

FEBRUARY 1989 £1.30

ISSN 0141-0857

Practical

Wireless

The Radio Magazine

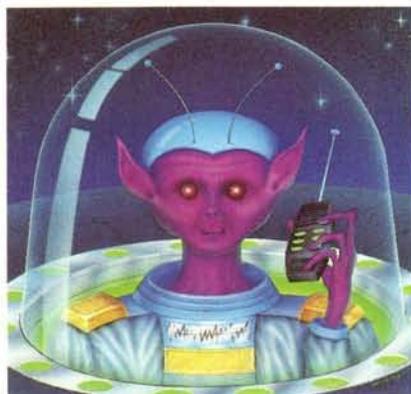
REVIEWED
The Standard C5200



An RF-Operated Relay

**Introduction to Digital
Communications**

Yaesu's FT-736R. Because you never know who's listening.



Why just dream of talking beyond earth?

With Yaesu's new FT-736R VHF/UHF base station, you can discover some of the best DX happening in ham radio. Via moonbounce. Tropo. Aurora. Meteor scatter. Or satellites.

You see, the FT-736R is the most complete, feature-packed rig ever designed for the serious VHF/UHF operator. But you'd expect this of the successor to our legendary FT-726R.

For starters, the FT-736R comes factory-equipped for SSB, CW and FM operation on 2 meters and 70 cm, with two additional slots for optional 50-MHz or 1.2-GHz modules (220-MHz North America only).

Crossband full duplex capability is built into every FT-736R for satellite work. And the satel-

lite tracking function (normal and reverse modes) keeps you on target through a transponder.

The FT-736R delivers 25 watts RF output on 2 meters, 220-MHz, and 70 cm. And 10 watts on 6 meters and 1.2-GHz. Store frequency, mode and repeater shift in each of the 100 memories.

For serious VHF/UHF work, use the RF speech processor. IF shift. IF notch filter. *CW Narrow Optional and FM wide/narrow IF filters. VOX. Noise blanker. Three-position AGC selection. Preamp switch for activating

your tower-mount preamplifier. Even an offset display for measuring observed Doppler shift on DX links.

And to custom design your FT-736R station, choose from these popular optional accessories: Iambic keyer module. FTS-8 CTCSS encode/decode unit. FVS-1 voice synthesizer. FMP-1 AQS digital message display unit. 1.2-GHz ATV module. MD-1B8 desk microphone. E-736 DC cable. And CAT (Computer Aided Transceiver) system software.

Discover the FT-736R at your Yaesu dealer today. But first make plenty of room for exotic QSL cards. Because you *never* know who's listening.

YAESU

*CW narrow optional



UK Sole Distributor **South Midlands Communications** S.M. House, School Close,
Chandlers Ford Industrial Estate, Eastleigh, Hants SO5 3BY. Tel: (0703) 255111

Prices and specifications subject to change without notice. FT-736R shown with 220-MHz option installed.

Practical Wireless

The Radio Magazine

FEBRUARY 1989 (ON SALE 12 JANUARY 1989)

VOL. 65 NO. 2 ISSUE 983

NEXT MONTH

Packet Radio
Update
(Part 1)

PW Review
ICOM IC-3210E
Dual-bander

NiCad Battery
Protector

plus
All the usual
features

Don't miss
it—place your
order with your
newsagent now!

On sale
February 9

Contents subject to last-minute revision

- 23 Crops and Coils—6**
George Pickworth
- 26 A Chicken-wire Discone**
Tony Gillbey G4YTG
- 27 Practically Yours**
Glen Ross G8MWR
- 28 Understanding Circuit Diagrams—11**
R. F. Fautley G3ASG
- 32 PW Review**
The Standard C5200ED Twin-bander
Mike Richards G4WNC
- 36 The British ATV Crowd at Dayton**
Andy Emmerson G8PTH and
Trevor Brown G8CJS
- 44 An Introduction to Digital Communications**
J. Huggins G0DZX
- 48 Amateur Radio in Spain**
Greg Baker
- 51 Kitchen Konstruktion No. 10**
Richard Q. Marris G2BZQ
- 52 An RF Operated Relay**
Paul Benton G8SVE
- 54 Antenna Clinic—Session 2**
F. C. Judd G2BCX

Regular Features

75 Advert Index	16 News Desk	19 Short Wave Mag
31 Binders	57 On the Air	30 Subscriptions
40 Book Service	47 PCB Service	53 Swap Spot
14 Comment	20 PW Services	14,20 Write On

Editor
Geoff Arnold I.Eng FSERT G3GSR
Assistant Editor
Dick Ganderton C.Eng MIERE G8VFB
Art Editor
Steve Hunt
Technical Features Editor
Elaine Richards G4LFM
Technical Projects Sub-Editor
Richard Ayley G6AKG
Editorial Assistant
Sharon George

Technical Artist
Rob Mackie
Administration Manager
Kathy Moore
Accounts
Alan Burgess
Clerical Assistant
Rachel Parkes

Editorial and Advertisement Offices:
Practical Wireless
Enefco House
The Quay
Poole, Dorset BH15 1PP
☎ Poole (0202) 678558
(Out-of-hours service by answering machine)
FAX Poole (0202) 666244
Prestel 202671191

Advertisement Manager
Roger Hall G4TNT
PO Box 948
London SW6 2DS
☎ 01-731 6222
Cellphone 0860 511382

Advert Copy and Make-up
☎ Poole (0202) 678558

COPYRIGHT © PW Publishing Limited 1989. Copyright in all drawings, photographs, and articles published in *Practical Wireless* is fully protected and reproduction or imitation in whole or in part is expressly forbidden. All reasonable precautions are taken by *Practical Wireless* to ensure that the advice and data given to our readers are reliable. We cannot however guarantee it and we cannot accept legal responsibility for it. Prices are those current as we go to press.

THIS MONTH



Microwave Modules

MML 144/100-S

£149 (C)

- ★ 100 Watts output power.
- ★ Suitable for 10 or 25 Watt transceivers.
- ★ Linear all-mode operation.
- ★ Straight through operation when turned off.
- ★ Ultra-low noise receive preamplifier — front panel selectable.
- ★ Equipped with RF vox and manual override.
- ★ Led status lights for power, transmit and preamp on.

MML 144/30-LS

£105 (B)

- ★ 30 Watts output power.
- ★ Suitable for 1 or 3 Watt transceivers.
- ★ Linear all-mode operation.
- ★ Straight through operation when turned off.
- ★ Ultra-low noise receive preamplifier — front panel selectable.
- ★ Equipped with RF vox and manual override.
- ★ Led status lights for power, transmit and preamp on.

MMT 50/28-S

£295 (B)

- ★ 20 Watts output power.
- ★ Input frequency range 28-30MHz.
- ★ Output frequency range 50-54MHz.
- ★ Input level range 0.1-750 milliwatts.
- ★ Modes:- SSB, FM, CW, FSK or AM.
- ★ 18.5 DB conversion gain.
- ★ Exceptional large signal receiver performance.
- ★ RF vox operator adjustable from 20 milliseconds to 1.5 seconds.

MMT 70/144

£149 (B)

- ★ 10 Watts TX output.
- ★ Output frequency range 70-72MHz.
- ★ Input frequency range 144-146MHz.
- ★ Input power range 10-500 milliwatts.
- ★ Low noise receive converter.
- ★ RF vox provides automatic changeover.
- ★ Input modes:- SSB, FM, AM or CW.

MMT 50/144

£295 (B)

- ★ 20 Watts output power.
- ★ Input frequency range 144-148MHz.
- ★ Output frequency range 50-54MHz.
- ★ Input level range 150 milliwatts-15 watts.
- ★ Modes:- SSB, FM, CW, FSK or AM.
- ★ 10 dB conversion gain.
- ★ Exceptional large signal receiver performance.
- ★ RF vox operator adjustable from 20 milliseconds to 1.5 seconds.

FREE CATALOGUE

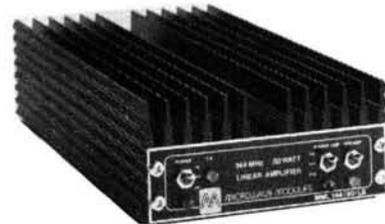
We have many other linears and transverters in our range as well as ATV and weather satellite equipment. Just write or 'phone and we will be pleased to send you a **FREE** catalogue which contains detailed descriptions and the full specifications of our products.



MICROWAVE MODULES LTD.

Brookfield Drive, Aintree, Liverpool L97 7AN, England.
Tel: 051-523 4011. Telex: 628608 MICRO G. Fax: 051-523 8899.

