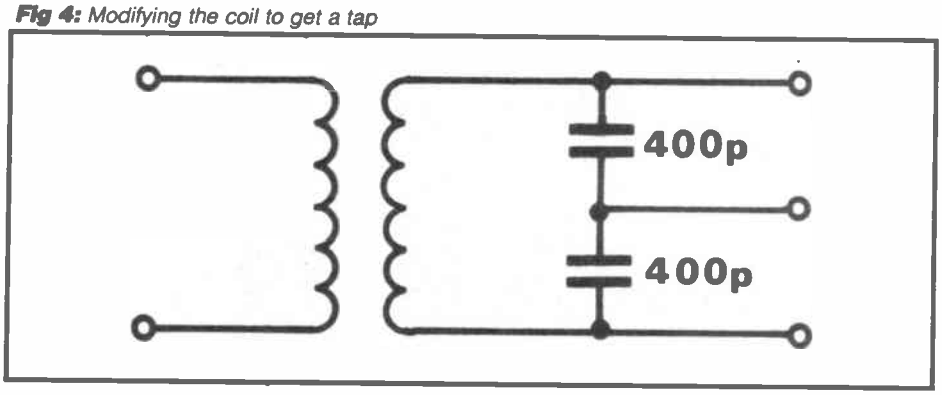


Fig 3: Standard IF coil

Fig 4: Modifying the coil to get a tap



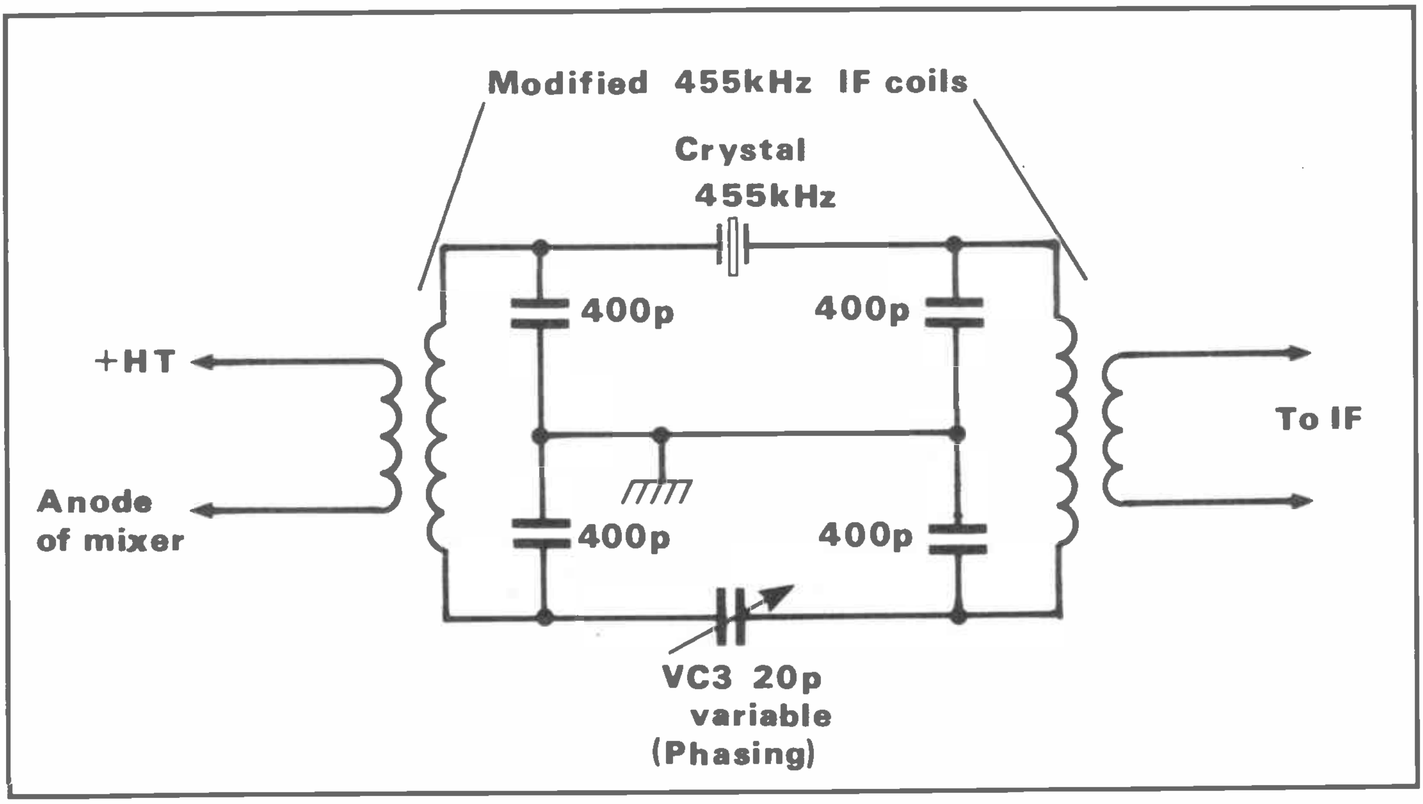


Fig 5: *The CW filter*

and the coupling went up by a couple of turns.

Switch on

I got the local oscillator going first and was well pleased to be able to swish a carrier around on the medium wave. A few components later the mixer was there and the moment of truth had arrived. In with the aerial, switch on, and ear next to the speaker. I needn't have bothered, out roared Jimmy Young at full strength. Pleased? I couldn't have been happier if the Queen had dropped in for a chat! All from three valves too.

Improvements

It took a week for the euphoria of it actually working to die down. You'd have thought no one had ever made a medium wave radio before. Then came the serious bit, getting it on to top band. Now, my sums above assumed additive mixing, ie, the oscillator was running on the high side of the wanted signal. KOA explained that subtractive mixing was just as feasible, so if I left the local oscillator at about 1.5MHz but retuned the front end to top band, ie, took that coil only down from sixty to forty turns, it should tune the band. Here is the sum, 1.5 plus .455 equals 1.955, so top band.

In practice the set now worked on top band but medium wave breakthrough (from the other mix) was a problem. You could listen to the locals with music in the background! Fortunately, my RF amplifier would provide additional rejection of the medium wave plus give the bonus of increased gain, so it got grafted in PDQ (pretty damn quick). The more elegant solution would have been to run the oscillator on the high side, but with no test equipment to tell me where it was running it seemed a good idea to leave it where it was.

Getting serious

At about this time I became interested in CW (Morse) so a BFO was required. In went another EF80 and one IF coil. Its output went back up its input and it oscillated. I could tell it was oscillating because I could again hear it on the domestic receiver. The trouble was, it wasn't doing any beating. Back to dear KOA and he suggested the Radio 2 trick again. Radio 2 is 909kHz. Half that is 454.5kHz. How much closer to 455 do you want? His idea was to listen to the second harmonic of 455 on a domestic radio and tune it until it beat with Radio 2. Some people are so clever it's awe-inspiring, isn't it? In practice the BFO must have been running high, I'd guess at about 500kHz, and even with the core fully in I couldn't quite make Radio 2 on the harmonic, so 100pF went in across the coil, and bingo!

Selectivity

By now I had a receiver to be proud of. A real rats' nest, but I understood it and, to be modest for a moment, it worked really well. The only problem left was selectivity.

I would be happily copying the slow Morse transmissions (every other letter at 12wpm!) when a coastal ship to shore would start up and it was all over. The problem was, all the filters I'd seen in the magazines used funny IF coils with taps and stuff. Hardly what you find in the average radio at a jumble sale. Again KOA to the rescue, but this time it involved money. Real money, like three quid which I was persuaded to spend on a 455kHz crystal.

KOA's idea was to make a 'capacitive tap' on two ex-domestic radio coils. Open them up and see what value of capacitor is fitted. Cut that out and put two capacitors of twice that value in series, centre to earth. Since capacitors in series reduce the value, you end up with the same resonant circuit but with the required tap. Brilliant!

In practice it worked well but cost me a lot in terms of insertion gain, so a new IF stage was added exactly like the other one!

In conclusion

The whole of the above took me about six months of the odd hour here and there to build. To me it is still one of the great wonders of the world, though physically it is undoubtedly a mess, hence no photographs! What must be said is that I learned a lot, built it for well under five quid and didn't need a life-support system of thousands of pounds worth of test equipment to get it going, just an old medium wave radio and some inspired advice. When are you going to build yours?

News and comment from Glen Ross G8MWR

MIR space station

Let us start this month with a look at what is happening in deepest space. Perhaps the biggest piece of news to come our way is the amateur radio operation which has taken place from the Russian space station. The callsign which is being used is U2MIR and the operators have already been worked by several people. The frequency to keep an eye on is 145.525MHz, although original reports suggest that they may also be using 146.525. If you hear them up there do not be tempted into going back to them because that is well out of our legal band.

The thought may have crossed your mind that, as no licensed amateurs have actually gone up to the space station, how come the operation is legal? This is, perhaps, another example of amateur radio being at the forefront of developments. The answer to our query is that the astronauts studied for, and took the exam, whilst actually residing in the space station. This is, therefore, almost certainly the first example of an examination in any subject which has been held in space. Is there no limit to what we amateurs can get up to?

Space notes

A few quickies to help get you up to date on the satellite scene. Fuji – Oscar 12 has been having some problems in its power controller section. Investigation and a subsequent recharging of the batteries are called for but it is hoped that the system will be up and running again by the time you read this. Oscar 13 is now operating in mode S for a few minutes in each orbit. If you can make use of this mode it should ensure that you do not suffer too much interference on your contacts. Uplink frequencies for this mode are from 435.601 to 435.737MHz with the downlink between 2400.711 and 2400.747MHz.

Adjacent channels

They are also using a simple ploy to help reduce interference and give as many people as possible a chance to work them. This has been used before on the American missions and is the simple idea of transmitting on one frequency and listening for replies on the adjacent channels. Provided they resolutely refuse to acknowledge people on their own channel this idea works very well. The only problem from your end is that you do not know if they are listening up or down a channel and as they will probably switch around at random intervals this will provide you with a continual source of amusement.

A typical 5.6m civil communications earth terminal satellite which is currently operating from the British International Space Centre

Going up

Now for some launch information. The University of Surrey's UoSat C is now expected to go into orbit sometime in early 1989. The next Japanese satellite JAS-1b is scheduled to fly a year later in 1990. From the States comes news that the Astro-1 shuttle mission is scheduled for March 1990. This one could cause a lot of interest as one of the crew members is WA4SIR. One has to say that if operation from the shuttle causes the same display of atrocious operating practices as we have seen in the past, then perhaps your best plan is to stay well away from it. That is unless you really want to see what depths our hobby can sink to.

6 metres

First of all news of the TF3VHF beacon. This came on air on 29 October. It runs 50 watts to a vertically polarised aerial and the frequency is 50.057MHz. The choice of vertical polarisation seems very strange on a band where the world-wide convention is for horizontal. If the idea was to get full omnidirectional coverage, surely this could have been better achieved using a stacked turnstile array rather than suffer the greater than 20dB loss which results from the present cross polarisation system? Reports on this one are being sought and should be sent to G4CVI or TF3JB.

Reports are coming in of a massive opening on Thursday 1 December. Initial reports claim contacts from Canada in the north to Argentina in the south.

Radiation

For many years RF radiation from TV sets, etc, has been a continual pain in the neck for amateurs. The slightest bit of interference to next door's telly and you are in real trouble. The fact that his timebase oscillator's harmonics wipe out your contacts never seem to matter. Then there is the case of the computer you bought so that you could get into RTTY and packet, only to find that the crud which the thing threw out made the bands unusable.

This problem was tackled many years ago in the States by directives which limit the amount of radiation which is acceptable. This then led to computers cased in metal with fully filtered mains leads, etc, whilst in Europe the same thing is in a plastic case with no vestige of filtering.

Fortunately things are changing and a new European EMC directive is planned to come into effect in 1992; having waited this long what is another three years! It will contain requirements for shielding and maximum permissible radiation levels which must be met by all consumer products. There will inevitably be a lot of grey areas to be sorted out and consultations are taking place between the various European amateur radio societies.

Giving up

Let me apologise for a shorter than usual offering this month. It has been compiled whilst under the threat of the flu bug, and at this point G8MWR is going to throw in the towel and retire to bed. Please send donations of medicinal whisky, tall, blonde nurses, grapes, etc, and your news and comment to me at: 81 Ringwood Highway, Coventry CV2 2GT. If you are not going to send goodies then try Prestel on 203616941.

INVESTIGATING 10 METRES

by Ian Poole G3YWX

Ten metres has tremendous potential. It is a band where DX can be worked with low power and poor aerials on sideband or CW. Alternatively FM can be used. This mode can also provide some very surprising results, especially when the American repeaters can be heard.

Unfortunately many people underestimate the band because it has been in the doldrums over the past few years. This is all changing very rapidly now as the sunspot cycle moves towards its peak and 10m is well worth investigating. Why not give it a good try, rather than hear about what everyone else has done and then have to wait another eleven years for the next peak?

Propagation

The secret of the success of 10 metres lies in the number of different types of propagation it can support. It is subject to reflections by the F layer in the same way as the other HF bands. Then it can be affected by sporadic-E, tropospheric ducting and even aurora, which are all effects which are more associated with VHF and UHF bands. With each of these effects apparent at one time or another there is enormous scope for using 10m in different ways and for different purposes.

Looking at the different types of propagation in turn, the reflections by the F layer are probably the most used. These give the band its capability for very long distance communication. In fact, operation on 10m makes use of the F_2 layer, which is the highest of the ionised layers. Being the highest in altitude it gives longer skip distances than those obtained with the other layers. Coupled with this the possibility of multiple hops gives world-wide coverage.

It is found, as on other bands, that the times of day and the seasons bring about changes to the band. As a day progresses it can be seen that the mornings bring DX from the east, then the band opens to stations from Africa, then the USA and finally the path to South America opens. Generally 10m opens later than other DX bands and closes earlier.

Unfortunately 10m is very susceptible to the state of the eleven year sunspot cycle. This means that the band is only really usable by this method of propagation when the sunspot is in the upper half of its cycle. However, when it is on form it is particularly good.

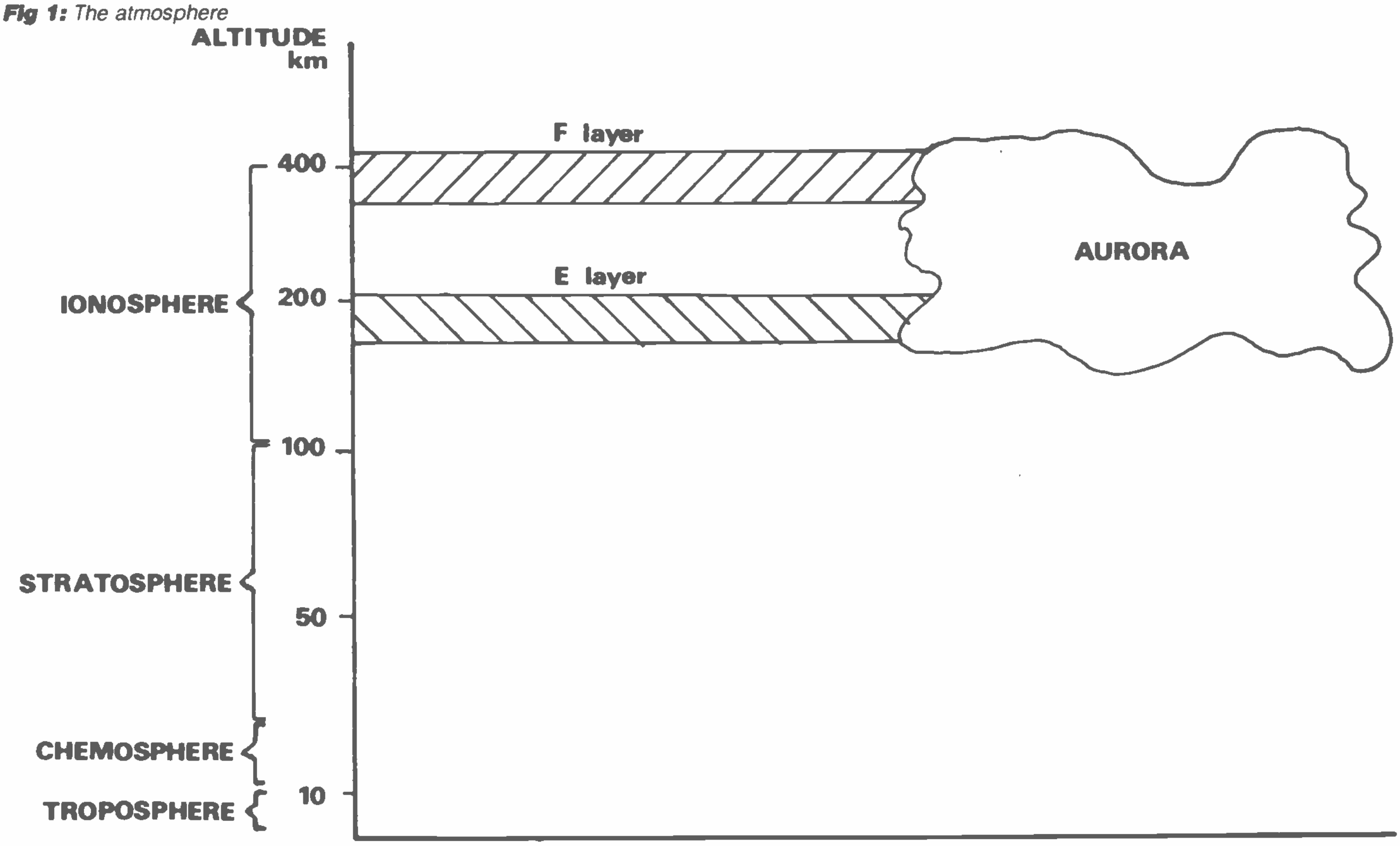
When the band is not capable of sustaining DX using the F_2 layer, it can still be open in the summer months to Europe as a result of sporadic-E activity. The way in which a sporadic-E opening occurs on 10m is essentially the same as it is on VHF. However, they are more frequent and last for much longer. As sporadic-E does not appear to be affected by the sunspot cycle it means that contacts can still be made over reasonably long distances even in the lowest period of the sunspot cycle.

Surprisingly, 10 metres can sustain propagation via aurora. When an auroral event does occur, normal communication via the F layer reflections is disrupted as on other bands. However, the very intense areas of ionisation near the poles can be used to give contacts over distances up to 1500 miles or so. In the same way as signals on VHF using this mode have a very distinct 'auroral' sound, so do signals on 10m. This means that it is best to use CW, although it is possible to use SSB if signals are strong enough.

As 10 metres behaves in many ways like a VHF band it is not surprising that signals are bent and ducted over the surface of the earth by the changing refractive index of the air. It is found that this falls slightly with height as the air density becomes less. This causes the radio waves to bend towards the area of higher refractive index and to follow the earth's curvature. This means that signals can be heard over distances which are much greater than the ordinary line of sight.

On top of this, tropospheric ducting can cause 'lifts' in conditions. At times when the pressure is high, when cold fronts are approaching or on cold frosty

Fig 1: *The atmosphere*



mornings a phenomenon called a 'temperature inversion' can occur. Normally the air temperature falls as the altitude rises. However, when a temperature inversion occurs this effect is reversed in part of the troposphere. When the lower temperature air nearer the ground is more dense than usual and the higher temperature air above it is less dense than usual, the refractive index change becomes even more marked, causing more refraction than usual. As a result signals can be heard over greater distances than when band conditions are flat.

Bandplans

With its many different types of propagation 10m also has a wide variety of uses and users. Not only does it support SSB and CW DX traffic like the other HF bands but it also carries a lot of FM. When band conditions are flat this FM is used to provide a quiet alternative to a noisy 2 metres. However, when conditions are good FM can be used to give world-wide coverage. Then there are other users which include a beacon service and a satellite downlink. In order to accommodate all these users a certain amount of band planning is necessary.

The IARU bandplan is shown below, but it does not cover all the uses. In spite of this there is a plan which has emerged and seems to work reasonably well.

IARU REGION 1 10 METRE BANDPLAN

Frequency (MHz)	Mode
28.0 –28.2	CW
28.1 ±.05	RTTY
28.2 –29.7	PHONE AND CW

In general most of the CW activity is found in the bottom 50kHz or so of the band, with RTTY stations being found between 28.050 and 28.150MHz. Above 28.2MHz is officially the phone section of the band, although the section between 28.2 and 28.3MHz is generally reserved for beacons. There is a number of these world-wide and they provide a good indication of band conditions. Even though most of the beacons are found in this section there are a few which transmit above this band. For details of the frequencies and locations of these, refer to the RSGB callbook.

Sideband signals are found between 28.3 and 28.8MHz. Frequencies above this band are used for low-power AM and FM transmissions, although when conditions are good and the band is crowded sideband signals are found here avoiding the QRM.

The next sub-band within 10m is 29.40 to 29.55 which is reserved as a satellite downlink. However, it does clash with some FM usage as frequencies between 29.50 and 29.70MHz are used by repeaters in America. In the UK 29.60 to 29.69MHz are used for FM operation with 29.6MHz being the calling channel.

Equipment

There is a wide range of equipment available for use on 10m. This means that there is something for virtually every taste and pocket.

Probably the most obvious but expensive route to use is to buy a new HF multiband, multimode transceiver. With the standard of the equipment available these days, very good transceivers can be bought from a wide range of manufacturers and suppliers. In many instances it is possible to obtain an FM option which is very useful for 10m. The cost is obviously the main disadvantage, but when comparing the equipment to many domestic radios and televisions amateur radio equipment still represents quite acceptable value for money.

If the cost of a new rig is likely to overstretch the bank balance or bring complaints from the wife then consider buying second-hand. Usually the readers' advertisements in the magazines contain a number of transmitters, receivers and transceivers at very reasonable prices. Then there is also the possibility of picking up a bargain at a rally or possibly through the local radio club. Most HF transceivers will have 10m on the dial as it is one of the 'old' bands and not one of the new WARC '79 bands.

One point to watch when buying some of the older units, and particularly those with valves, is that the receiver sensitivity drops off on the higher bands. This means that many of the older receivers are rather deaf on 10m. This is made all the more noticeable by the fact that the noise from the aerial is lower than on the LF bands.

A third way to get on to 10m is to use some converted CB equipment. There is plenty around and there are a number of companies offering conversion kits to get these rigs on to 10m. This can often be a cheap and effective way of getting on to the band, particularly if FM operation is envisaged. However, with the new licence conditions which have been introduced it is often necessary to obtain an 'authority' from the DTI to build or convert equipment for single-band operation on 10m. Fortunately, it is just a simple matter to obtain one and details can be obtained from: DTI, Radio Investigation Service, Room 102, Waterloo Bridge House, London SE1 8UA.

This authority is required to stop unauthorised importation and modification of illegal apparatus. However, it is freely available to bona fide radio amateurs.

Aerials

A large variety of aerials can be used on 10m. Wire aerials can be strung up quite easily as they are reasonably small. Trapped verticals are also available. Alternatively a CB aerial could be modified to fit the bill. However, before making a decision about which type of aerial to use, it is worth considering what type of operation is envisaged. Some aerials are quite suitable for DXing, but give very poor results for local type FM contacts.

Maybe the most obvious type of aerial to put up is a simple and straightforward horizontal dipole. It is easy to erect and only about 17ft long. This sort of aerial will perform well for SSB and CW type working when the polarisation is not particularly important and very low angles of radiation are not imperative. For FM most stations use vertical polarisation and if a dipole were to be used it would have to be made vertical. This is not always easy to implement and there are certainly more convenient ways of erecting a vertical aerial.

Other forms of dipole aerials like trap dipoles such as the G8KW or W3DZZ also operate quite well for DX contacts. Again they suffer from the same drawbacks as horizontal dipoles if they are to be used for FM operation.

Trap verticals like the 14AVQ, HF5 and the like can also give reasonable results. However, if they are ground-mounted you may be disappointed. This is because only the bottom section of the aerial is used and it will be more prone to the effects of nearby objects. Better results are achieved if they are mounted above ground using a ground plane. Even so, FM operators do not find them particularly good as they seem to have a comparatively high angle of radiation which considerably reduces their ground coverage.

For FM operation the most popular choice seems to be a modified five-eighths or half-wave CB aerial. They are designed to give a very low angle of radiation and often require only a little adjustment to make them resonate on the correct section of 10m.

Another alternative is to use one of the many mobile CB aerials and operate it against a ground plane. This approach is not as successful as using one of the full size verticals as they are considerably smaller and the bandwidth is limited. In spite of this they are freely available at very reasonable prices and their visual impact is small.

When considering any aerial system for 10m it is worth remembering how wide the band is. As a result most aerial systems will not operate satisfactorily over the whole band. In fact, a typical dipole may only be usable over 500kHz or 1MHz of the band. With this in mind some operators may want to set up two aerials. For example, it may be worth considering a dipole for the bottom end of the band and a vertical of some description for FM operation at the top. By having the two aerials with different polarisations, mutual coupling effects will be reduced.

Final comments

Ten metres is one of the most interesting and varied amateur bands. Situated on the border between the HF and VHF portions of the spectrum it can be used as a local natter band or as a DX band with the possibility of world-wide communication. Unfortunately it seems to be used only during the peak periods of the sunspot cycle. At other times there seems to be very little activity. This is a cause for concern because there is 1.7MHz of valuable spectrum left idle for most of the time. If this is obvious to us, it must surely be obvious to other people as well.

SECOND-HAND

by HUGH ALLISON G3XSE

Tokyo hi power (Micro 7)

Also known as the HT-7, these are quite attractive-looking 70cm hand-portables with three channels, crystal controlled. I've repaired a few now and the number one failing seems to be the battery carrier. This takes four Ni-Cads and the contact fingers are extremely prone to corrosion. As a transceiver it is not brilliant. The Tx gives 200/300mW out and the receiver is about 2μV for 20dB quietening – not exactly outstanding. Price-wise I've seen a few change hands for £35.00 to £45.00, which seems excessive for what they are. Performance-wise they are comparable to pocket-phones.

Icom IC-320

These are 70cm FM 12V 'car-type' crystal controlled transceivers. I've always considered them extremely reliable and any failings on the few that have come in for repair have been exceptionally random, until recently that is. Suddenly three on the trot with a preset potentiometer intermittently shorting to chassis.

The pot in question is the set deviation one which lives in the long, thin module directly behind the crystal board. The symptoms are no mod and an extra half amp when on transmit. If you look carefully down the edge of the screen of this module you will see that the edge crimp of the pot is extremely close to the metal work. A thin strip of insulating tape seems to cure it!