Callers are welcome but it is advisable to telephone in advance to ascertain stock levels.
Our hours of business are:-
Monday-Friday, 9-12.30, 1-5.00 p.m.
(Post & Packing B = £5, C = £6).



Microwave
Modules

RF Amplifier
and Transverter
Catalogue



**ALL PRODUCTS
ARE FULLY
GUARANTEED
12 MONTHS**



ARE

COMMUNICATIONS
01-997 4476

**NOW
OPEN SAT
10 am - 1 pm**

IT'S JANUARY SO LETS HAVE

A SALE

GREAT DISCOUNTS ON STOCKS OF **KENWOOD – YAESU – ICOM – BNOS DATONG**

AND A MULTITUDE OF OTHER BITS & PIECES

	List Price	Our Sale Price		List Price	Our Sale Price
YAESU					
FT767GX HF Transceiver	1599	1399			
FT747 100W compact HF	659	569			
FT736 25W VHF/UHF	1450	1295			
FT965 60-905MHz Receiver	499	429			
FT23 2M H/H TCV12	220	175			
FT290 2M Multi mode	429	359			
FT690 6M Multi mode	399	359			
KENWOOD					
TS 440S HF Tcvr 100W (with ATV)	1282	1149			
TS 140S HF Tcvr 100W	862	775			
TS 680S HF plus 6M Tcvr	995	895			
TR 751E 2M Multi mode	599	525			
TM 721E Dual bander	699	599			
TS 530S HF valve PA	927	795			
ICOM					
IC 781 HF Top of range	4500	3900			
IC 761 HF with Auto Tune	2459	2195			
IC 735 Compact HF	979	859			
IC 3210 Dual bander	499	459			
IC 32 Dual bander H/H	387	369			
			B.N.O.S.		
			LPM 50-10-100		
			L144-3-100		
			LPM 432-3-50		
			LPM 432-1-50		
			LP 50-3-50		
			MICROWAVE MODULES		
			432-30 L 30 for 1W		
			DATONG		
			MOST ITEMS AVAILABLE		
			KENPRO ROTATORS		
			KR 400		
			KR 600		
			plus other models		
			ANTENNA		
			Jaybeam		
			T.E.T.		
			TOKYO SINGLE BANDERS		
			10-15-20-40 or 80 Metres		
			SSB mobiles 20W PEP	£299	£249

LIST less 20%

We cannot list all the items we carry in stock. So please phone for prices.

Opening Hours Mon/Fri 9.30 to 5.30 Sat 10.00-1.00



ARE Communications Limited, 6 Royal Parade,
Hanger Lane, Ealing, London W5A 1ET, England
Fax 01-991 2565
Tel 01-997 4476

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 PW, Sea Street, Herne Bay, Kent CT6 8LD. Tel: 0227 363859. 24 Hour.

Count on us!

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 attenuator 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.



ommunications Ltd. YAESU

WIMBORNE, HANTS. SO5 3BY TEL: 0703 255111 FAX: 0703 263507 TLX: 477351

Overseas 27.3% APR Barclaycard
 UK 25.3% APR Access

MONEY — 0% INTEREST

**SUBJECT
TO
STATUS**

DON'T BE CONFUSED

"Some companies tempt your custom with gimmicks and discounts, others use sarcasm against the competition. Fortunately SMC, as one of the oldest established companies in the business still put the interests of you, the customer, first. We continue to offer quality products at sensible prices with an unrivalled after care service.

Remember that the bitterness of poor service remains long after the sweetness of tempting deals."

- SONY ICF7600DS Just 640g in weight but packed with digital sophistication 153 to 29995KHz and 76 to 108MHz. Four way tuning, quartz locked PLL synthesiser
- SONY AIR7 The compact, high powered professional multi band receiver, 150KHz-108MHz, 30 station preset memory
- SONY PRO 80 Eight way tuning system, 40 station random preset memory, superwide coverage, 8 way tuning 150KHz-108KHz plus, 115/15MHz-223MHz
- SONY ICF2001D The of the range multi-band receiver, 150-29999.9KHz, 76-108MHz, 116-136MHz, outstanding reception
- AIRHANDY SKYVOICE (KE-3000), airband monitor 118-136MHz/AM720 channels real value at
- VHF HANDY RX A lightweight but tough little monitor receiver 141.00-179.99MHz with accessories ...
- BJ200 CHALLENGER A remarkable pocket scanning receiver which receives both AM and FM (narrow band) transmissions 26-29.995MHz, 50-88MHz, 115-178MHz, 200-280MHz, 360-520MHz

SONY ICF7600DS £157 Inc.

SONY AIR 7 £227 Inc.

SONY PRO 80 £297 Inc.

SONY ICF2001D £297 Inc.

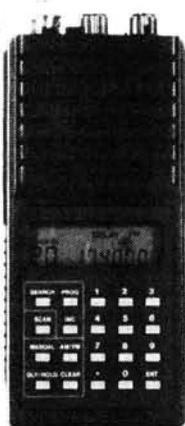
VHF HANDY RX £169 Inc.

BJ200 £132.25 Inc.

BJ200 £199 Inc.

YAESU 9600M PLUS ACCESSORIES

HX850E



- HX850E REGENCY 20 Channel memory AM/FM selectable scanner 60-89MHz, 116-136MHz, 140-174MHz, 406-495MHz £299 Inc.
- YAESU FRG8800 The general coverage communications receiver. All mode/selectable IF-BW multi scanner 150KHz-29.999MHz, wide band VHF option £649 Inc.
- YAESU 9600M 50-950MHz, 100 keypad programmable memory capacity, PC interface, electronic tuning 90KHz to 34MHz scan and sweep reception £1195 Inc.
- ICOM R71 0.1MHz-30.0MHz, 32 tunable memories superior grade general coverage £885 Inc.
- AR2002 25-50MHz/860-1300MHz. High performance monitor and surveillance reception £487 Inc.

YAESU FRG8800

Please call us for full specification literature and details of free finance (on some items). Carriage on all the above items this month is free. Payment by cheque, Access or Barclaycard.

GUARANTEE

Importer warranty on Yaesu Musen products. Ably staffed and equipped Service Department. Daily contact with the Yaesu Musen factory. Tens of thousands of spares and test equipment. Twenty-five years of professional experience.

Free Interlink delivery on major equipment.

Small items, Plugs, Sockets, etc. by post £1.75. Antennas, Cables, Wire & larger items. Lynx up to £5.00. Interlink delivery available, upon request, for items other than radios, from £7.30 depending on weight. Same day despatch whenever possible.



FREE FINANCE . . .

On many regular priced Yaesu items SMC offers. Free finance (on invoice balances over £120) 20% down and the balance over 6 months or 50% down and the balance over a year. Details of eligible items available on request. You pay no more than the RRP price!

PRICES & AVAILABILITY SUBJECT TO CHANGE WITHOUT PRIOR NOTICE

AKD

Unit 5
Parsons Green Estate
Boulton Road
Stevenage
Herts SG1 4QG



THE FILTER SPECIALISTS



MAIL ORDER DEPT.
Stock Items Normally
Despatched within 48 hours,
21 days latest.
TEL. 0438 351710

TV INTERFERENCE PROBLEMS??!

Are you having trouble receiving a watchable picture on your TV? If so, the cause may be airborne interference. For many years AKD has manufactured a low cost range of in-line interference suppression filters that are easily inserted into the aerial system to help reduce the effects of interference from local taxi radio, CB, amateur radio, airport radar, etc. Each filter is terminated in standard aerial co-ax plug and socket and requires no external power. Fitting could not be more simple. No technical knowledge is needed. There are 13 standard stocked filters in our range, but individual filters can be tuned to reject interference at specific frequencies if required. If you are not sure which filter type to order or have any questions regarding interference phone our helpline on 0438 351710 and ask for John who will be pleased to assist you in making the best choice of filter.

THE FILTER RANGE IS AS FOLLOWS:

FILTER TYPE RBF1

A range of filters designed to eliminate Radar Blip, especially noticeable on video recorders. Stocked on channel 36 and 846MHz (RAF Boulmer interference) can be tuned at our factory from 420MHz to 890MHz. **£6.95 each**

FILTER TYPE TNF2 (Suitable for UHF TV only)

A range of Tuned Notch filters stocked on generally useful frequencies used by Amateur Radio operators, CB users, Private Taxi companies. Can also be factory tuned to reject any spot frequency up to 300MHz. Now stocked at 50 & 70 MHz. **£7.95 each**

FILTER TYPE HPF1

Used in weaker reception areas for general interference problems. Use with UHF TV, Video & Pre-Amps **£6.95 each**

FILTER TYPE HPF6

Used in strong signal area for severe interference on UHF only **£7.50 each**

FILTER TYPE BB1

A general purpose filter that can be used on its own or together with other filters in our range for severe interference problems. Ideal at the input of VCR and Pre-Amps. **£6.95 each**

FILTER TYPE HPF6

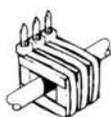


£17.00 each

The HPF6 is a 6 section UHF high pass filter particularly useful for the rejection of any airborne interference below 450 MHz yet having minimal insertion loss on Bands 4 & 5 (UHF TV). It can be used with UHF TV, video recorders and should be sited before any aerial pre-amp. In common with all the other filters in the AKD range the HPF6 requires no external power and is simply fitted in line with the aerial co-ax with its standard terminations.