I quite like the IC-320. It is sensitive enough, considering its vintage, normally responding to about the microvolt for 20dB quietening, and there is plenty of audio available. The Tx normally seems to give out about 6 or 7 watts – the claimed 10W seems a bit hopeful – and the mod is quite punchy. Price seems to be in the £65.00 to £70.00 mark nowadays, assuming several useful British channels are fitted. Beware, some 'grey' imports came in with some weird channels in them. The handbooks on all the examples I have come across are in Japanese, though the circuit diagrams are clearly drawn and quite helpful.

Yaesu FT75

An 'all band' HF SSB transceiver for about £50.00? You are right to expect a catch, and it is crystal control.

The FT75 is an early offering from Yaesu and was a spin-off, so I'm semi-reliably informed, of a commercial HF rig that required crystal control. What you get with the amateur version is a bandswitch and three crystal sockets per band, plus a three-push-button bank on the front to select the crystal required. Note that the crystal you have fitted in, say, channel 1 on 14MHz, cannot be selected to give you anything on any other band. There is a VXO to pull your rock plus or minus about 5kHz, so we are talking of, say, three 2.7kHz SSB 'channels' per rock. This may sound off-putting, only having maybe 30kHz per band, but I was exceedingly surprised at how quickly I fell in love with this box of tricks.

The FT75 does not have a built-in power supply, there being a mobile and mains power pack available. All FT75s I've come across come teamed up with one or other power supply, sometimes both. A 'nude' one (ie no PSU) would be a bit of a challenge to use, especially mobile and I certainly wouldn't pay more than about £25.00 for one. On the subject of prices, £50.00 is about right for a 'showing signs of having been used' one with at least one PSU. A good clean example, full of rocks and with a nicely made home-brew VFO, plus both PSUs sold for £65.00 last year at Woburn, so that's got to be the top price to pay.

The review sample came with both PSUs, so it was promptly mounted in the van and connected up to an old G whip. 'Mounted' is an extremely polite word for chucked on the passenger seat and secured with stretch elastic. However, I digress.

For mobile use the crystal plus VXO turned out to be ideal. Give a channel button a push and turn the VXO till you hear someone. Listen to his QSO then jump in at the end. Maybe he comes back. If not, try a CQ. We are talking one valve in the PA, by the way, so 50 watts or so input is the order of the day, let's guess at 25 or so out (the review box gave 30 on all bands except 10 metres, where 25 was all it was prepared to give). You cannot expect 100% reliable contacts every time with power levels like that, plus a corroded G whip and a waterlogged length of unsuitable coax between rig and aerial – I do my mobile installations with care – but it was all cheap fun. I can honestly say that the crystal control was never a hang-up when used mobile. Incidentally, we have valves only in the PA and driver stages, so current consumption isn't too horrendous.

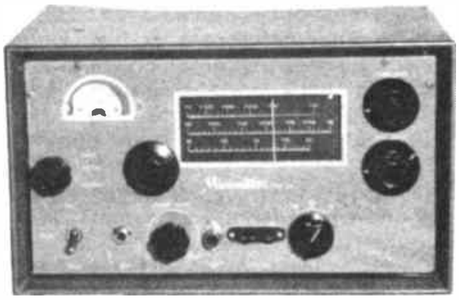
In the shack the crystal control was a bit annoying, I had it all connected up when a mate walked in with an SSTV receiver. Problem: no rock in for 14.230MHz (the SSTV 'channel') so it all had to be hauled out. There is absolutely no reason why a VFO cannot be knocked up and, as I said before, the second-hand examples seen at rallies often have some form of VFO attached. These have ranged from dubious-looking efforts in die-cast boxes, complete with spurious holes and almost shouting 'drift' at you, to very well made examples with a silky, smooth feel, dial drive reductions, flywheels, etc. Consider any supplied VFO as a bonus and be prepared to build your own!

In all fairness to the review box, it may have shown itself up by not having 14.230 fitted, but the first call was to a Canadian on 20m and he came straight back. Next came a Russian who took two attempts at getting the callsign (then a report of 59, natch) so it redeemed itself. The Canadian was quite surprised at the low power, and doubtless his three element beam at 60 feet was helping, but it was a good solid contact and that's all that matters. The aerial was 100 metres of wire 20 feet up. ATU? What ATU?

On CW the filter, which is the SSB one, was really too wide. I must admit I found it a bit annoying, but an MFJ audio filter stuffed in between rig and headphones soon sorted it out. All in all, probably the cheapest HF transceiver you are going to get and there is plenty of fun to be had from it. Worth considering if you are short of cash.

Minimitter Top 2/7

Nice, though not a lot of watts. The 'review' example, bought for £25.00, will suck about 100mA on CW. Since the HT is 350 volts the more mathematical among you will have worked out that we have a typical input here of 35 watts. Although the reason for the '2' in its name escapes me, the 'Top 2/7' covers 160 metres (that must be the top bit, unless they mean table top), 80 and 40. The review one will just about double to 20 metres in the PA, but it doesn't tune up properly (too much L) and chucks out only a dirty, harmonic-ridden 4 watts. Use the thing as the designer intended and you have a nice clean stable 20 watts output available on all three bands. We are talking a VFO design (though there is provision for crystal control via a present-day-none-too-standard crystal socket on the front panel) and it will 'do' AM or CW only.



Minimitter Top 2/7

The first thing that strikes you when you lift off the covers is the fact that the designer must have liked 6AQ5 pentode B7G based valves. Would you believe five of them in the PA and modulator? Could be worth buying at least one spare valve of this type if you own one of these. It's also worth noting that if you whip one valve out of the PA and lightly tune it, then 4 watts dc input, or thereabouts, becomes available. A QRP rig conforming to the rules of the game!

Construction: well, out of the case just a little bit flimsy, probably due to the sheer weight and size of the mains transformer in one corner (the mains power supply is built in). Bolt chassis and case together and everything firms up. The rectifier valve is a mite close to the VFO, though there is a screen in the way, and the RF layout leaves a bit to be desired with one stage able to 'see' another. However, having said all that they get away with it. There are no known problems with stability.

Back to that mains transformer. Substantial would be an understatement. It wouldn't be out of place on the national grid. The same goes for the net/standby/send switch, which looks like it came off the control board of a Frankenstein movie. I've had a few dead 'uns through my hands and it's only been open circuit resistors and the like that have prevented them doing the business. I've never seen a circuit for one but it all seems easy to follow and there's enough room for a party inside, never mind a soldering iron, so all in all quite easy to service. One niggly little fault concerns the front panel meter. This is a proprietary item inside the meter that Minimitter has stuck its own label over. This tends to come unstuck and foul up the movement. Simply re-stick to cure.

One final point on the circuit. The power supply features a real, proper, decent, mansized smoothing choke. No hum whatsoever. Super.

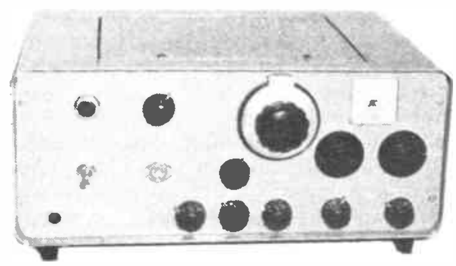
In use, well, not much AM about these days. Oh, all right, I admit it, I like waving Morse keys about. After clearing a biggish space on the bench (more for the receiver than this rig – it's about 12 inches long) in went a Minimitter MR44/11 receiver and the review Tx. Purely in the interests of journalistic examination you understand. Oh, all right, it was super fun. I'd almost forgotten how to use 'separates'. I'd say about 45% of the stuff I called (which was everything that I could hear calling CQ) came back. Sure you got trampled all over by bigger boys with bigger signals, but it was acceptable for a total station cost of £50.00. Irritating to have a Tx capable of 160 metres and a receiver that isn't, though a converter could be knocked up. Reports always T9.

The front panel of the Minimitter is plastic and, like its friend the MR44 'ugly duckling' receiver, it is very brittle. Don't abuse it. Definitely no lifting it up by the plastic when it's out of the case. The VFO dial markings are fragile and will come off with the slightest rub (the printing is on the inside of the set). Leave well alone.

Price-wise, a non-worker £5.00, worker £15.00 to £25.00, though I've seen one sell at £35.00, which seems too high. Good fun, there's plenty of work with 10+ watts on 160/80/40 CW, even with a mediocre aerial.

Sphinx

This looks, well, er, weird. That's 'cos there isn't a proper tuning dial. What you do get is a calibrated knob, graduated 0-100, and you are supposed to get a graph of calibration against VFO frequency, but it is often missing. OK, always missing.



Sphinx

Assuming you have got over the shock of the appearance of the thing, what have you got before you? A remarkably well designed and stable SSB Tx covering 160, 80 and 20 metres at about 80 watts out. You can also run CW and AM and double to 40 metres in the PA (not recommended with SSB). There is a built-in power unit and we are talking 16 gauge aluminium for the chassis, 12 gauge for the front panel, so this is a substantial bit of kit and not too big either. On the reliability front, I've never come across a dead one yet. If they ever go wrong I'd expect no problems, they are well laid out with plenty of room inside to swing an avo probe.

The circuitry is valves, valves and more valves. At one stage during their production (in Britain) a solid-state rectifier was an option against the (at that time) more conventional valve. This was supposed to give more power and cooker running. I'll go along with that, though only to the extent of an extra 5 watts or so more. On the subject of valves, the PA is a QV06-20 and I've never come across a woozy one of those either, the whole thing just keeps on going.

On the circuit front, the crystal filter in the exciter looks 'quaint' by today's standards of multipole filters. Here we have but two (war surplus?) crystals of about 455kHz, my example being blessed with 435kHz rocks. Makes a change from the normal sums of adding 455 on to mixer crystals I suppose. Having taken the mickey out of the filter, it must be said that it works well. Given a highish output crystal mike (Sphinxs sound very basey if driven by a dynamic mike) the rig will sound very punchy indeed at the other end. Incidentally, there are muting facilities available: a spare pair of contacts. Do they work? Decidedly yes. I had a happy week, purely in the interests of writing this article, using a Sphinx plus an FR50B as the receiver. Of what I called, 70% came back. Great fun.

The handbook isn't exactly multi-coloured photographs and glossy paper. However, it does tell you how to use the thing.

There were a few 'Sphinx' accessories. A decidedly tasty matching linear, the 'Pyramid', though not too many about these days. There is of course no reason why the Sphinx couldn't be used with any linear, perhaps being controlled by the mute line. There was also a 'Napoleon' SWR indicator, ditto, use what's to hand. A funny accessory was the grandly named Delta Control Unit. Don't go getting too excited. This is just a box containing a mains transformer/rectifier and a fairly substantial relay doing all the Tx/Rx switching for you.

A bare Sphinx is nowadays worth about £35.00 to £40.00. I've only ever seen good clean examples so I can offer no price guide to grotty ones. By the way, the mains power supply is built in. This makes it worth considering against, say, a transceiver with an external PSU if you are a bit limited on space.

50MHz

by Ken Ellis G5KW

Ray Cracknell reviews 1988

'This period has been an exciting one with many new countries appearing on the scene. There has also been an unexpectedly steeper rise in solar activity. Consequently, continued international interest and activity on 50MHz seems assured. The advancing maximum for cycle 22 should equal cycle 21, and may even compare favourably with cycle 19 when sunspot numbers rose to unprecedented heights during an International Geophysical Year.

'In Europe, the Netherlands, France and Finland are warmly welcomed with Sweden shortly to appear with a "weekend pilot scheme".

'For over a year now, Malta has leapt into the limelight with achievements that have astounded us all. The "square bashers" expedition to Gibraltar also confirmed that location's potential which was partly revealed by the ZB2BL and ZB2VHF beacons during the last solar minimum.

'In Africa, Tanzania 5H1HK has been activated and worked through to Malta and Japan. Zaire 9Q5NW is expected to follow suit. South Africa and Namibia have provided Europe with many fine openings and Zimbabwe has now released 50MHz for the benefit of all its amateurs. CT3 has also been worked to good effect by many from Europe. KH6HSS from Nigeria, and J52US from Guinea-Bissau should soon be active and many expeditions to exotic places are being planned. Cyprus 5B4 now has two active stations, and 4X4IF has been available for heavy loads of crossband contacts'.

50MHz DXCC

With several stations operating in very high temperatures the first 50MHz DXCC should provide a very close finish. The UK's leading 50MHz DXers are looking eagerly to Australia to complete 'worked all continents' (WAC). Any major outburst of solar activity in the next few months may well push the muf high enough for an opening to occur. It is particularly interesting that VK6 and VK8 can now use 50 to 54MHz, while VK1 to 5 are permitted to use the DX portion of 50MHz from 1600-2100hrs.

The award for the most outstanding QSO of the year must surely have gone to 9H1BT. On 8 October Paul was working down nature's wonderful high-density propagation path to South America when JAs occurred on 50110 between 2145 and 2345hrs. He worked over fifty stations in Southern Japan with signal reports between 55 and 57.

Seraphim CT4KQ heard 100 JAs on the same frequency and worked five – 9H1OG joined in later. Further openings are occurring and the latest report is that French stations have also worked Japan. The distance from Malta to Tokio is approximately 10362km on the direct path and 29640km by the long route at an azimuth of 222.

It is interesting to note that the longest QSO from the UK so far during this cycle was probably that of Scunthorpe to Buenos Aires – a distance of 11272km at 225 degrees down the same route!

F layer and mixed-mode propagation

Although we cannot say with absolute certainty that the classification we are using is correct, for the sake of analysis all signals coming from South America (or across tropical regions) are put in this category. FY7THF is the most difficult to classify as it is a borderline case between what we term 'transatlantic Es' and signals emanating further south which are almost certainly propagated by the F layer. The latter do at times arrive in Britain by Es, especially during the summer Es season. Such signals are termed 'mixed-mode' but this does not mean that signals from FY7THF are propagated differently from other transatlantic signals. My personal guess is that they vary possibly more F than Es at sunspot maximum, more Es than F at sunspot minimum, and exactly what the mix is at any one time is extremely difficult to determine.