Technical Details:—

Pass Band:— Frequency range 470-895MHz
Stop Band:— (inner only) DC-450MHz typical >75db @ 300MHz >30db @ 435MHz
Input & Output Impedance:— 75 ohms nominal
Case Material:— Aluminium
Case Size:— 122x40x25mm (excl socket, flylead & plug)
Terminations:— Standard Belling Lee type aerial co-ax plug and socket



Unifilter 'CLAMP-ON' RADIO-FREQUENCY CHOKE

PHONE OR SAE FOR PRODUCT SPECIFICATION & APPLICATION NOTES

Allows leads to be toroidally protected without the need to cut or remove plugs or connectors. Ideally suited for moulded plugs, leads, ribbon, and large diameter cables. Can easily be fitted and stacked in multiples to increase rejection. 'UNIFILTER' works by suppressing the interference currents that flow along the outside of cables without affecting the signals or power flowing inside. This means that you don't need to worry about upsetting normal operation or invalidating guarantees. Suitable for both reducing the emission of, or rejecting the effect of, 'common mode' interference as experienced on computer, hi-fi & speaker leads, as well as the normal mains & aerial cables.

UF 4 KIT (SUITABLE FOR SMALLER INSTALLATIONS) **£9.89**

UF 8 KIT (FOR MULTI INSTALLATIONS) **£19.55**

ALL PRODUCTS ARE AVAILABLE FROM US DIRECT
MAIL ORDER OR WHY NOT MAKE USE OF OUR ACCESS
& VISA FACILITIES TO ENSURE MINIMUM DELAY

ALL AKD PRODUCTS CARRY THE USUAL AKD 2 YEAR
GUARANTEE. PRICES QUOTED ARE CORRECT AT TIME
OF GOING TO PRESS AND INCLUDE VAT,
POSTAGE & PACKING

TRADE ENQUIRIES WELCOME
TRADE ORDERS CAN NOW BE PLACED BY
FAX ON 0438 357591

Props: RT & VEL Wagstaffe. Technical Adviser: John Armstrong

G6XBH GIRAS G8UUS

Visit your Local Emporium
Large selection of New/Used Equipment on Show

AGENTS FOR:

F.D.K. ● AZDEN ● ICOM ● YAESU ● ALINCO

ACCESSORIES:

Welz Range, Microwave Modules, Adonis Mics, Mutek Pre-Amps,
Barenco Mast Supports, DRAE Products, BNOS Linears & P.S.U.'s

AERIALS, Tonna, New Diamond Range of Mobile Whips, Javbeam
BRING YOUR SH EQUIPMENT IN FOR SALE

JUST GIVE US A RING

Radio Amateur Supplies

3 Farndon Green, Wollaton Park, Nottingham NG8 1DU
Off Ring Rd., between A52 (Derby Road) & A609 (Ilkeston Road)
Monday: CLOSED Tuesday-Saturday: 10.00 a.m. to 5.00 p.m.

Tel: 0602 280267

R.A.S. (Nottingham)

R.A.S. (Nottingham)

MERLIN

MERLIN WAY, BOWERHILL,
MELKSHAM, WILTSHIRE SN12 6TJ.
Tel: 0225 706886.

SYSTEMS

WIZARDS PACKS

RADIAL ELECTROLYTICS

10 off 1uf 350v	at 45p
10 off 2.2uf 35v	at 35p
10 off 2.2uf 250v	at 40p
10 off 3.3uf 160v	at 40p
10 off 10uf 250v	at 40p
10 off 10uf 50v	at 35p
10 off 22uf 10v	at 35p
10 off 22uf 35v	at 35p
10 off 47uf 35v	at 40p
5 off 47uf 250v	at 60p
10 off 47uf 25v	at 35p
10 off 100uf 50v	at 40p
10 off 100uf 10v	at 40p
10 off 220uf 25v	at 45p
10 off 220uf 16v	at 35p
10 off 220uf 10v	at 35p
10 off 220uf 40v	at 45p
10 off 220uf 50v	at 50p
5 off 470uf 50v	at 45p
10 off 1000uf 25v	at 60p
5 off 2200uf 25v	at 75p
5 off 3300uf 35v	at 80p
2 off 470uf 200v	at £1.30
2 off 220uf 315v	at £2.00
2 off 220uf 400v	at £2.50
2 off 100uf 400v	at £2.30

POWER ELECTROLYTICS

2 off 220uf + 25uf 380v	at £1.30
2 off 330uf + 50uf 200v	at 70p
2 off 3400uf + 3400uf 40v	at 80p
2 off 2200uf 63v	at £1.20
2 off 1500uf 100v	at £1.60
2 off 1300uf 25v	at £1.80
5 off 3300uf 25v	at 80p

CAPACITORS

10 off 002uf 2000v	at 95p
10 off 1000uf 1500v	at 60p
10 off 33uf 250v	at 40p
10 off 01uf 100v	at 35p
10 off 02uf 100v	at 35p
10 off 1uf 100v	at 35p
10 off 1uf 400v	at 60p
10 off 15uf 250v	at 60p
10 off 02uf 200v	at 35p
10 off 01uf 200v	at 35p
10 off 022uf 200v	at 35p
10 off 047uf 800v	at 60p

MISCELLANEOUS

1 off RS 581-118 PSU 5v 1a (240vac in)	at £7.00
1 off 12.0 12v 6va Transformer (chassis)	at £2.40
1 off 20v 4va x 2 Transformer (PCB)	at £1.80
1 off 18.0 18v 6va Transformer (PCB)	at £1.70
1 off B7A Valve Bases	at 60p
5 off B8A Valve Bases	at 50p
1 off Selection of Gromets	at 50p
2 off 50ohm BNC sockets (Amphenol)	at £1.40
1 off 75ohm BNC sockets	at £1.30
2 off 50ohm BNC sockets B/Head	at £1.80
5 off S/H BNC sockets	at £2.00
3 off Mains on/off switches 15a with neon	at £1.70
1 off Rocker switches SPDT 2a 250vac	at £1.50
5 off Slide switches DPDT	at 70p
5 off 3w 2p switches with knob	at £1.20
2 off 300vdcac 1.25a cutouts	at 85p
1 off 65vdc 1.5a cutouts	at 85p
2 off Chassis 1.25m Fuseholders	at 50p
5 off 20mm Panel Fuseholders	at £1.30
1 off Relay 12vdc coil 4PDT 10a w-socket	at £1.70
2 off 0.3 ohm 100w wire wound	at 60p
10 off Photo plugs	at £1.20
1 off IEC 6a Mains filter socket	at £1.75
1 off IEC 3a Mains filter socket	at £1.25
1 off IEC 1a Mains filter socket	at £1.25

SEMICONDUCTORS

4 off 2N3055 NPN 100v 15a 117m TO3	at £1.20
5 off 2SD67D NPN 120v 5a 50w TO3	at £2.20
10 off 2N4302 NPN 60v 30a 200w TO3	at £2.00
10 off BSX47 NPN 120v 1a 50mhz TO5	at 80p
5 off 2SC2688 NPN 300v 200ma 10w TO22	at 70p
5 off 2SC1514 NPN 300v 1a TO22	at £1.10
5 off 2S8857 PNP 70v 4a 40w TO22	at £1.20
3 off 7812 12v Regulators TO22	at £1.30
10 off 2N3904 NPN 60v 200ma	at 80p
10 off 2N3906 PNP 40v 200ma	at 80p
10 off 2SC541 NPN 40v 200ma	at 80p
10 off 2SC458 NPN 30v 100ma	at 70p
5 off 1.7a 200v Bridge Rectifiers	at £1.30
3 off 1a 50v Bridge Rectifiers	at 60p
10 off 1N5418 3a 400v Diodes	at £1.20
10 off Green Leads	at £1.00
10 off Red Leads	at £1.00
4 off Led Displays Com Cath	at £2.00

TWIN CASSETTE—Just a few left! Twin cassette mechanisms with stereo heads 12v motors at £5.00 + £1.50 P&P. Main music center PCB trunking. To good to miss at £50.00 + £16.00 P&P

THE WIZARDS COMPUTER DESK—Save over £150.00 on this NEW desk! L102cm x W74cm x H74cm with keyboard recess and cabling trunking. To good to miss at £50.00 + £16.00 P&P

COMPRESSORS AND WIND GENERATORS—Gast rotary air vacuum pump 20psi/29inHg. 1.12hp HP 240vac motor. Good for Desoldering. Although work. Just £17.00 + £3.00 P&P. Just in. Printed circuit permanent magnet motor-generator with toothed belt reduction drive. Output-input 2v to 30v up to 15amps. Price £14.00 + £3.50 P&P

IN THE WIZARDS DEN!—We have from time to time the following new and S/H stock. Printers. Monitors mono-colour. Valve amps and PSUs. Lots of odds and ends.