The GB3BUX project

Plans are going ahead to increase our knowledge of how 50MHz signals are propagated. The GB3BUX beacon has now received official approval and has been licensed to operate as a 'time and frequency beacon' on 50MHz. It will be sited at Sheffield University, Buxton, Derbyshire and is being constructed by Dr Tony Whitaker G3RKL. His progress report dated 11 October 1988 reads: 'The status on GB3BUX (stage 1) is that the exciter and its A1 keying circuit are built and working, the two PA modules are completed and the whole transmitter could be finished and starting soak tests within the next few days. The 10MHz drive unit (derived from the Racal 5MHz high-stability crystal unit) has yet to be built, and I am going to incorporate an ID keyer driven from it.

'The sequence will be a 100ms break per second, with the callsign every minute and the callsign *plus* locater every three minutes. I hope to get it "on the air" before the end of 1988, with stage 2 ready in about six months' time when the frequency and time markers will be locked to the time and frequency standard MSF (on 60kHz from Rugby). This will enable the propagation delay time to be measured very accurately anywhere GB3BUX is received provided that the location also has access to a time standard transmission.'

The mystery of cycle 22

About this time last year and again during the spring of this year, we were told by leading authorities that the peak of cycle 22 could be much earlier than predicted, even as early as autumn 1988. We were also told that there could be a higher sunspot maximum than those recently encountered. This was probably based on the exceptional conditions prevailing together with the high solar activity. I have been examining my records since cycle 18 (1946/1947) when I started operating on 50/56MHz. I have found no evidence to support a departure from the 11/12 year cycles. This infers that the peak of cycle 22 should be 1990/1991. The present pattern is very similar to the corresponding period during 1978 when cycle 21 indicated a peak during the autumn of 1990.

I have written to some of the accepted experts on these matters for a general consensus of opinion and hope to publish their comments in a later issue.

Looking ahead to 1989

Operators on 50MHz or 23MHz do not need to be told of the dramatic effect that the rapid rise of solar flux and sunspot numbers are having on DX reception. A year ago, A22KZ set a record for the maximum distance obtained at the solar minimum by contacting GM4DGT. Six months later, the southern limit extended as far south as Pretoria. The limits have recently extended as far south as Durban, and in another year or so we shall be able to repeat the feats of 1947 and reach Cape Town as the tropical high-density areas of the F layer become more extensive.

During the same period, the main area where signals from the south were coming from has extended from the Mediterranean to mid-France and up to the Channel Isles and southern England. Northern England and Scotland have access when single-hop Es carry the signal northwards, but by the end of September (on one or two occasions) the F layer reached the Midlands and contacts over the Atlantic to Argentina became possible following the high density belts of the F layer.

On 8 October 1988 the route opened up from Malta and Portugal right through to southern Japan. Such events are more likely when active areas of the sun, ie sunspot clusters, cross the centre of the sun as seen from the earth. A flare in the cluster's vicinity at that time will send a vast outpouring of energy in the form of ultra-violet light, thereby increasing the density of ionisation in the F layer some 48 hours later. A bombardment of ionised particles follows this event creating magnetic storms, disrupting the ionosphere and producing an aurora later on.

Meteor scatter and tropospheric propagation

Paul Turner G4IJE has written a very useful article on meteor scatter (MS) for the projected RSGB publication '50MHz at the Crossroads'. He writes: 'During 1 March to September 1988 I completed fifty-four MS contacts on 50MHz. Many of these contacts were made as a result of my weekly skeds with GM3WOJ (IO 77). We usually complete a contact within ten minutes and often the QSO takes only five minutes. I would expect that contacts be made between G and GM on any day, provided that both stations are running the full legal ERP'. (I hope to elaborate on MS in a later contribution).

From the mailbag

Mike Devereux G3SED, Horndean, Portsmouth, has had many two-way QSOs on 50MHz with South Africa and Namibia during the autumn openings. Mike lives eight miles from G3JVL and they keep in constant contact using a 934MHz link. On 8/9 September (during the big opening) he worked: ZS3E peaking S9+, JG89, ZS6CE KG34, ZS6XL KG43, ZS6AT JG87, ZS6XJ KG33, ZS6LN KG46 and six different squares towards the Ten Square Award during one day's operating. He says that it was interesting to see the band opening regularly to Lagos, Nigeria (22/10/83 to 2/11/88) and felt sure it was open to many other parts of central Africa, although there were no reports of any activity.

Steve Richardson G4JCC, Hayling Island, who regularly contacts G3JVL and G3SED, has now worked twenty-one countries two-way and twelve countries crossband on 50MHz. He says that there was little activity during October from his QTH, another example of how conditions can vary over a few miles. Steve's best day was 27/9/88 when he contacted seven African stations in five different squares.

Hal Lund ZS6WB reports

Experts forecast that cycle 22 will peak late in the year with an anticipated high smoothed sunspot number of around 180. If they are correct, cycle 22 will be the second best-ever with excellent DX conditions on 6 metres world-wide. The highest, cycle 19 in the late 1950s, peaked at an SSN of 200, while cycle 21 peaked in the late 1970s at about 165. Now is the time to promote activity on 6m for next year because when the band opens there will be DX QSOs to be made.

From our side, we plan to activate as many southern African countries as possible with a high priority being given to Botswana, Lesotho and Swaziland. We would like to ask European DXers to assist us by putting on rare countries and squares during 1989; especially during the April and October time-frames. In the past, European expeditions have been made during your Es season. How about giving the rest of us a break this time? Let's make 1989 a year to be remembered by 6 metre DXers as one of the best-ever. Start planning now. There are some rare grid squares to watch for which include the following: ZS2HZ, KF26, ZS2NR, KF37, ZS4AAB, KG11, ZS4PV, KG30, ZS4NS, KG32, ZS4S, KG41, ZR6CBK, KG53, ZS5ACV, KG61, ZS3AT, JG87 ZS3E and JG89.

6 metre beacon status

On 8 October Craig ZS5AV had a QSO with G3SED, which turned out to be the longest contact north to south from ZS so far during cycle 22.

'The band opened for me at 1145hrs with a QSO with FC1GHP and was followed by GJ3YHU, EA4CGN and EA1MO. First G for the day was G6YXT at 1335hrs followed by eight more Gs. FD1FLN last worked DX at 1708hrs and was followed by a backscatter QSO with ZS4NS – well to the south in KG32.

'I often try to sneak over to the house from the office at lunchtime when the band sounds promising and was fortunate in catching an opening on 18 October. The first station worked was G4IJE at 1046hrs. At 1150hrs I heard CW on 50.110 which later turned out to be Chris GM3WOJ, calling CQ. I called him on single sideband and we had a QSO at 1151hrs (52/53). After our QSO I heard him work ZS6LN. I have heard nothing from east to west to date. Still, we were very grateful for the DX we received and we have great hopes for next year.

'I recently had the pleasure of meeting Ray G2AHU when he paid a visit to Pretoria. We had a small gathering of 6 metre operators including: ZS6PW, ZS6LN, ZS6XL, ZS6HS, ZS4SA, ZS6BMS and ZS6SS (ex-ZS2SS).'

By the time this appears in print we should have had some indication if the exciting propagation that we had last autumn is to continue.

QSL INFORMATION

CT3BX	Hernani Correia, Vereda Bela Vista 3, P-9000 Funchal, Madeira Island
CT4KQ	Serapmim Matos da Silva, Estrada da Azenha, 3500 Viseu, Portugal
CT1WW	Tiago Frederico, Nagoselo do Douro, 5130 S Joao Pesqueira, Portugal
EA1MO	Manuel de la Torre Padre Claret 9, Valladolia, Spain
G3GJQ/5N0	S/Ldr Roy Handley, JJ16 Akin Adesola VI, Lagos, Nigeria
9H1EL	KN Mauseth, Heggelia 7500, Stjordal, Norway (QSL Via LA2TO)
PA0HIP	Willem Morsink, Oostendestraat 37, 4826 KM, Breda, Netherlands
SV1DH	(SZ2DH) Dr Costas Fimerelis, 23 Elianou Street, Athens 112 54, Greece

NEXT MONTH

FM Smith G8KG ('Smithy') will give a detailed appreciation on 50MHz about propagation. His contribution will include a graph showing the progress of cycle 22 compared with cycles 19 and 21.

May I take this opportunity of thanking all those who have kindly sent in their interesting reports. Have a good time on DX on 6m during 1989. Until next month, 73 de Ken Ellis G5KW, 18 Joyes Road, Folkestone, Kent CT19 6NX.

THE AMATEURS SALUTE MARCHESE MARCONI

by David Lazell

At the time of Marconi's death in 1937, the press published many salutes to this 'Miracle Man of Radio'. Ironically, the tributes included a theme we know all too well today, ie, the inability of bureaucrats and governments to capitalise on native inventiveness.

On the other hand, he was still only a young man of twenty-one when, on his father's estate near Bologna, Italy, he showed the practicality of transmitting radio signals through space. Allegedly, the experiment was conducted with the aid of a gardener employed by the family who was despatched to the end of the grounds with a loaded gun and a galvanometer. If and when the galvanometer needle moved, responding to young Marconi's signals, the gardener was to fire the gun. Eventually, the shot was heard and, in a very real sense, echoed around the world.

It was certainly heard here in Britain. Entrepreneurs in the mid-1890s seemed to be as excited about wireless telegraphy as they recently have been about satellite and/or cable television. At any rate, in 1896 young Marconi came to this country. As a scientist, he was only interested in developing his work, and almost certainly would have preferred to remain in his native country. There, alas, the authorities were still inclined to wait a while.

One reason for Britain's interest was certainly the implications of radio (if it worked) for communication throughout the British Empire. William Preece, later knighted, was the Postmaster General at the time: some would argue that he was also the true godfather to infant radio.

The GPO building in London provided the facilities that Marconi needed, though other experiments were held at Alum Bay, on the Isle of Wight. Marconi had soon learned that the range of 'wireless' communication could be greatly increased by using an earth and antenna. It is interesting to note that in the same year that he made the first successful transatlantic transmission (1901), two books appeared to prove conclusively that such an act was quite impossible because of the earth's curvature. There were other disbelievers, of course.

Early experiments

Those early transatlantic experiments must have looked quaint and even unpromising. An impressive antenna was attached to a box-kite flown by Mr G S Kemp at the receiving station in Newfoundland. Bad weather and other problems did not assist Marconi and his aides, yet they heard the pre-arranged signal 'S' (three dots) transmitted from Poldhu in Cornwall. The receiver at Newfoundland was primitive, the message in itself inconsequential, but Marconi had proved that the curvature of the earth did not affect radio signals – and that was, in practical terms, the most profound discovery in modern communication.

A radio craze hit Britain. The press published photographs of a large tractor fitted with a cylindrical antenna. It looked like a steam can fitted with a tall funnel. Behind all the ballyhoo, financial interests planned to make the most of Marconi's discovery. Thus, the Marconi Wireless Telegraph Company was formed, to develop commercial uses of radio.

The Marconi International Marine Communication Company was created in April 1900 and, fifty years later, produced a handsome commemorative volume (**Wireless At Sea: The First Fifty Years** by H E Hancock). In a painstaking manner, the author examined competing claims for the true invention of radio. Marconi, like other pioneers, enjoyed the benefit of original study done by Clerk Maxwell, Heinrich Hertz and Oliver Lodge. His special and epochal contribution was in changing theory into practice by using an antenna and earth apparatus. Marconi, like Edison, wanted to translate scientific discovery into equipment that could be used by anyone, albeit with some necessary training.

Short range experiments

The great transatlantic experiment of 1901 was preceded by all kinds of short-range experiments in Britain. Mr G S Kemp, Marconi's assistant (with Marconi present during the experiment), transmitted the first radio messages across water in 1897 between Lavernock Point near Penarth, Glamorgan, to the island of Flat Holm in the Bristol Channel (3½ miles) and also to Brean Down in Somerset (5 miles). In May 1948, the Cardiff Rotary Club arranged the installation of a bronze plaque at St Lawrence Church, close to the site of the experiment. George Kemp died in 1933, only four years before his celebrated chief.

Among all the serious experimental work, Marconi was shrewd enough to keep public interest high. Take, for example, the so-called stunt at the Kingsdown Regatta in 1898. Until that year, the progress at the Regatta was not known on shore (and thus to the press) until the event was almost over. In 1898, Marconi watched the Regatta from a following boat, sending the news to shore by radio. This early example of the sport's running commentary gave **The Dublin Express** its scoop, and Marconi's ideas a further boost in popular esteem.

The arms race between Britain and Germany prior to the First World War emphasised the role of battleships, or dreadnaughts as they were called. Although Marconi worked for the good of man, it was inevitable that the naval powers saw radio's possibilities in advancing their political aims. Germany was first to equip a commercially operated craft with the Marconi system. The **Kaiser Wilhelm der Grosse** had been launched to compete with Cunard on the transatlantic run.

However, the British merchant fleet was quick to follow Germany's example. Cunard's **Lucania**, competing with the German ship mentioned above, undertook its first trip with the Marconi system on 15 June 1901. Later in the year, Cunard's **Campania** enjoyed the benefit of similar equipment. Cunard's executives ran extensive tests before accepting the Marconi system and their approval gave a tremendous boost to its prestige.