VISIT MERLIN—At the following rallies exhibitions. March 4th Blue Star Rally Newcastle Upon Tyne. 12th GMX Tralford Rally Manchester

MORE DATA—Ring the wizard on 0225 706886 (Day time) 0225 763027 (Home). For more information or for a visit to the works.

PAYMENT—Access, Cheque, PO and Cash Post and Packing on components £1.50. Over £100.00 £1.00. Please add VAT to total.

Thank you John and Adrian the Sorcerers Apprentice!

Books for radio amateurs

FDK

THE 'HAM SHACK'

for the Radio Enthusiast

APPOINTED DISTRIBUTOR

JAYBEAM AMATEUR ANTENNAS

RIGS, ANTENNAS, SWR BRIDGES, POWER SUPPLIES, TEST GEAR, COMPONENTS, MORSE KEYS, COAXIAL CABLES, ROTATORS, MICS, PLUGS AND SOCKETS, SWITCHES

Call us on (0533) 553293

OR COME AND LOOK AROUND AT 26/28 Braunstone Gate, Leicester

OSY OLD MAN TO

INSTANT HP AVAILABLE

WATER DELIVERY ON REQUEST

WSE — HAM RADIO STORE

ALINCO 2M FM ALR22E

The budget 2m FM rig that is low on price but high on spec. 25 watts with a rx coverage that extends from 140-170Mhz (optional). Hundreds in use. For the full spec. see last months advert or send for full colour brochure.



£249

AZDEN PCS-6000 2M FM + AIRBAND!

This rig is unique. It provides 25 watts of FM on 144-146MHz plus full receive coverage from 108-180MHz AM/FM. 20 memories any duplex split in any memory, auto tone-burst, listen on input etc. etc. The airband section has been purpose designed for the job. Send today for colour brochure.



£329

ALINCO DJ-100E 2M FM

Latest rig from the ALINCO stable, this handheld has been developed from the successful ALX-2E. Now incorporating LCD display and 10 memory channels it will fit into even small pockets! The extended receive range cover 140-170MHz and there are no extras to buy. Chris Lorek says in Ham Radio Today, "a lovely little transceiver with a very impressive technical performance."



NEW

IN STOCK

£219

ALINCO ALD-24E Dual Bander

If you thought that dual band rigs were expensive, then look again at this one. It gives true duplex operation with a single antenna output. Basically 2 rigs in one box, it has a superb specification covering 2m & 70cms FM. Extended receive coverage is possible upon request. Probably the most cost effective rig on the market. Send for full details today.



£449

ALINCO 2M AMPLIFIERS

These amplifiers will give you the means of boosting the output from any handheld into a full blown 30-50 watt signal. Each one has a built-in receive pre-amp and requires approx 3 watts of drive. Rugged construction, full protection and both hard switching and RF sensing are features you'll appreciate. They also provide a 10V output for direct operation of handhelds from car supply. Send for details.

SSB/CW/FM



ELH-260D 50W **£119**
ELH-230D 30W **£75**

QRP HF TRANSCEIVERS

Single banders for 80; 40; or 20m with 2 Watts output SSB/CW. Fits into the pocket but can work the DX. These rigs have provided us with some fun recently, and they could do the same for you. Ideal for holidays, hotels or just a new challenge. Go anywhere, no TVI and beautifully engineered. VXO control, IRT, and a host of other features. We got 569 for LA2 on 80m with an indoor wire and W's on 20m! Send for specification.



£179

*80M Model **£189**

BOOKS & FREQUENCY LISTS

THE BOOKS THAT ARE USED BY THE PROFESSIONALS, NEWS AGENCIES, RADIO STATIONS, ETC.

UK Listeners Confidential Frequency List 1.6 to 30MHz.....	£6.95
Complete Guide to VHF/UHF Frequencies 25 to 2GHz.....	£5.95
VHF/UHF Airband Guide to Commercial & Military. Pub Aug 1988.....	£5.95
HF Oceanic Airband Communications 1988.....	£3.50
The Secret of Learning Morse Code.....	£4.95
Pocket Guide to RTTY & FAX Stations.....	£2.95
Marine Radio Frequency Guide HF & VHF.....	Phone
Airband Radio Handbook Second Edition.....	£5.95
Air Traffic Control by D Adair.....	£6.99

DIAMOND POWER METERS

A superb range of VSWR & Power meters from a very famous stable! All with new styling and RMS/PEP readings.



SX-100 1.6 to 60MHz up to 1kW.....	£95.00
SX-200 1.8 to 200MHz up to 200W.....	£65.00
SX-400 140-525MHz up to 200W.....	£79.00
SX-600 1.8 to 525MHz up to 200W.....	£119.00
SX-1000 1.8 to 1300MHz up to 200W.....	Phone

Send for spec. sheet.

ADONIS MICROPHONES

AM-303G

Used by many stations to provide that distinctive voice quality on either FM or SSB. A switch selects the correct response for each mode. Touch buttons provide the PTT and the omni-directional microphone gives the distinctive quality that hand mics just can't match. Works with any rig and includes up/down controls.



£49.95

AM-503G

As above but with speech compressor. **£65.95**

SUPER RODS 2m & 70CM

COMPACT DIPOLE TRAPS

These traps have many uses. Basically they can be made to form a compact 80/40m dipole of some 70ft. Added to a 1/2 size G5RV they add 80m for the addition of only a few feet. Can be used for adding 80m to a 40m trap vertical. Can be used for loading many LF aerials.

£16.95 + £1



£12.95

Superrods are amazing telescopic 1/4 or 5/8th whips that fit into most handhelds. They give a gain of some 8dB over the normal helical. Fittings for BNC, Phono; or FT290

LATEST PRICE LIST AND ILLUSTRATED CATALOGUE — FREE

We have just produced a brand new price list with all the latest products listed. Virtually every make of Ham gear is in there. We have also prepared our very first illustrated catalogue. There are many products that we stock that cannot be mentioned within the space of the average advert and so we thought it would be a useful idea to produce an illustrated catalogue of all the Ham products that we import. To get your copy simply send a first class stamp and we will send you a copy today.



RETAIL & MAIL ORDER:- 18-20, Main Road, Hockley, Essex SS5 4QS.

Tel: (0702) 206835, 204965

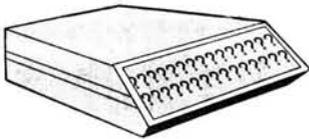
RETAIL ONLY:- 12, North Street, Hornchurch, Essex RM11 1QX.

Tel: (04024) 44765

Visa and Access by telephone. 24hr. Answerphone.

GAREX THE SCANNER SPECIALISTS

NEW CONTINUOUS COVERAGE



**MODEL
FROM REVCO
- CONTACT US
FOR DETAILS**

REVCO RS-3000



THE COMPACT SCANNER
* Size only 6" x 2" x 8"
* Covers: 26-32MHz, 60-90MHz,
118-180MHz, 380-512MHz
* AM & FM all bands
* Liquid crystal display
* 50 memories
* Scan, search, priority

£225

JIL SX-200N THE SUPERIOR SCANNER



* The choice of the professionals
* Proven reliability
* Covers: 26-88MHz,
108-180MHz, 380-514MHz
* AM & NFM on all bands
* Positive action keyboard
* 16 memories
* 12V dc & 240V ac

£325

AOR 2002

* Covers: 25-550MHz, 800MHz-1.3GHz
* AM & NFM & WFM on all bands
* Computer interface socket
* 20 memories
* Compact size
* 12V dc operation
* Up/down step control knob



£487

AOR 800E

THE SMALLER HANDY-SCANNER

* Covers: 75-106MHz, 118-175MHz, 406-496MHz,
830-950MHz
* AM & NFM programmable on all bands
* Full scan & search functions are available
* 20 memories
* Measures only 2.5" x 5.5" x 2"
* Nicads, charger & BNC whip antenna included in
the price



£199

NEW IMPROVED REVCONe

The British made REVCONe already renowned throughout the world has now been improved with a new exclusive feature. The addition of a vertical element to a discone has been shown to improve the performance on a selected band.