By the outbreak of hostilities during August 1914, Marconi's contribution to safety at sea was acknowledged by virtually all maritime nations. Italy entered the war on the side of the Allies, and Marconi served his native country's army and navy.

Honours

As if to make up for its early hesitation in recognising his genius, Italy awarded various honours to Marconi. He was made a marchese, but perhaps his best possession was the **SY Elettra**, a steam-powered yacht which was also a floating laboratory. It was equipped with high-powered short wave radio said to be capable of world-wide range.

This wonderful yacht was built at Leith, Scotland, for a member of the Austrian royal family. Marconi bought it in 1920 and used it until his death. In 1930, Marconi turned on the lights of the Great Sydney Radio Exhibition by radio signal, even though the **Elettra** was anchored off Buenos Aires at the time. He often entertained guests on board with radio programmes broadcast across the world. As a trained navigator, holding the rank of captain in the Royal Naval Reserve of Italy, Marconi loved the sea and it was his desire to make sea travel safer that motivated his work in maritime radio communication.

Britain's memorial to Guglielmo Marconi is a little distance from the sea, at Chelmsford in Essex. In a small building in Hall Street, Chelmsford, he opened the world's first radio factory. Britain's first radio programmes were transmitted during 1920 from another building in the same town, in New Street, and later from Writtle, which is two miles west of Chelmsford.

The company set up for broadcasting in Britain, the Marconi Wireless and Telegraph Company Ltd, was involved in a radio service seven years before the creation of the British Broadcasting Corporation in 1927. Mr W T Ditcham made the world's first *true* news broadcast from Chelmsford on 23 February 1920, though one or two amateurs had tried a similar idea earlier than that. The Marconi organisation was very much involved in the setting up of the British Broadcasting Company in 1922.

Antennas

Although for most people, Marconi was to become a tradename for domestic equipment, his major contribution to humanity was his work on antennas. He wrote and delivered papers, encouraged training programmes for ships' officers and came to symbolise the spirit of the true radio professional. Between the wars, the Marconiphone Company Ltd (Radio House, Tottenham Court Road, London W1) published **Radio Review**, an occasional 16-page magazine for stockists and customers. Reviews of 'Marconiphone' domestic radio sets were printed with features on broadcasting included in its pages. References to Marconi transmitters in aircraft and cars were included, as if to confirm that the domestic models were really out of the ordinary.

Radio amateurs, like the rest of us, owe a lot to Marconi, whose life story had an almost science fictional quality. H E Hancock reported a story of the great inventor: on visiting the Chicago World Fair in 1933, Marconi heard that there was an amateur radio station among the exhibits. He at once visited the two radio operators, who both failed to recognise him. Marconi introduced himself and congratulated the pair on their equipment. 'It was only built by an amateur,' said the modest builder of the rig. 'But I am just an amateur myself,' smiled Marconi.

He identified himself fully with working radio men, amateur or professional, for he knew that such people would be in a position to save life or limb, on sea especially and on land too. One gets the idea that broadcasting, though exciting, was less important.

The Baily Interview

The BBC vaults should have a recording of Marconi telling the true story of the 1901 experiment. During the international crisis created by the conflict between Italy and Abyssinia, Marconi decided to leave Britain and return to his native country. An announcement of his decision appeared in a London evening paper, and was noticed by a BBC producer, Leslie Baily (famous for the radio 'Scrapbook' series).

Mr Baily contacted the great inventor and asked if he would give an interview for a radio broadcast. As Marconi was soon to leave Britain, there was little time to plan. However, Marconi agreed to meet him briefly in his offices at ten o'clock the following morning. Rarely in the BBC's history (then at least) had arrangements been pushed ahead so quickly. In fact, Leslie Baily did not get to bed until three in the morning and was up a few hours later to prepare for the interview. Mr P W Paget, who was one of Marconi's original assistants at the Newfoundland experiment, was also present for the interview.

Marconi said his farewell to Britain by recalling the marvellous mission that had created the possibility of world-wide communication. He died in Italy a few months later.

Although Britain has sometimes failed to capitalise on native inventiveness, we can remember Marchese Marconi with considerable pride and gratitude.

Mr J E Farrer of Blackpool, summed it up in a letter to a radio journal, just after Marconi's death was announced in July 1937: 'I would like, on behalf of the bedridden, the blind, the lonely, the long distance fliers and those who go down to the sea in ships, to pay tribute to one who has conferred so many benefits on his fellows. Cowley asks in **The Motto**:
"What shall I do to be forever known,
And make the age to come my own?"
Marconi knew and he did it.'

LOOK WHAT YOU GET EVERY MONTH IN

Amateur RADIO

★ **DX DIARY** Don Field G3XTT with all the news of rare DX, contests and DXpeditions

★ **ON THE BEAM** Glen Ross G8MWR with all the news and comment from bands above 50MHz

★ **SECOND-HAND** Hugh Allison with valuable advice on buying second-hand and plenty of tips on repairs and improvements to your gear

★ **KEN ELLIS G5KW** with the latest developments on 6m

MORE NEWS, MORE FEATURES, MORE FUN, MORE STYLE THAN ANY MAGAZINE AVAILABLE ON THE MARKET TODAY

Make sure of your copy by placing a regular order at your newsagents or by taking out a post free, inflation proof subscription, with early delivery to your door each month

AMATEUR RADIO SUBSCRIPTION ORDER FORM

To: Subscription Department • Amateur Radio •
45 Union Road • Croydon •
Surrey • CR0 2XU
Tel: 01-684 9542

NAME ....

ADDRESS ....

....

....

.... Postcode ....

PLEASE SUPPLY: (tick box) for 12 issues, all rates include P & P

Inland	World-Surface	Europe-Air	World-Air
£25.30 ☐	£27.35 ☐	£31.20 ☐	£35.05 ☐

PAYMENT ENCLOSED: £ —

Cheques should be made payable to Amateur Radio. Overseas payment by International Money Order, or credit card

CREDIT CARD PAYMENT VISA ☐ ☐ EXPIRY DATE

Signature ....

SHORT WAVE LISTENER

TREVOR MORGAN GW4OXB

Looking back on 1988, there has been a fantastic climb in the sunspot level with still some time to go before this cycle reaches its peak; although there has been some 'levelling off'. There are rumours that we could be in for the biggest count ever, with an upgrade in the loggings of long distance traffic.

Desirability

The trouble with DXing is that once you have logged the furthest distance in each direction there's not a lot left, is there? From whence comes my old echo of 'DX' meaning 'desirability'.

It is amazing how many listeners (and operators) make an issue out of struggling to log stations which are thousands of miles away, putting up massive aerial arrays (and using kilowatts on transmitting) to get into the Pacific or wherever those distant stations are, yet haven't logged any European or African rarities.

In my early listening days, I used to log anything I heard. If it was faraway it was great, but I got just as much pleasure from logging OH0, OY, MC, HB0, etc, because they were hardly ever heard.

How often do we hear Gs stating that they can't hear or work the DX because of QRM from the Europeans? Trouble is, it's the same problem for those on the European mainland and, I understand, the problem is even worse for eastern USA. It appears that no-one in Europe wants to work east coast stations when conditions are good, so the poor blighters are stuck between 'California kilowatts' and their European equivalent. I often wonder what would happen if the upper power limit was 100W. At least it would clean up the signals and make people think more about aerial quality and less about distortion.

Getting back to the original question which ties the two together. I recently latched on to LG5LG's frequency for over an hour just listening to the pile-up he was creating. Richard, the operator, must now have a serious hearing problem due to stations calling him from local areas using 400W up. It is a pity that QRP stations were calling him while the QRO operators couldn't hear him (or didn't want to). I'm sure they would have liked a brief contact – if only to get a rarity in the book. I bet the listeners were having a whale of a time logging the DX while trying to work LG5 over the top of the European stuff! Well, someone had to gain out of it, didn't they?

There was plenty of DX to be had last year. Philip Davies of Market Drayton, was one listener who thoroughly enjoyed filling in the blanks on his map with nice new stuff, and not all of it such a long way off either!

The American and Australian Bicentennial celebrations brought out the specials like: NK200G, NQ2000, VI88NSW and VI8WA while, more locally, EI1000 (Phoenix Park, Dublin), OZ1000 (Odense, Denmark), FY0EK (from the club station of the Arianne Space Centre in French Guiana), TV6VNP (from Parc Nationale Venoise, on the French/Italian border), TM7EU (from the 'centre of Europe') and TV6WAT (from an expedition to Belle Island in the Bay of Biscay), all gave worthwhile loggings.

There were plenty of islands to be heard, including: 4J1FS (Malyl Visotskij, off Finland), PY0FF (Fernandez de Noronha), IC8YHZ (Isle of Ischia), CY9DXX (St Paul Island), GD0IOM (Calf of Man), HC2JW/HD2 (Puna Island, off Ecuador) and GE0GHO (Easter Island), just to name a few.

Successful

The RSGB's 21/28MHz contest and the Soviet MIR (Peace) Contest were very successful with listeners. A very good opening occurred on 10m to western USA during the first and some good oblasts were to be found in the second. Well worth listening for next year.

Another good contact was the CQWW SSB event which was held in October. Some good openings occurred on the top band with UP8, OZ9, IU2, 7X2, LX9, HB0, ZB2 and C30. A crop of USA stations were also logged. 80 was very noisy and 40 revealed ZF2, 8R1 and a further crop of USA stations. 20m found some really nice openings in FR5, 7P8, JW5, 4M3, ZX0, VB3, 4U43, W200ILO, KL7, VE7 and YS0. 15m was going well with N7DF/NH2, UA0, CH2, CW8, HH7, OA4, 4M1 and L8 (all logged). 10m really came up trumps, proving that this end of the spectrum is a winner at this time in the sunspot cycle with AH0B, UZ0, RL1, JY9, ZL3, 5T5, D44, CR3, HD8, CW5, TG9, LT8, WG0, N7, AA5, WO6, NR9 and KO7 in the USA.

Contests

Early news on contests for 1989 include the Derby and District Amateur Radio Society which is holding its third Annual 144 to 146MHz Contest on Sunday, 12 March. The times are 1300 to 1700 GMT. SWL logs must show which station was heard and worked, including the RST and county sent. Full details of the contest's rules are available from: DADARS, 119 Green Lane, Derby DE1 1RZ.

The UBA SWL Competition starts on 1 January and operates throughout the year; the idea being to log as many countries as possible on all bands. There are five categories (you can enter more than one) and they are: phone (single op), CW (single op), RTTY, AMTOR, ASCII and PR (single op), SSTV, fax (single op) and all-mode (club or multi-op). A special log is available for three IRCs and full details are available from: Marc Domen, Postbus 38, B-2200 Borgerhout 1, Belgium. Marc says that nearly 100 SWLs took part in 1988, so why not give it a try?

On the local scene, I received a letter from Dennis Sartin GW6JNE, who has taken over the SWL section of the 'Worked All Britain' group. Dennis has been a WAB bookholder since 1981 and has obtained a number of WAB awards. He will be pleased to assist listeners with their queries about the group if they contact him at: 7 Penrhos Crescent, Rumney, Cardiff, South Wales.

Awards

Our intrepid award hunters have been well to the fore again. Ken Burnell, RS88465, Milton Keynes, sent in his claim for the Gold Award for 1000 prefixes logged. Well done, Ken. Some very nice prefixes among the crowd were KH0, KX6, P29, 6W6, J56, D44, 6W1, 9Q5, HH7, FP5, V31, A92, VS6, HL5 and OH6/4U. Ken also claimed the Continental awards for Oceania, Asia and South America – a successful year for him.

Geoff Hughes, ILA302, Chelsea, also tried the Continentals and claimed the North American, South American, European and Soviet Union awards. Geoff says he has now logged 171 countries and some 650 prefixes, so I expect a Gold claim from that neck of the woods in 1989!

Darrell Jacobs, ILA152, Reading, has put in a claim for the European award on 20m only. He says it's his last claim for a while as he is concentrating on getting Gold Prefix awards for 15 and 20m. Using his Amstrad computer, Darrell hopes to add SSTV as yet another string to his bow. As the higher bands are now very active, Darrell is re-siting his old 11m vertical (suitably trimmed to cover 10m) to gain better signals on that band than he currently achieves with the wire.

News of an interesting award comes from the Mansfield ARS, entitled 'The Sherwood Forest Award'. It is available for scoring up to 30 points which are obtainable as follows: 1 point for each station logged from Nottinghamshire, 2 points for each Mansfield ARS member logged and 5 points for logging the Mansfield ARS club calls – G3GQC and G1GQC. Logs should be sent (with a £1.50 fee) to: A Gibbins G4GNC, 52 Wheatfield Crescent, Mansfield Woodhouse, Mansfield NG19 9HQ.

Air banding

The general term 'short wave listening' covers many activities and interests outside the usual amateur and broadcast bands. One of these is 'airband' monitoring.

Air traffic can be heard on both HF and VHF. The VHF spectrum (from 108 to 136MHz) is where you will find the control towers and aircraft on their final approach to your local airport, or even flying one of the many routes that cross the UK. These 'air corridors' are just like spaghetti junction – only more organised!

For reception of these frequencies, it is easy to obtain a small portable pocket receiver for less than £20.00. A great deal of pleasure can be obtained from these, as I experienced on my Thames boating trip last year. However, a scanning type is better, whether crystal-controlled or fully synthesised with memories. Obviously, the more facilities you have, the dearer it's going to be (you can pay over £300.00 for a good scanner).