Now the REVCONe offers YOU the choice of band
All new REVCONes supplied by us now incorporate a mounting stud for an optional vertical whip for the band of YOUR choice. Whips may be chosen for any frequency from 27 to 950MHz from the standard REVCO range.
Basic REVCONe, excellent value at **£33.75**
Add-on whips from **£3.90 to £10.75**

BROADBAND PREAMPLIFIERS

REVCO PA3 inline masthead model, with special mains psu DC-1GHz min. 13dB gain **£49.95**
PA3I instrument or back-of-set version for 12V DC operation, BNC connectors (SO239 or N-type options) **£35.50**

GAREX ELECTRONICS

MAIN DISTRIBUTOR OF REVCO PRODUCTS. PRICES INCLUDE UK P&P and 15% VAT. Ask for details of our interest free credit.
Extensive range of PYE radiotelephone spares — S.A.E. for list.

7 NORVIC ROAD, MARSWORTH, TRING, HERTS. HP23 4LS.

Phone 0296 668684. Callers by appointment only.

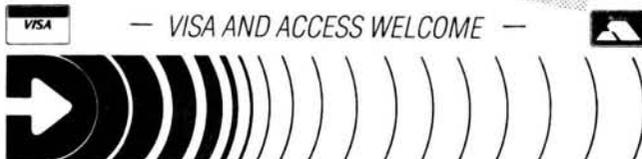
Ask for our secondhand scanner bargain list.



D A T O N G
ELECTRONICS LIMITED

**For products you can
rely upon to give
amazing results**

For information on **Active Antennas, RF Amplifiers, Converters, Audio Filters, the Morse Tutor and Speech Processors** send or telephone for a free catalogue and selective data sheets as required. All our products are designed and made in Britain. Orders can be despatched within 48 hours subject to availability.



DATONG ELECTRONICS LTD

CLAYTON WOOD CLOSE, WEST PARK, LEEDS LS16 6QE. TEL: 0532 744822.

COMMUNICATION CENTRE OF THE NORTH

The largest range of communications equipment available in the North. Full range of receivers, transceivers, antennas, power supplies, meters. All tubing — wall brackets — rotators — insulators.

FULL RANGE OF KENWOOD AVAILABLE

BUTTERNUT	
HF2V 40-80m vertical	£142.00
20 MRK 20m add on kit	£33.49
HF6VX 6 band vertical	£159.00
TBR160S 160m Add on kit	£53.99
HF4B Triband Mini Beam	£235.00

CUSHCRAFT	
A3 3 element Tribander	£262.00
A4 4 element Tribander	£350.00
10-3CD 3 element 10m	£115.00
15-3CD 3 element 15m	£139.75
20-3C2 3 element 20m	£238.00
AP8 8 band 25ft vertical	£164.00
AV5 5 band 25ft vertical	£123.00
18 element 2m Boomer	£106.00
15 element 2m Boomer	£85.00

WELZ	
DCP5 5 band vertical with radial kit	£195.00
DCP4 40-20-15-10 vertical with radial kit	£147.00

JAYBEAM	
VR3 3 band vertical	£73.60
TB1 Rotary Dipole	£105.80
TB2 2 element Tribander	£202.00
TB3 3 element Tribander	£316.00

SWR/POWER METERS	
MFJ 815 HF 2kw SWR/PWR	£57.32
SWRT Twin Meter 1.8-50MHz	£25.00
DIAWA CN410M 35-150MHz	£61.72
DIAWA CN460M 140-450MHz	£65.40
NS660P 1.8-150MHz + PEP	£115.00
Welz SP220	£67.95
Welz SP420	£59.95

DUMMY LOADS	
DL60 60 watt	£10.96
DL600 600 watt	£62.75
CT S30 500 watt	£59.00
MFJ2600 300 watt	£29.35

G5RV full size £16.50, half size £14.50 Full range of Antenna — Accessories plus full range of VHF — UHF — HF mobile Antennas. Alpha HF Linears now available.

Full range of RSGB and ARRL publications in stock. Part Exchanges welcome. Second hand lists daily. Send S.A.E. for details of any equipment. HP terms. Access/Barclaycard facilities. Open 6 days a week. 24 Hour Mail Order Service. Goods normally dispatched by return of post.

**KLM ANTENNA RANGE
AVAILABLE
NOW AVAILABLE
THE 'TEN TEC' RANGE
OF HF TRANSCIEVERS**

Phone 0942-676790.

STEPHENS JAMES LTD.
47 WARRINGTON ROAD,
LEIGH, LANCS. WN7 3EA.



From the makers of the world renowned STAR MASTERKEY a new MORSE KEYBOARD.

Send perfect morse as easily as typing a letter. It has never been as easy to send morse.

Variable transmission. Speed 1-99 wpm or 100-200-300-400 wpm for Meteor Scat operation.



£199.95
INC VAT
P&P £5

4 Message Memories each of 255 characters.
26 scratch pad memories each of 127 characters.
All memories stored on non volatile Ram. Messages stored for up to 5 years.

Indication of speed on 7 segment display.

Indication of operating mode on leds. Sidetone and relay output for all types of transmitter.

Full QWERTY keyboard with real keys.

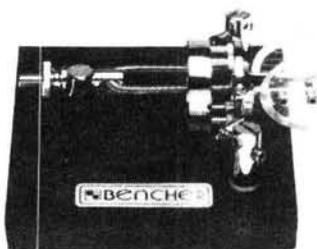
Metal cased for RF immunity.



STAR MASTERKEY CMOS MEMORY KEYER
8 MEMORIES, BEACON MODE, DIRECT & GRID BLOCK KEYING. FULL DETAILS IN PREVIOUS ADS. STILL ONLY **£95.00**



STAR MASTERKEY MKII DOT-DASH MEMORIES
IAMBIC OR SIDE SWIPE, SEMI AUTOMATIC MODE, 12 VOLT OR INTERNAL BATTERY. **PRICE £54.70**



FULL RANGE OF BENCHER KEYS

POST, PACKING AND INSURANCE ON EITHER KEYERS £3.00

FULL RANGE OF KENWOOD PRODUCTS STOCKED
We are also stockists of DAIWA—POCOM—JRC—TAR—TASCO TELEREADERS—MICROWAVE MODULES—B.N.O.S.

Dewsbury Electronics, 176 Lower High Street, Stourbridge, West Midlands.
Telephone: Stourbridge (0384) 390063/371228



Instant finance available subject to status. Written details on request.



Yaesu

FT767	HF Transceiver	1599.00	(—)
FEK767(2)	2m Module (767)	169.00	(3.00)
FEK767(70)	70cm Module (767)	215.00	(3.00)
FEK767(6)	6m Module (767)	169.00	(3.00)
SP767	Speaker	69.95	(2.50)
FT290	MkII New Super 290	429.00	(—)
FT190	MkII 6m M/Mode 2.5W	399.00	(2.00)
YHA15	2m Hejical	7.50	(2.00)
YHA44D	70cm 1/2wave	12.50	(2.00)
YH45	Speaker Mike	23.00	(2.00)
MMB15	Mobile Bracket	14.55	(2.00)
FT23R	2m Mini HH	209.00	(3.00)
FT23R	70cm Mini HH	229.00	(3.00)
FN89	Nicad Battery Pack (23/73)	34.50	(2.00)
FN810	Nicad Battery Pack (23/73)	34.50	(2.00)
FN811	Nicad Battery Pack (23/73)	67.85	(2.00)
NC.18C	Charger (23/73) 13A Plug	17.71	(2.00)
SMC28	Charger (23/73)	17.71	(2.00)
NC.28	Charger (23/73)	17.71	(2.00)
NC.29	Base Charger (23/73)	69.00	(3.00)
PA6	Car Adap/Charger (23/73)	24.15	(2.00)
MH12A2B	Speaker Mic	31.05	(2.00)
MH18A2B	Speaker Mic Miniature (23/73/727)	31.05	(2.00)
FT27R	2m/70cm HH	425.00	(3.00)
FN83	Spare Battery Pack	41.00	(2.00)
FN84	Spare Battery Pack	46.00	(2.00)
FN85	Emergency Call Case	10.00	(2.00)
FRG9600M	60-950MHz Scanning RX	509.00	(—)
PA4C	Power Supply for 9600	29.00	(2.00)
MMB10	Mobile Bracket	10.00	(2.00)
NCSC	Charger	11.50	(2.00)
PA3	Car Adapter/Charger	21.85	(2.00)
YH44A	Speaker Mike	31.05	(2.00)
FRG8900	HF Receiver	649.00	(—)
FR1700	Converter 118-175 for above	100.00	(2.50)
MH188	RX ATU	59.00	(2.50)
MD188	Hand 600 8pin mic	21.00	(2.00)
YH177	Desk 600 8pin mic	79.00	(2.00)
YH177	Boom mobile mic	25.00	(2.00)
YH177	lightweight phones	19.99	(2.00)
YH177	Padded phones	19.99	(2.00)
YH1	Newsgate Mobile Hsst-Boom mic	22.00	(2.00)
SB1	PTT Switch Box 208/708	22.00	(2.00)
SB2	PTT Switch Box 290/790	22.00	(2.00)
SB10	23cm FM Transceiver	22.00	(2.00)
FT736 NEW	2700cm 25W Base Stn.	1,359.00	(—)
FT747GX	160-10 All mode TX Gen. Cov.	659.00	(—)
FT211R	23cm FM Transceiver	475.00	(—)
FT211RH	2m 45W FM Mobile	309.00	(—)
FT212RH	New 2m 45W FM Mobile	349.00	(—)