If you do get a crystal-controlled scanner, make sure you have the correct crystals for the airport you want to monitor. I thought a little scanner I had was either deaf or stone dead until I checked its crystals against a list of airport frequencies ... there was no way I was going to receive Glasgow or Luton from Swansea! If you are contemplating buying a synthesised scanner, make sure it covers the airbands. Not all of them do, even the most up to date ones.

On high frequency

The HF bands also carry air-traffic communications which can be received on a normal HF receiver operating on single sideband. Scanning receivers of the portable variety are also available for HF but they are usually very expensive. Alternatively, receivers such as the Sony ICF-7600D or the cheaper Tatung 7602, have a few memories for you to program in the required frequencies which will be scanned for signals. For base station use, the facilities and quality of modern general coverage receivers will prove more than adequate as many of them have programmable memories.

One advantage of the HF airbands is that your usual aerial is normally just the job, although some enthusiasts prefer vertical aerials or, at least, find them better in certain locations. The answer is to try your current aerial and experiment with others. Aircraft mostly listen on these bands while crossing the Atlantic on routes planned by Gander and Prestwick. On this side of the Atlantic Ocean, communication is covered by 'Shanwick' (an abbreviation of Shannon and Prestwick) which will agree a route with the pilot using VHF (frequencies 123.95 or 127.65) and then transfer to an HF frequency for further instructions.

'Selcal'

There is a selective calling device called 'Selcal' on board the aircraft which enables a specific aircraft to be called by code, thus obviating the need for continuous monitoring by the crew. The table below shows some of the frequencies for communications of this type. A full list of these frequencies is in the '**Aeronautical Radio Handbook**' which contains over 5,500 frequencies and lots of other information (available from: Interbooks, Stanley, Perth PH1 4QQ. Priced at £16.25).

Military transmissions

You can also hear military transmissions on the HF bands, both national and international. The usual rules apply here, but you must *not* relay anything you should accidentally hear to anyone else. Weather forecast stations are also found on these bands giving conditions over a very wide area. Some of the information is given in a coded form but the abbreviations are easy to recognise.

Composite

The voice heard on the 'Volmet' transmissions is, in fact, a composite, ie, made up from pre-recorded phrases which are selected automatically to suit a particular situation. Airport control stations can be heard over some considerable distance and it is quite possible to 'track' an aircraft from take-off to landing.

So, good airbanding! Keep listening for those Concorde flights and watch for the unusual! Remember Richard Branson's balloon flight?

North Atlantic HF Network

Pt 1: Nat A Southern routes ... all aircraft

Gander	New York	San Juan	Santa Maria	Shanwick	Paramaribo	Canaries
3016	3016	3016	3016	3016	3016	3016
5598	5598	5598	5598	5598		5598
8825	8825	8825	8825	8825	8825	8825
13306	13306	13306	13306	13306		13306
	17946			17946		17946

Pt 2: Nat B Central and Northern routes for aircraft registered West of 30 degrees west.

Gander	Reykjavik	New York	Santa Maria	Shanwick
2899	2899	2899	2899	2899
5616	5616	5616	5616	5616
8864	8864	8864	8864	8864
13291	13291	13291	13291	13291
	17946	17946		17946

Pt 3: Nat C Central and Northern routes for aircraft registered East of 30 degrees west.

Gander	2962	5649	8879	13306	
Reykjavik	2899	5649	8879	13306	17946
Shanwick	2899	5649	8879	13306	17946

Pt 4: VHF communication frequencies

121.5	Emergency frequency
123.95	Oceanic clearances
124.6	London information
124.75	London information
124.9	Scottish information
127.65	Oceanic clearances
128.6	London Volmet (South)
131.05	Flight information (above FL245)
132.6	Flight information (above FL245)
133.8	North Atlantic tracks
134.7	London information
135.37	London Volmet (Main)

FREE CLASSIFIED ADS

FREE CLASSIFIED ADS CAN WORK FOR YOU

We are pleased to be able to offer you the opportunity to sell your unwanted equipment or advertise your 'wants'.

Simply complete the order form at the end of these ads. Feel free to use an extra sheet of paper if there is not enough space. We will accept ads not on our order form.

Send to: *Amateur Radio Classified Ads*, Sovereign House, Brentwood, Essex CM14 4SE.

DEADLINE AND CONDITIONS

Advertisements will be published in the first available issue on a first come first served basis. We reserve the right to edit or exclude any ad. Trade advertisements are not accepted.

FOR SALE

■ New TSC7106S (display drivers) £4, used but okay £3. 3½ digit LCD displays, new £5, used but okay £4, used and scratched £3. PCBs with 7106 and display, £3. PCBs with SPST high quality PCB switch and 7621, 75p. 50p P&P per item. Also Omron 24V (okay at 12V) relays, 50p each. Mr Jon Baker, 3 North Road, Surbiton, Surrey KT6 4DY

■ Receiver, 2m SMC12A12, but with external squelch, 12 xtals, Ni-Cad powered, complete with charger and antenna, £50. 23cm converter MMC for above, £15. Both in good condition. Simon. Tel: Fareham (0329) 283949

■ Yaesu FT101E, excellent condition, £275. Tel: (0522) 753180 after 6pm

■ Racal TM4 security test meter, tests all Racal infra-red and microwave security equipment, brand new, never used, £20. Or exchange for Bird 43 wattmeter, external condition not important. Tel: (0207) 544342 after 7pm

■ AR40 rotator, control and cable, 9 element 2m tonna N type connector, £60. G4MTA. Tel: (0235) 27128

■ CB Murphy base station and Murphy portable, both 40 channels and in excellent order and condition, £60 ono, will separate. Also Philips pocket secretary vest pocket cassette recorder with two miniature cassettes, £35. Will exchange for Airband Marine etc, covering 68-87, 88-107, 108-136, 138-174, 410-512 or similar, with cash adjustment. Nash, 39 Fleet Street, Holbeach, Lincs PE12 7AD. Tel: Holbeach 22649

■ Trio TL-922 linear, in excellent condition, boxed with manual, £750. Sony ICF-7600DS receiver, complete with earpiece, case, manual, external aerial, in excellent condition, £110. Lowe Electronics HF-125 general coverage receiver, 30kHz-30MHz, FM board fitted, PSU, manual, 6 months old, £325. MM transverter, 144/28, 10W output, vgc, £80. Also MM 432/144, 10W output, also vgc, £80. DNT CB on new FCC freq, boxed, new, £75. Tel: (0692) 82075 daytime. Ask for Ian

■ Fundamentals of Radio (Terman), 1938, £5. Royal Corps of Signals Handbook of Line Communication, Vol 1, 1947, £5. Reference Data for Radio Engineers, 1963, £5. Theory and Practice of Model Radio Control, 1977, £2.50. Radio Control for Models, 1976, £2.50. Radio and Television Engineers Reference Book, 1954, £5. Advanced National Certificate Mathematics (2 Vols), £5. All P&P. Tel: (0491) 576852

■ Trio 930S Tx/Rx, mint condition, no mods, boxed and manual, £1,000 ono. Cap-Co SPC 300 ATU, £130 ono. Epson FX-80 printer, excellent condition, all leads to fit BBC-B, £130 ono. Fred G4RJS. Tel: 01-761 5470 Mon-Fri after 6.30pm; (0760) 338416 Sat-Sun all day

■ Saisho SW5000 receiver, virtually unused, only three months old, 3 year guarantee, for quick sale £60 including postage. Tel: Canterbury (0227) 65831

■ Yaesu FT207 2m hand-held with case, Ni-Cads and charger, £100. Trio SP520 speaker, £25. RTTY and Morse tapes for Spectrum, £5 each. Ian Hogarth, 64 Winterburn Place, Newton Aycliffe, Co Durham DL5 7ET

■ Components clear out. Giant parcels of all sorts of new/used components. Resistors, capacitors, diodes, transistors, ICs, PCBs for breaking down. Maybe odd items of equipment. Weight at least 45lb, thousands of useful parts, £15 plus £5 for postage (UK only). K Bailey, 40 Seymour Close, Selly Park, Birmingham B29 7JD

■ Mint Icom 251E, muTek fitted, £400 ono. GM4PPT, 34 Craig View, Coylton, Ayrshire KA6 6LB. Tel: (0292) 570517

■ Spectrum analyser FTS Mk1, cable portable 9×4×14, 12V Dryfit chargeable, 5 bandwidths 1,2,5,10 B, 3in square screen with h/duty leather case, working 100%. Made by Sonic Instruments Inc USA/UK, no instruction manual. Cost £2-3000, sell for £150 plus postage. One item from lots of test equipment bought from bankrupt communications company. Peter. Tel: (0473) 85203 9am-5pm

■ Tagra BT122, 27MHz CB quad aerial in box, cost £140, asking £60 plus carriage. Kenwood SP520 external speaker, frequency response 100Hz to 5kHz, 6in high × 7½in FB, complete with speaker cord, new, not used, still in box, £30, suitable for Trio or Yaesu. Sony DRS5 dynamic stereo, new, not used, boxed, with adjustable headphones with adjustable tone and volume controls for left and right ear, can be used for amateur radio or stereo use, in perfect order, £30. Mr N Barlow, Glenside, Lon Street, Ffraid, Trearddur Bay, Holyhead, Gwynedd LL65 2YR, North Wales. Tel: (0407) 860575

■ Shure 444 microphone, 50kΩ impedance, £20 plus postage. James G6XM. Tel: Okehampton 2923

■ MMT 28/144 transverter, 2m in, 10m out, with 7dB input attenuator. Ideal for FT-290, new, unused, in box, £75. Tel: (0926) 498388

■ Exchange Yoko DX TV monitor, new, boxed, for HF Rx. Bill Batley, West Yorks. Tel: (0924) 471226

■ Yaesu FRG-7700 HF receiver, 0 to 30MHz, all mode plus FRV-7700 converter, 120 to 170MHz. Both as new, bargain, £350. Tel: (0698) 745750

■ Aerial mast, 30ft telescopic, ex-Ministry, £20. Also three-piece telescopic extension, £5. Base kit for same, £10. Ex-army mic, £4. Headset, £4. Large four 'H' section aerial with cables, £75. Bob Taylor. Tel: Boston (0205) 53514

■ Admiralty B-41, 15-700kHz, £50. B-40, 64-30MHz, £75. Barlow Wadley XCR30 with FM and handbook, £80. Icom IC-4N (similar IC-4E but no repeater shift), £50. Tel: Cheltenham (0242) 512777

■ Icom 1200E mobile/base 23cm FM transceiver. Latest model, mint, 10W output, £450. Trio/Kenwood SW200 power/SWR (twin) meter for 1.8MHz to 150MHz, plus SWQ, separate 'head' for 700m, £100. Professionally made 10GHz 'penny feed' assembly, super quality, £20. 70cm module for Yaesu 726, perfect, £155. Jaybeam D15 23cm yagi, new, £33. Paul G4XHF QTHR. Tel: (0293) 515201

■ Two Hammarlund HQ170 Rx. One at £140, the other at £120 ono. Marconi xtal calibrator mod TF1374, good condition, £200. 75A4 Rx, £250. Tel: Milton Keynes (0908) 313507

■ Trio 430S with FM, £650 ono. Trio TR9000 multimode, 2m with mobile bracket, £285 ono. AT230 ATU, £150 ono. All vgc, boxed, and manuals. Targa electronic keyer, £35. Colin G0JDX. Tel: (0623) 513758 after 6.30pm

■ PW Meon 50MHz transverter, 144MHz IF. Built but not aligned or tested, £35 ovno. Reason for sale – time is no longer available to finish project. Robin GW1AHV. Tel: (0291) 420506 (Gwent)

■ Capco ATU, SPC3000D, built-in relay for low-loss 3kW pep, £175. 1000 watt RMS dummy load, £35. FM CB transceiver, suitable for 10 metres, £25. Tel: (0689) 58825

■ Save £60. Icom IC02E, virtually new, boxed, little use with all accessories, £200 ono. Mr Shaw G8FRA. Tel: (0203) 415815

■ Must sell the following home-brewed items: WEA-SAT Rx, 6ch type, mute facility, tape remote out, on board PSU components, case, clean condition and gwo, £55 inc post. Frame store for displaying live images from satellites, 256×256×64 resolution, all 3 boards socketed, composite video out, metal case, clean condition and gwo, £85 inc post. QRP rig for 80m, dc type, home-brew, 3W out, CW and DSB modes, audio filter board, cased, gwo, little use to me, £50 inc post. WPO PLL VFO for 2m, home-brew, gwo, £30. K Kumar, 24 York Rd, London W5 4SG

■ 6m multimode FT-690 MKI transceiver, very good condition with soft case, £240. G0KNN. Tel: (0388) 817325 (Spennymoor)

■ Leak audio power amp, two EL34s, £10. Similar smaller amp, two EL84s, £5. Del G0DLN. Tel: 01-657 0716 evenings

■ Complete 2m all mode station FT-480R, immaculate condition, never used, mobile, £285. MML144/100S linear amp, £110. 20A 13.8V dc PSU twin meters, volts and amps, £50 or all three £435. TR2300 FM 2m portable, complete with Ni-Cads and charger, £110. All above carriage at cost or arrangement. Terry G4OXD. Tel: (0462) 35248 after 6pm

■ Yaesu FL2100Z linear, very good condition, has not been used for more than 1 hour from new. Boxed with manual, £500. No offers! Tel: (0282) 64236

■ Yaesu FT101B Tx, Ten-tec ATU, Heathkit 4-way coax switch, SWR meters, filters, key, spare new Tx valves, traps, coax and twin feeders, aerial insulators connectors, etc, manuals, ex-G4DIL. Removal forces QRT sale. £200, cash to clear, no haggling. Buyer collects. Tel: Bracknell (0344) 54748

■ Uniden Bearcat 175XL scanner, 5 months old, boxed with instructions, £150 ono or will swap for 934MHz rig and beam. Discone antenna £20. Expert home-base CB radio, 80ch AM/FM, USB LSB, with 24hr clock and scanner built in. Ideal for 10m conversion, £85 + p&p. Altron CB home-base (needs attention) works intermittently! £50 ono. Martin Williams, 8 Caiach Terrace, Trelewis, Mid-Glamorgan, South Wales. Tel: (0443) 411954

■ Versatile power supply with five dc outputs: 12-15V, 6A; 12-14V, 6A (twice); 5-15V, 3A; 5V, 30A; all regulated, floating, fully protected. Compact unit, mint, in original packing, £50. Tel: (0483) 66441 (Surrey) after 6.00pm or weekend

■ Yaesu FT280 2m multi-mode, FM, CW, SSB, £250. Colin G6JWE. Tel: (024020) 660 (home) or 01-248 9155 ext 3072 (work)

■ Uniden Bearcat UBC-100XL VHF/UHF/airband h/held scanner. Boxed, as new, £135. G2FQG. Tel: Maidenhead (0628) 27302

■ Hy-gain 14AVQ trap vertical antenna, 10-15-20-40m. Brand new, box opened to check contents only. Save £35 on dealer's price, £75 ono. Tel: Alan G1EBH. Tel: (0268) 45573 after 6pm

■ Catronics RTTY video display unit, model CD300 series. Catronics RTTY terminal unit, model CT100-1-2-3, manuals, £50. Telequipment S3 service scope with manual, £20. Wayne Kerr autobalance universal bridge with manual, £50. APT regulated power supply, type TCV0550, 0-50V, £10. Exchange any or all above for good rotator or WHY? Tel: (0235) 816947

■ Yaesu FT23 2m handie. Mint condition, £150 ono. Clive. Tel: 091-514 4987

■ FRG7 mint condition, £120 cash. Tel: (0202) 604 806

■ AY-5-8116 dual baud rate generator chip. In package, unused, with data sheet. Cost £9.99 sell £5 ono or swap BBC B education software. Tel: (0380) 77600

■ Yaesu FT101ZD MKIII, WARC CW filter, FM, mint condition, original packing, new 6146B's fitted, full service manuals, £500. Matching FV101DM remote digital VFO, £200. Drake R4B, T4XB, AC4, MS4, complete overhaul, new valves fitted, used as separates or transceiver can be used. WARC bands, four filters, notch, passband, superb receiver, service manuals, all connecting leads, offers? Buyers test and collect all above. L Huntley G4LW, 118 Bradford Road, Trowbridge, Wilts BA14 9AR. Tel: Trowbridge (0225) 753166 any time

■ Capco 1kW pep ATU. 28/2m transverter. FT902 ac/dc, new leads, SMC, 10 FM transceiver, 0/25W variable, 143/9. Hytech computer and comm course in five volumes. Also National Radio School course, 20 books, Tow'ne point bracket for HF G whip. G4YUG. Tel: (0473) 830147

■ ICF Sony 2001D, boxed, as new, £240. Mr Vyin Grove, 114 Wakehurst Road, London SW11 6BT. Tel: 01-228 4835

WANTED

■ Any interesting, unusual valves for collection. Also valve tester, anything considered. K Bailey, 40 Seymour Close, Selly Park, Birmingham B29 7JD

■ Up to four unused OC170 transistors. Tel: (0491) 576852

■ Icom CB 1050. Board with IF cans on it to repair my brand new duff set, or complete non-working rig (for conversion to 10m FM). Also matching 2m transverter for Yaesu FT757. GM4PPT, 34 Craig View, Coylton, Ayrshire KA6 6LB Scotland. Tel: (0292) 570517

■ T1083 amp coil range C. Cover for PSU type 16, belongs TR1143 or USA, complete PSU off SCR522. Any command gear, modulator, receiver, dynos, rack, scrap Tx/Rx for spares. Tuner TU10B. Mount for BC348. Amp A1214. Buy or swap. Have WS18. MO coil range C for T1083 etc. 52 Bramble Lane, Mansfield, Notts NG18 3NR

■ KW2000 in good working order, will collect. Please phone or write, stating price. W Watson G4EHT, 12 Chadswell Heights, Lichfield, Staffs. Tel: (0543) 251133

■ Superstar 360 FM, in vgc, with Lo-Lo/Lo/Mid/Hi/Hi-Hi, UK FM bands and the full coverage of alpha channels with instruction book, or coverage from 26MHz to 30MHz and alpha channels. Or Ham International Concord 3 in vgc with Lo-Lo/Lo/Mid/Hi/Hi-Hi and UK FM bands and the full coverage of alpha channels or frequency coverage from 26MHz to 30MHz. Or Ham International Jumbo in vgc. Mr N Barlow, Glenside, Lon Street, Ffraid, Trearddur Bay, Holyhead, Gwynedd LL65 2YR, North Wales. Tel: (0407) 860575

■ HF rig for serious CW enthusiast, prefer Ten-Tec, but WHY? Full QSK and excellent relays for very high speeds are essential, must be QRO, no rig/linear separates please. CW only rig acceptable, min 5 bands, top band/WARC appreciated but not essential, digital display essential. About spring 1989. Will pay cash. All letters answered. Please write with full details and price, to Angie G0HGA QTHR, (Herts)

■ Beginner requires receiver. All offers considered, within 30 miles of Northamptonshire. Tel: (0536) 713047

■ Small 'scope up to 30MHz and KW107 or Decca ATV KW Dartford. Also h/book, circuit diagram or HQ145X. Tel: Milton Keynes (0908) 313507

■ Bedridden amateur with little money, seeks radio equipment. Does not matter about looks, just in working order. Anything home-brew, anything radio related, HF, 70cm, 29 FM, 2m, 4m. GI4LXL. Tel: (0266) 45527

■ IC751A, IC735, TS930S or FT767. Your price or exchange Trio 430S with FM, TR9000 with mobile mount, AT230 ATU. All vgc, boxed with manuals. Colin G0JDX. Tel: (0623) 513758 after 6.30pm

■ Microwave Module RTTY or RTTY/CW direct converter. Tel: (0442) 59595

■ German WW2 ex-Service gear, parts, literature. WHY? Working or not, for display only. British WS No 11, T-1190, WS66, WS No 1, 56 4Q, R637, 52 ect, WS65, AD67. For museum purposes only. OZ8RO Rag Otterstad, Vejdammen 5, DK-2840, Holte, Denmark. Tel: 010-452 801875

FREE CLASSIFIED ADS

FREE CLASSIFIED ADS CAN WORK FOR YOU

We are pleased to be able to offer readers the opportunity to sell your unwanted equipment or advertise your 'wants'.

Simply complete the order form at the end of these ads – feel free to use an extra sheet of paper if there is not enough space. We will accept ads not on our order form. Send to ***Amateur Radio***, Classified Ads, Sovereign House, Brentwood, Essex CM14 4SE.

■ Marine crystals, channels 6, 67, 10, 12, 13, 73, 14, 16, 26, 9. To fit Woolfson or Daiwa Search SN9 receivers. Tel: Holbeach 22649 after 6pm (Lincs)

■ Desperately wanted: signal meter for RCA AR88 D. Also spares for RCA AR88 D. Eddystone 730/4. Tel: (0335) 631976 (Leicester)

■ Circuit diagram and/or service manual for Record-a-Call answering machine, model dual remote 90AT. Will pay all costs etc. Chris Dermott, 91 Endsleigh Gardens, Blackpool, Lancs FY4 3PN. Tel: (0253) 402842 after 6pm

■ Good quality general coverage Rx, T2000, FRG7700 or similar, together with ATU and matching decoder. Tel: (0705) 550890 (Lee-on-Solent)

■ Marine crystals: 156.300, 156.375, 156.400, 156.500, 156.600, 156.650, 156.675, 156.700, 156.800. All third overtone to fit holder HC25U. All wanted to fit Daiwa Search 9. Will purchase individual crystals. Tel: Holbeach 22649 after 6pm (Lincs)

■ Manuals for Bell & Howell 16mm projectors, type 621, 631, 636. Manual for Wayne Kerr LCR bridge, type B521, and army test set unit FTI (R210/C11/C42/C45 field checks). I need various small items such as knobs, tuning scales, escutcheons, etc, for Hallicrafter's VHF set type S27. Would buy non-worker for parts. I am looking for aerial tuning knob, and locking plate for army WS62. For the R1155/T1154 set-up I need items such as loop aerial, drive box, resistance unit, trailing aerial etc. Contact Tony Howard. Tel: (0908) 73114 (Milton Keynes)

■ Microwave Modules 2001 RTTY to TV converter, good price paid for good example, prefer with manual. I have a B40D general coverage and PRO2008 scanner, will swap. Write to S P Martin, 24 Collingwood Close, Worle, Weston-Super-Mare, Avon BS22 9PQ

■ Tx 3 comm 64 in exchange for Rx4. Tel: (0752) 6636 38

■ Yaesu FRG-7700, Trio R-1000 or similar communications receiver. Must be in excellent condition. Write or phone with details to: Richard, 14 Silverdale, Barming, Maidstone, Kent ME16 9JG. Tel: (0622) 26515

■ FT-101ZD, FG-902 ATU, FT-707 ATU. Ian. 'The Dormouse', 5 Sunset Walk, Bush Estate, Eccles-on-Sea, Norfolk NR12 0SX. Tel: (0692) 82075

■ SP70 VFO700S Trio desk mic IC402. Exchange FT-290R, FL-2010. Mint for above or sell, haggle etc. Tel: 021-427 8701

■ Trio R600 or R1000. Must be in first class condition. Cash waiting. Will travel. No time wasters. G R Creed, Cartref Villa, Rectory Road, Crumlin, Gwent. Tel: (0495) 243944

FREE CLASSIFIED AD FORM

Send to: Amateur Radio Classified Ads · Sovereign House · Brentwood · Essex CM14 4SE

Classification: (tick appropriate box) If you want to insert ads under more than one classification use separate sheets for second and subsequent ads

For Sale .... ☐ Wanted .... ☐

USE BLOCK CAPITALS (One word per box)

To avoid mistakes please write clearly and punctuate your ad

Name/Address Postcode/Telephone								

USE SEPARATE SHEET FOR MORE WORDS

Ensure that you have included your name and address, and/or telephone number

CONDITIONS: Ads will be published in the first available issue on a first come first served basis. We reserve the right to edit or exclude any ad. Trade advertisements are not accepted

Amateur RADIO SMALL ADS

Amateur RADIO SMALL ADS

This method of advertising is available in multiples of a single column centimetres — (minimum 2cms). Copy can be changed every month.

RATES
per single column centimetre:
1 insertion £7.00, 3 — £6.60, 6 — £6.30, 12 — £5.60.

AMATEUR RADIO SMALL AD ORDER FORM

TO: **Amateur Radio · Sovereign House Brentwood · Essex CM14 4SE · England · (0277) 219876**

PLEASE RESERVE..............centimetres by...............columns

FOR A PERIOD OF 1 issue........☐ 3 issues........☐ 6 issues.......☐ 12 issues........☐

COPY enclosed........☐ to follow........☐

PAYMENT ENCLOSED: (Add 15%VAT).... £ —

Cheques should be made payable to Amateur Radio. Overseas payments by International Money Order and Credit Card

CHARGE TO MY ACCOUNT........☐ CREDIT CARD EXPIRY DATE ☐☐ / ☐☐

COMPANY ....

ADDRESS ....

SIGNATURE .... TELEPHONE ....

....

	C	P	I								

Racal MA211 Aerial Tuning Unit	£148.00 ea
Racal MS 61 Line Prog Unit	£35.00 ea
Vernier Dial 0:100 25mm with Brake	£3.75 ea
8R 50W.W/W V/contol ¼" D shaft	£1.75 ea

HIGH VOLTAGE ELECTROLYTICS

1/360V AC Wkg	35p	15/160V DC Wkg	60p
2/360V AC Wkg	40p	47/160V DC Wkg	£1.50
4.5/280V AC Wkg	40p	4/440V DC Wkg	£1.25
6/360V AC Wkg	75p		

CO-AXIAL CABLES

LDF 4/50A Heliax ½"	£3.75 per mtr
LDF 4/50B Heliax 2"	£4.25 per mtr
RG 218 Co-Axial	£2.50 per mtr
RG 215/U Co-Axial	£1.75 per mtr
RG 215 B/U Co-Axial	£1.65 per mtr
RG 178 B/U Co-Axial	£0.35 per mtr
CA 190 Co-Axial	£0.60 per mtr

ALL PRICES INCLUSIVE VAT + P&P

ELECTRONIC EQUIPMENT CO (LONDON) LTD

UNIT 180, LAKESIDE PARK, NEPTUNE WAY, ROCHESTER, KENT.
Tel: Medway (0634) 290626. Fax: 290843:
Allow 10 days delivery

JAYCEE ELECTRONICS LTD

JOHN GM3OPW

20 Woodside Way,
Glenrothes,
Fife KY7 5DP

Tel: 0592 756962

Open: Tues-Fri 9-5 Sat 9-4

Quality secondhand equipment in stock. Full range of TRIO goodies. Jaybeam – Microwave Modules – LAR.

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 REW)
12 Longshore Way, Milton, Portsmouth PO4 8LS

PSSS....