Datong Products

PC1	Gen. Cov. Con.	137.40	(2.50)
VLF	Very low frequency conv.	34.90	(2.50)
FL2	Multimode audio filter	89.70	(2.50)
FL3	Audio filter for receivers	129.00	(2.50)
ASPB	r.f. speech clipper for Trio	82.80	(2.50)
ASPA	r.f. speech clipper for Yaesu	82.80	(2.50)
ASP	r.f. above with 8 pin conn	89.70	(2.50)
D75	Manual RF speech clipper	56.35	(2.50)
D70	Morse Tutor	56.35	(2.50)
RFA	RF switched pre-amp	36.00	(2.50)
AD270 MPU	Active dipole with mains p.s.u.	51.75	(2.50)
AD270 MPU	Active dipole with mains p.s.u.	69.00	(2.50)
DC14A/2B	2m converter	39.67	(2.50)
ANF	Automatic notch filter	67.85	(2.50)
SRB2	Auto Woodpecker blanker	86.25	(2.50)
RFA	RF switched pre-amp	36.00	(2.50)

Instant credit available.
Mail/Telephone order by cheque or
credit card. Cheques cleared before
goods despatched. (E&OE)

IC761	New Super HF Transceiver	2459.00	(—)
IC751A	HF Transceiver	1500.00	(—)
IC755	New HF Transceiver	929.00	(3.50)
AT100	100W ATU (75/1745)	379.00	(3.50)
AT150	150W ATU (73/5)	329.00	(3.50)
PS55	Ext PSU (73/5)	192.00	(3.00)
IC505	50MHz multi-mode portable	529.00	(—)
IC290D	2m 25W M/Mode	559.00	(—)
IC28E	25W FM	359.00	(—)
IC28H	2m 45W FM	399.00	(3.00)
IC28G	2m New Mini HH	455.00	(3.00)
IC28F	2m The Original HH	235.00	(3.00)
IC28E	2m HH	279.00	(3.00)
IC275E	New 2m 25W Base Stn	1069.00	(—)
IC4E	70cm HH	285.00	(3.00)
IC4E	70cm HH	318.00	(3.00)
IC48E	70cm 25W FM Mobile	455.00	(3.00)
IC490	70cm 10W M/Mode	625.00	(—)
IC3200	2m/70 Dual Band FM Mobile	556.00	(—)
IC17E	23cm HH	449.00	(3.00)
ICR71	Gen Cov RX	855.00	(—)
IC7000	VHF/UHF Scanner	989.00	(—)
AH7000	15-1300MHz Discone	1069.00	(—)
SP3	Ext. Speaker	64.00	(2.50)
CK70	DC Cable (R70/R71)	8.00	(2.00)
EX257	FM Board (R70/R71)	74.75	(2.50)
CP1	World Clock	43.00	(2.50)
G05	Waterproof Bag all Icom HH	14.38	(2.00)
BC39	Desk Charger	74.75	(2.50)
BP3	Battery Pack 8.4V (2/4E/02/04E)	32.20	(2.00)
BP4	Battery Pack 10.8V	9.78	(2.00)
BP5	Battery Pack 13.2V (02/04E only)	78.20	(2.50)
BP6	Battery Pack 8.4V	74.75	(2.50)
CP1	12V Charge Lead BP3/78	7.48	(2.00)
DC/DC	converter operate from 12V	18.40	(2.00)
FM	2m Helical BNC	9.75	(2.00)
FA3	70cm Flexible 1/4 wave Antenna (BNC)	9.75	(2.00)
HMS	Speaker/Mic	23.00	(2.50)
HS10	Head set Boom Mike	23.00	(2.50)
HS10SA	Vox Unit HS10 (02/04E only)	26.45	(2.00)
HS10SB	PTT SW Box HS10	23.00	(2.00)
LC1	Leatherette Case 2E4F/BP5	9.20	(2.00)
LC2	Leatherette Case 2E4E/BP3	9.20	(2.00)
LC3	Leatherette Case 02E/04E/BP3	9.20	(2.00)
LC4	Leatherette Case 02E/04E/BP5/78	9.20	(2.00)
SS1	Shoulder Strap	11.50	(2.00)
SM6	690MHz BP Base Mic	48.00	(2.50)
SM8	1.3kpa600u BP Base Mic	86.00	(2.50)
SM10	Comp/Graphic Mike	129.00	(3.00)

CW Keys

VIBROPLEX	lambic Standard	63.33	(3.00)
VIBROPLEX	lambic Deluxe	78.09	(3.00)
VIBROKEY	Standard	63.98	(3.00)
VIBROKEY	Deluxe	78.09	(3.00)
The Original Standard		73.54	(3.00)
The Original Deluxe		82.74	(3.00)

BENCHER

BY1	Squeeze Key, Black base	67.42	(3.00)
BY2	Squeeze Key, Chrome base	76.97	(3.00)

STARMASTER

Dewsbury	Electronic Key Unit (No Paddle)	54.70	(3.00)
Dewsbury	Electronic Memory Key (No Paddle)	95.00	(3.00)

KENWOOD

TS9405	9 Band TX General Cov RX	1995.00	(—)
AT540	Auto ATU	244.88	(3.00)
SP40	Ext Speaker	256.00	(3.00)
TS930S	9 Band TX General Cov RX	1695.00	(—)
AT530	Auto ATU	206.03	(3.00)
SP90	Ext Speaker	86.23	(3.00)
TS440	9 Band TX General Cov RX	1138.81	(—)
AT440	Auto ATU	144.82	(3.00)
PD50	H/Duty PSU	222.49	(3.00)
AT230	All Band ATU/Power Meter	208.67	(3.00)
AT240	Station Speaker Unit	189.00	(3.00)
PS430	Matching Power Supply	173.78	(3.50)
SP430	Matching Speaker	40.81	(3.00)
SM270	Station Monitor	343.62	(3.50)
BS8	Band Scope Unit (830/940)	77.00	(2.50)
TL922	10/160 2W Linear	1495.00	(7.00)
TH21	2M Mini HH	189.00	(3.00)
TH41	70cm Mini HH	218.00	(3.00)
TH205	2M HH	215.26	(3.00)
TH215	2M HH Keyboard	252.13	(3.00)
TR751	2M 25W M/M Mode	599.00	(—)
TS711	2M 25W Base Stn (New Low Price)	998.00	(—)
TS711	70cm 25W Base Stn (New Low Price)	998.00	(—)
R2000	Gen Coverage HF/RX	599.00	(—)
VC10	118-174MHz Converter (R2000)	161.94	(2.50)
RS600	General Coverage HF/RX	875.00	(—)
VC20	118-174MHz Converter (R5000)	167.21	(2.50)
BT2	Empty Battery Case TH21/41	11.86	(2.00)
DC21	DC Power Supply TH21/41	24.36	(2.00)
EB2	Ext. Battery Case TH21/41	6.77	(2.00)
HMC1	Headset with Vox TH21/41	32.21	(2.00)
TH2141	Nicad Pack TH21/41	24.36	(2.00)
BC6	Desk Charger TH21/41	99.00	(2.50)
SC8	Soft Case TH21/41	11.86	(2.00)
SMC30	Speaker/Mic TH21/42/600	28.31	(2.00)
MC50	4P Desk Mic	46.08	(3.00)
MC50A	8P Desk Mic	88.22	(3.00)
MC50	Electric Desk Mic	93.98	(3.00)
MC85	Desk Mic Audio Level Comp	99.00	(3.00)
MC43	RF Fist Mic	22.00	(2.00)
MC35	4P Fist Mic	21.72	(3.00)
MC55	Mobile Mic (6p.o. 8p)	52.67	(3.00)
LF30	HF Low Pass Filter	32.26	(2.50)
HS5	Lightweight Hipbones	24.36	(2.50)
TS140	Deluxe Hipbones	37.54	(2.50)
TH4100	HF 9 Band Gen. Cov. TX/RX	862.00	(—)
RZ1	2700cm FM Dual band model SPECIAL	499.00	(5.00)
SM8	500 950MHz AM/FM Scanner	465.00	(6.00)

SWR/PWR Meters

HANSEN W720S	130-440 MHz 20/200W	52.75	(2.50)
FS5E	3.5-150MHz 20/200W	42.75	(2.50)

Miscellaneous

SMCS 2U	2 Way SO239 Switch	18.95	(2.50)
SMCS 2N	2 way n Sfts Switch	23.50	(2.50)
Kenpro KP21N	2 way Switch n Socket Deluxe	27.00	(2.50)
T100	100W Dummy Load	45.00	(3.00)
T200	200W Dummy Load	65.00	(3.00)
WV1	Wave meter 120-450MHz	24.96	(2.50)
PK232	Packet/RTTY Terminal	269.95	(3.00)

OPEN TUES.-SAT. 9.00-5.30
(CLOSED MONDAYS)

STOCK ITEMS USUALLY
DESPATCHED WITHIN 48 HRS.

DELIVERY/INSURANCE PRICES
IN BRACKETS

R. N. Electronics

Professionally designed equipment for Amateurs

TRANSVERTERS

- 144/50 MHz 25w p.e.p. £179 + £4 p&p.
- Use with an FT290 or similar 2m transceiver, for the opportunity to work U.S.A., Africa, Japan, Australia, etc. In fact almost anywhere in the world.
- 28/50 MHz 25w p.e.p. £199 + £4 p&p
- 145/70 MHz 25w p.e.p. £239 + £4 p&p
- 145/70 MHz 10w p.e.p. £199 + £4 p&p
- 28/70 MHz 10w p.e.p. £199 + £4 p&p
- 7db Switched Attenuator £22 + £2 p&p

POWER AMPLIFIERS

- RN690 P.A. 6m power amplifiers 25w p.e.p. £75 + £4 p&p
- RN490 P.A. 4m power amplifiers 25w p.e.p. £75 + £4 p&p

RECEIVE ONLY CONVERTERS

10M receive, 2M I.F. With thru switching on transmit use with 6m transverter and work 10m/6m Crossband £45 + £2 p&p

RECEIVE ONLY CONVERTERS

2m IF for 4m, 6m or 10m, receive £39 each + £2 p&p each
10m IF for 2m, 4m or 6m receive £39 each + £2 p&p each

PRE AMPLIFIERS

- Low Noise (<1dB) GaAs Fet Pre-amplifiers for 6m, 4m and 2 metres. RF or DC Through Switching (Max 100W pep).
- Indoor boxed unit £36 + £2 p&p
- Masterhead (line powered) with indoor DC feed unit £59 + £4 p&p

MET. ANTENNAS

50MHz 3 el. £39.95, 5 el. £59.90 + £4.50 p&p

NAVICO 2m F.M. MOBILES

- AMR 1000 5/25w 12.5/25KHz 2 Metre FM Mobile £247.25 + £4 p&p
- AMR 1000S 10 memory + full scanning £299.00 + £4 p&p
- Top mount bracket for above £6.85 + £1 p&p
- 12.6v 8A Switch mode regulator (15-32v input) £56.35 + £4 p&p

All prices include VAT

37 Long Ridings Ave, Hutton, Brentwood,
Essex CM13 1EE. Tel: 0277 214406

RST

RST MAIL ORDER CO.
LANGREX SUPPLIES LTD,
1 MAYO ROAD,
CROYDON,
SURREY CR0 2QP.
SPECIAL EXPRESS
MAIL ORDER SERVICE

£ p	EM81	2.50	PL519	6.00	6AK5	5.99	6KD6	12.00	
AZ31	2.75	EM87	2.50	PL802	6.00	6AL5	1.50	6L6G	7.50
DY867	1.50	EN91	6.50	PY33	2.50	6AM6	6.02	6L6GC	7.50
DY802	1.50	EY51	2.75	PY81	1.50	6AN5	4.75	6L7	2.50
E88CC	10.33	EY86	1.75	PY82	1.50	6AN8A	3.50	6L06	7.50
E180F	12.05	EY88	1.75	PY83	1.25	6AO35	3.25	607	3.75
E810F	35.48	EY900A	3.00	PY88	2.00	6AS6	25.00	6BH/6BK/6BN	10.00
EABC80	1.50	EZ80	1.50	PY800	1.50	6AS7G	8.75	6SA7	3.00
EB91	1.50	EZ81	1.50	PY800	4.00	6AT6	1.25	6SC7	2.75
EBF80	1.50	EY501	3.00	PY801	1.50	6AU5GT	5.00	6SG7M	2.50
EC91	8.00	G232	4.75	QQV02-6	38.00	6AU6	2.50	6SJ7	2.50
ECC33	4.50	G234	5.00	QQV01-6	26.25	6AW8A	3.75	6SK7	3.50
ECC80	1.50	G237	4.75	QQV03-20A	48.38	6B7	3.25	6SL7GT	3.00
ECC81	1.75	KT61	6.00	QQV06-40A	46.00	6B8	3.25	6SN7GT	3.00
ECC82	1.75	KT66	15.00	OV03-12	6.00	6BA6	1.50	6SS7	2.25
ECC83	1.75	KT77	Gold Lion	R18	3.00	6BB7	5.00	6J8A	2.75
ECC85	1.75	KT88	12.00	R19	9.24	6BB6	2.50	6K4	3.00
ECC88	3.50	N78	15.00	R19	6.20	6BL6			



SPECTRUM COMMUNICATIONS
MANUFACTURERS OF RADIO EQUIPMENT AND KITS

MULTIMODE CB CONVERSION KITS PHONE FOR DETAILS AND PRICES

CB TO 10 FM CONVERSION BOARDS, for rigs with LC7137 and TC9119 to give 29.31 to 29.70MHz. Built and aligned board SC29 £18.50. Or send your rig and we'll fit it £31.50 inc P&P. £35 inc P&P for base rigs. For rigs with MM55108 use SC29F board £15, or £28 fitted.

FM CONVERSIONS FOR YAESU & KENWOOD, for rigs with AM £71 boards or £115 fitted, rigs without AM £81 boards or £125 fitted. Add £16 for Valve only rigs. State rig type when ordering.

RECEIVE PREAMPS, 2, 4, 6, or 10 metres. RF switched and DC sensing. 100W power handling, gain panel adjustable 0-20dB, NF 1dB on 2m, 4m & 6m 3.5dB on 10m. 13.5V negative ground operation. Excellent performance at a reasonable price. Types RP2S, RP4S, RP6S, & RP10S. PCB kit £14.75, PCB built £22.25, Boxed kit £25, Built & tested £35.50.

TRANSVERTER, single board 1/2W out for 2m or 4m or 6m. 10m drive 25mW-500mW. Types TRC2-10, TRC4-10, or TRC6-10. PCB kit £39, PCB built £54, Boxed kit £54, Built & tested £83.25.

TRANSVERTER, receive converter and 2.5W transmit converter in single boxed unit. 10m drive 10-100mW unbuffered, types TRX4-10H & TRX6-10H. Boxed kit £60, Built & tested £99.50. Buffered types for use with 10m rigs giving -6dBm drive, TRX4-10B & TRX6-10B. Boxed kit £68, Built & tested £115. With interface unit for use with 2m drive 1/2W-5W types TRX4-10I & TRX6-10I, Boxed kit £68, Built & tested £115.

FREQUENCY MOD-DEMOD BOARD converts AM only synthesized rigs with 455 KHz IF to FM. Type FM455, PCB kit £8.25, PCB built £12.25.

NOISE SQUELCH, mutes rig when noise is too high. Allows reception of weak signals between noise bursts. PCB kit £9.50, PCB built £14.

TRANSMIT AMPLIFIERS, linear single stage, gain 10dB, 30W output, ideal for FT290, FT690, etc. RF switched and DC sensing. Types TA2S1, TA4S1, & TA6S1. PCB kit £33, PCB built £40.25, Boxed kit £39, Box built £49.50.