ALL THE SUPER BARGAINS ARE ON THE INSIDE FRONT COVER

Selectronic

Radio communications and scanning receiver specialist

203 High Street
Canvey Island, Essex,
Tel: 0268 691481
(Open Mon-Sat 9-5.30)

Amateur radio equipment also in stock

SOUTH WALES

ELECTRO DISPOSALS

HOWES KITS, ELDY KITS AND EVERYTHING ELSE YOU'D EXPECT!

UNIT 31, LONLAS WORKSHOPS
SKEWEN, NEATH
Tel: 0792 818451

SMC/TMP ELECTRONICS

Unit 27 Pinfold Workshops
Pinfold Lane,
Buckley, Clwyd
Tel: 0244 549563

ICOM

For all your amateur equipment and accessories. Open Tues, Wed, Fri 10am-5pm, Saturday 10am-4pm. Other days by appointment

BRAND NEW, QUALITY COMPONENTS
ONLY £1.00 PER PACK

400 Mixed Resistors, ⅛-1 Watt
50 Mixed WW & Power Resistors
25 Mixed Pots & Presets
100 Mixed Polyester Capacitors
200 Mixed Ceramic & Mica Caps
200 Mixed Capacitors, all types
50 Mixed Electrolytic Capacitors
10 Slide switches, two types
25 Mixed Zener Diodes
12 Mixed W W Potentiometers
20 Transistor Sockets, 4 pin
1 39,000 uF/20v Electrolytic
100+ Hardware, eg Grommets, Knobs, Clips, Clamps, etc
5 Copperclad Stripboard, like 'Vero' but no holes. 100 x 125mm size 0.1" or 0.15" pitch
50 OC71 Transistors, long leads
1 Sound Effects PCB with Data. Just add LS & Switches for Siren, train, trimphone, etc, etc
2 Power Resistors, 1 ohm 100W
10 Clip-on Transistor Heatsinks
3 Red LED Displays, 7 segment
5 680 uF/63v Electrolytics
5 6800 uF/10v Electrolytics
3 15,000 uF/25v Electrolytics
50 Components Mystery Pack

Giant Packs. Superb selection of all types of new components. Approx 700 to the pound weight. 1lb @ £3.50, 2lbs @ £5.90, 4lbs @ £9.90. Large stocks of **NEW VALVES** (many **RARETIES**) and **SEMICONDUCTORS** at Unbeatable Prices. Many more component & equipment bargains. Ask for free list. Mail Order Only. Add 85p Post/packing (No VAT).

KENZEN, 1436 PERSHORE ROAD, STIRCHLEY, BIRMINGHAM B30 2JL

FAX FOR YOUR SPECTRUM

RECEIVE FAX PICTURES ON YOUR SPECTRUM. WEATHER MAPS ETC.

REAL TIME CLOCK, CONTRAST CONTROL WIDTH CONTROL, SCREEN STORE ETC

SAVE RECEIVED DATA TO TAPE OR DUMP TO YOUR PRINTER.

THE PROGRAMME NEEDS AN EXTERNAL DRUM SPEED GENERATOR.

PROGRAMME ONLY	£9.00
DRUM SPEED GENERATOR	£24.00

SAE for details of all our products

J.&P. ELECTRONICS LTD.

Unit 45, Meadowhill Est, Dixon Street
Kidderminster DY10 1WW. Tel: (0562) 753893

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.

MILITARY SURPLUS EQUIPMENT MANUAL

Giant collection Military Equipment Circuits-/Data. Only **£10.00** including Post/Packing. Just one of many unique Repair and Data Guides. LSAE for your FREE catalogue.

FULL WORKSHOP SERVICE MANUALS

Video Recorders £12.00, All others £6.00 inclusive. State Make/Model/Type with order.

MAURITRON ELECTRONICS LIMITED (REW)
8 Cherry Tree Road, Chinnor
Oxfordshire OX9 4QY
Tel: (0844) 51694

NEVADA COMMUNICATIONS

urgently require

A RADIO ENGINEER

With experience of amateur radio, scanning receivers and CB radio, including microprocessor based equipment.
We offer an excellent salary, working with a small enthusiastic team in a friendly atmosphere.
We also have a position available for a **TRAINEE ENGINEER.**
Telephone or write with CV for an interview to:

Nevada Communications
189 London Road, North End,
Portsmouth PO2 9AE
Tel: (0705) 662145

RAYCOM

COMMUNICATION SYSTEMS LTD

TEL: 021-544 6767

International House,
963 Wolverhampton Road
Oldbury, Warley,
West Midlands B69 4RJ
Fax: 021-544 7124
Telex: 336483 G

ICOM YAESU

RADIO SERVICE ENGINEERS

£8,000-£15,000 PA plus expenses.

Raycom Communications Systems Limited based near Birmingham are **urgently** looking for Service Engineers, both for our workshop and in the field. The work will involve the servicing of the latest hand-held transceivers, mobile radios with CTCSS tone squelch, and general amateur band transceivers. If you think you have the abilities required for this well paid position, even if you do not possess formal qualifications, or if you are a radio amateur who can build/repair his/her own radios and accessories, you well may qualify for the position! A basic knowledge of radio is essential, and a practical test may be given. If you want to improve your career prospects, come and show us what you can do! We are conveniently situated close to Junction 2, M5. We use modern test equipment, and we work in a small, friendly environment with a team of talented people... Please send a written application, or call Ray Withers personally, on the above telephone number.

We offer you the chance to grow with an expanding company, providing business and amateur radio enthusiasts with tomorrow's radio technology today!

Please mention *Amateur Radio* when replying to any advertisements

ADVERTISING RATES & INFORMATION

DISPLAY AD RATES

depth mm x width mm	ad space	1 issue	3 issues	6 issues	12 issues
			series rates for consecutive insertions		
61 x 90	1/8 page	£66.00	£62.00	£59.00	£53.00
128 x 90 or 61 x 186	1/4 page	£115.00	£110.00	£105.00	£92.00
128 x 186 or 263 x 90	1/2 page	£225.00	£210.00	£200.00	£180.00
263 x 186	1 page	£430.00	£405.00	£385.00	£345.10
263 x 394	double page	£830.00	£780.00	£740.00	£660.00

COLOUR AD RATES

depth mm x width mm	ad space	1 issue	3 issues	6 issues	12 issues
		colour rates exclude cost of separations	series rates for consecutive insertions		
128 x 186 or 263 x 90	1/2 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

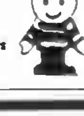
All packs are £1 each, if you order 12 then you are entitled to another free. Please state which one you want. Note the figure on the extreme left of the pack ref number and the next figure is the quantity of items in the pack, finally a short description.

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. One 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 1 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.
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 switch 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.
BD283 3 Mild steel boxes approx 3in x 3in x 1in deep—standard electrical.
BD293 50 Mixed silicon diodes.
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 adaptable to power a go-kart, 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.

ATARI 65XE COMPUTER At 64K this is most powerful and suitable for home and business. Brand new, complete with PSU, TV lead, owner's manual and six games. Can be yours for only £45 plus £3 insured delivery.

DATA RECORDERS ACORN for Acorn Electron, etc., reference number ALF03, with TV lead, manual and PSU Brand new. Price £10 plus £1 50 post. Order ref 10P44

ATARI XC12 for all their home computers. With leads and handbook. Brand new. Price £10 plus £2 post. Order ref 10P53.

JOYSTICK FOR ATARI OR COMMODORE for all Atari and Commodore 64 and Vic20. New. Price £5. Order ref 5P126.

EXTRA SPECIAL OFFER We will supply the Atari 65XE, data recorder XC12, joystick and six games for £57.50 plus £4 insured delivery.

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

VENNER TIME SWITCH. Mains operated with 20 amp switch, one on and off per 24 hrs. repeats daily automatically correcting for the lengthening or shortening day. An expensive time switch but you can have it for only £2.95 without case, metal case—£2.95, adaptor kit to convert this into a normal 24hr. time switch but with the added advantage of up to 12 on/offs per 24hrs. This makes an ideal controller for the immersion heater. Price of the adaptor kit is £2.30

SOUND TO LIGHT UNIT. Complete kit of parts for a three channel sound to light unit controlling over 2000 watts of lighting. Use this at home if you wish but it is plenty rugged enough for disco work. The unit is housed in an attractive two-tone metal case and has controls for each channel, and a master on/off. The audio input and output are by ¼in. sockets and three panel mounting fuse holders provide thyristor protection. A four pin plug and socket facilitate ease of connecting lamps. Special price is £14.95 in kit form.

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

RECORD PLAYER DECK BRS, 12volt operated, belt driven with an 11in turntable, stereo cartridge. It will play 7in-10in or 12in individually at either 45rpm or 33rmp. Fitted speed selector and pick-up cueing lever. Price £12 plus £3 postage. Order ref 12P4.

2.5kw TANGENTIAL BLOW HEATER has an approximate width of 3in. (plus motor), elements made up of two 1.2kw sections so with switch available you can have 2.5kw, 1.2kw or cold blow. Over-heat cutout eliminates fire risk should fan stop or air flow be impeded. Fan blades are metal. Price £5 plus £2.50 post. Our ref 5P62. Switch 50p.

ALBA TWIN CASSETTE RECORDER AND PLAYER WITH STEREO RADIO This is a mains/battery portable made to sell, we understand, at about £50 but the ones we have are line rejects. They are brand new still in the manufacturers' boxes but have a slight defect associated with the cassette section. The radio and amplifier section, both mono and stereo, is perfectly OK. If you are handy at mending things then this should be for you. Price £20 or two for £38 plus £3 insured post, either package. Our ref 20P7 or 2 x 20P7.

LASER TUBE

Made by Philips Electrical. New and unused. This is helium-neon and has a typical power rating of 1.6mW. It emits random polarised light and is completely safe provided you do not look directly into the beam when eye damage could result. DON'T MISS THIS SPECIAL BARGAIN! Price £29.95 plus £3 insured delivery.

POWER SUPPLY FOR PHILIPS LASER is now available in kit form, Price £15 plus £2 postage, or made-up ready-to-use at £20 plus £2.50 postage. Our ref 13P1 for the kit and 18P1 for the made-up version.

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.

ORGAN MASTER is a three octave musical keyboard. It is beautifully made, has gold plated contacts and is complete with ribbon cable and edge connector. Brand new, only £12 plus £3 postage. Order ref. 12P5.

MUSIC FROM YOUR SPECTRUM 128 We offer the Organ Master three octave keyboard, complete with leads and the interface which plugs into your 128. You can then compose, play, record, store, etc., your own music. Price £19 plus £3 special packing and postage. Order ref. 19P1.

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.

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.

CASE NOW AVAILABLE FOR THE CHINON F353 This is the 80 track, single sided one which we have been selling at £28.50. The case is sheet metal, finished in hammer-beige with ample ventilation and rubber feet. Overall size 4¼in x 7in x 1½in approx. Designed to take the ribbon cable and 3 core power lead. Price £8. Our ref 8P21

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.

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. BO631. **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

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. Price £2. Order ref. 2P191

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

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. BO630

13A PLUGS Pins sleeved for extra safety, 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.

CAPACITOR BARGAIN axial ended, 4700µF at 25V. Jap made, normally 50p each, you get 4 for £1. Our ref. 613

PIEZO ELECTRIC FAN—An unusual fan, more like the one used by Madame Butterfly than the conventional type, it does not rotate. The air movement is caused by two vibrating arms. It is American made, mains operated, very economical and causes no interference, so is ideal for computer and instrument cooling. Price is only £1 each. Ref. BO598

SPRING LOADED TEST PRODS—Heavy duty, made by the famous Bulgin company. very good quality. Price 4 for £1. Ref. BO597.

ASTEC P.S.U.—Switch mode type. Input set for +230V. Output 3.5 amps at +5V, 1.5 amps at +12V, and 3 amps at +5V. Should be OK for floppy disc drives. Regular price £30. Our price only £10. Ref. 10T34. Brand new and unused.

APPLIANCE THERMOSTATS—Spindle adjust type suitable for convector heaters or similar. Price 2 for £1. Ref. BO582.

3-CORE FLEX BARGAIN No. 1—Core size 5mm so ideal for long extension leads carrying up to 5 amps or short leads up to 10 amps. 15mm for £2. ref. 2P189.

3-CORE FLEX BARGAIN No. 2—Core size 1.25mm so suitable for long extension leads carrying up to 13 amps, or short leads up to 25A. 10m for £2. Ref. 2P190.

ALPHA-NUMERIC KEYBOARD—This keyboard has 73 keys giving trouble free life and no contact bounce. The keys are arranged in two groups, the main area is a QWERTY array and on the right is a 15 key number pad, board size is approx. 13" x 4"—brand new but offered at only a fraction of its cost, namely £3, plus £1 post. Ref. 3P27.

WIRE BARGAIN—500 metres 0.7mm solid copper tinned and p.v.c. covered. Only £3 plus £1 post. Ref. 3P31—that's well under 1p per metre, and this wire is ideal for push on connections.

INTERRUPTED BEAM KIT—This kit enables you to make a switch that will trigger when a steady beam of infra-red or ordinary light is broken. Main components—relay, photo transistor, resistors and caps, etc. Circuit diagram but no case. Price £2. Ref. 2P15.

1/8th HORSEPOWER 12 VOLT MOTOR Made by Smiths, the body length of this is approximately 3in, the diameter 3in and the spindle 5/16th of an inch diameter. It has a centre flange for fixing or can be fixed from the end by means of 2 nuts. A very powerful little motor which revs at 3,000rpm. We have a large quantity of them so if you have any projects in mind then you could rely on supplies for at least two years. Price £6. Our ref 6p1, discount for quantities of 10 or more.