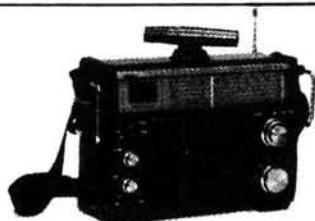
TRANSMIT AMPLIFIERS, linear two stage 1/2W in 20/30W out, unswitched, suitable for MEON. Types TA2U2, TA4U2, & TA6U2, PCB kit £41.25, PCB built £52.50, Boxed kit £45, Boxed built £59.25. Switched version for use with Spectrum transverter, types TA2S2, TA4S2, & TA6S2, PCB kit £47, PCB built £60, Boxed kit £58.25, Boxed built £72.50.

VAT & P&P INC PRICES
Delivery within 14 days if available
24 hr answering.

SHOP TIMES: 9am-1pm & 2pm-5pm TUES-FRI
9am-1pm & 2pm-4pm SAT
CLOSED SUNDAY & MONDAY



UNIT B6, MARABOUT INDUSTRIAL ESTATE,
DORCHESTER, DORSET. TEL: 0305 62250



*Component
Centre*

LISTEN INTO THE WORLD

WIN 108 Scanning Airband Receiver.....	£175.00
SAB 9 POCKET AIR BAND—MW LW FM.....	£21.50
MBR 7—9 BAND INC SW Air Marine Mains/Batt.....	£59.95
R537S TUNABLE AIR BAND—118-136MHz + 2 CRYSTAL CONTROLLED CHAN.....	£73.00
BLACK JAGUAR MKIII Hand Held Scanner with Air Band.....	£225.00
AUDIO TECH AT 9560 Electric Cond Lapel Radio Microphone 100HT Range 88.108M Tunable.....	£52.80
PORTASOL GAS SOLDERING IRON 25-60watt Variable.....	£19.95
ANTEX SOLDERING IRON Type CS 18 watt.....	£5.95
ANTEX SOLDERING IRON Type CX 25 watt.....	£5.95
SOLDERING IRON STAND ST4.....	£2.95
N TYPE CONNECTOR For RG58U.....	£2.95
N TYPE CONNECTOR For URM203.....	£2.95
N TYPE CONNECTOR FOR RG8/RG213.....	£2.95
RG58 Cable.....	25p per Mtr
RG213/UR67 Cable.....	75p per Mtr
BFO Kit to work with IF of 455 kHz.....	£12.00
BFO Built & Tested.....	£17.95

Sony Radios

ICF 5100.....	£69.95
ICF 7601L.....	£89.95
ICF 7600DA.....	£129.95
ICF 7600DS.....	£59.95
ICF SW1S.....	£249.00
ICF SW1E.....	£149.95
AIR 7.....	£229.95
ICF 2001D.....	£299.95
PRO 80.....	£299.95
Radio Antenna AN3.....	£44.95
Radio Antenna AN1.....	£49.95

ALL SETS GUARANTEED. PRICES INCL VAT & P/P EXCEPT PLEASE
ADD £2.00 P/P ON RADIOS
CALLERS WELCOME MONDAY, TUESDAY, THURSDAY, FRIDAY,
SATURDAY, 9.30-5.30

COMPONENT CENTRE
7 LANGLEY ROAD, WATFORD,
HERTS WD1 3PS
Tel: WATFORD (0923) 245335

ARE COMMUNICATIONS

The very latest "2 in 1"
ICR7000HF Receiver
500KHz — 2GHz



**EXCLUSIVE TO
A.R.E. COMMUNICATIONS**

YES, 500KHz to 2GHz CONTINUOUS receive in one unit. Using the ICR7000 multimode facilities, this probably makes the "2 in 1" ICR7000HF Receiver the most versatile scanner available today. Because of the enormous frequency coverage, the ICR7000HF has 200 mode sensitive channels for increased flexibility.

With excellent strong handling characteristics, using a direct fed Double Balanced Mixer, the need for a pre-amp is unnecessary.

Compare the price of an ICR71E at £855 and an ICR7000 at £989!!

Available from stock, the new ICR7000HF.

Only £989.00 incl. VAT. Phone 01-997 4476 for immediate delivery.

*Also available as an after-fit to your existing ICR7000 only £129 incl. VAT.

**Opening Hours Monday — Friday 9.30 to 5.30
NOW OPEN SATURDAY MORNINGS 10-1pm**



**ARE Communications Limited, 6 Royal Parade,
Hanger Lane, Ealing, London W5A 1ET, England**
Fax 01-991 2565
Tel 01-997 4476

Novice Licence



I read with interest the letter from R. G. Wilson in *PW* Oct. 88. He asks: "Where are all the rumours coming from?" Well, I don't know what rumours he may have heard, but I have seen and heard some that would make me drop amateur radio altogether if they came about.

If we need an easy route into amateur radio, and that is yet to be proved, then I think the following proposals are worth some thought.

1. Any person over the age of 14 who is interested in perhaps becoming a radio amateur, should register with the DTI as the licensing body.
2. Their registration details should include the callsign of the existing amateur whose station they intend to use under supervision.
3. The "Assistant" licence, as we would call it, would be valid for one year. By the end of that year the holder would have to have taken

the full RAE. In the event of failure in the exam, the licence could be renewed for just one more year. A second failure would mean the end of the road.

4. The fully licensed amateur named under "2" would be responsible for the operating and behaviour of the assistant, and his licence could also be revoked should things go amiss.
5. The assistant would enjoy the full privileges of the "A" or "B" class licence held by the amateur supervising him.

Approaching the problem this way would not upset so many of the existing amateurs, it would be more controllable as regards abuse, and most of all the cost would be very little for the assistant.

In many ways, what I have suggested is similar to the privileges afforded to a GB special event callsign, and I have not heard of those being abused.

The main point that needs proving one way or another though, is whether there really is a need for another route into amateur radio.

**Vince Bobin G1FBH
Kingsbridge, S. Devon.**

For those readers who have not seen first-hand details of the RSGB proposals for the Student Licence and Project YEAR, we understand that copies of the Information and Consultive Document on the subject which appeared in September 1988 Radio Communication are available from RSGB Headquarters on request.—Ed.

Morse

I must leap to the defence of D. J. Carr in his letter in *PW* Dec. 88. I am one of the people to whom he refers. For over 20 years I have pursued the hobbies of radio and electronic construction, and short wave listening.

I passed the RAE with distinctions about 4 years ago but have not yet obtained a licence, as I find the content of the 2m band only a marginally more entertaining way of wasting time than CB. However, the h.f. bands can provide the most rewarding and absorbing interest both in communication and in talking to someone sharing the same hobby on the other side of the world.

I have not been able to learn Morse, which I admit is partially laziness, but which I am sure is influenced by an underlying objection to having to pass a test which is not related to the form of communication I would like to pursue—s.s.b. on h.f. I find it is very difficult to explain this requirement to

PW COMMENT

Licence News

WHEN DETAILS OF THE NEW UK AMATEUR LICENCE were announced in August 1988, it was obvious that there would be quite a few questions to be asked about the precise meaning and implications of the new rules. Some of the queries would only become apparent after detailed reading and comparison with the provisions of the previous licence. Others were immediately obvious, and we raised these with the DTI's Radiocommunications Division straightaway.

The legality of receiving transmissions from stations in the Standard Frequency Service has caused some pretty heated discussions among radio enthusiasts in the past. Because the Amateur Licence authorised reception of such stations, it was argued by some that an s.w.l. wasn't allowed to listen to them. When I enquired of the DTI some years ago, just what the true situation was, I was told that Clause 1. (1) (d) in the old licence was there by mistake, and that because Standard Frequency Service stations were considered to be authorised broadcasting stations, anyone in the UK was allowed to listen to them without any need for a licence.

Then, lo and behold, the new amateur licence comes out with Clause 1. (12) repeating the old Clause 1. (1) (d). Just what is the situation?

Well, for once we're all winners, s.w.l.s and licensed amateurs alike. The UK s.w.l. is exempted from the need for a licence to receive sound signals from authorised broadcasting stations (and licensed amateur stations) under a Statutory Instrument last updated in 1984 (S.I. 1984 No. 1053), so he's in the clear. However, that exemption applies only to "receive-only" stations. When a licensed radio amateur installs a transmitter or transceiver, he no longer has a "receive-only" station, and the exemption doesn't apply.

Hence Clause 1. (12) in the new licence, which puts him in the clear as well. Simple, isn't it, in a complicated sort of way!

In any Act of Parliament or Statutory Instrument, one of the most important sections is that labelled "Interpretation", which basically defines what various words and phrases in that piece of legislation mean. A trap for the unwary, this, as the same words or phrases may have a different meaning in everyday life, or even in another piece of legislation. In the 1949 Wireless Telegraphy Act, for example, the definition of "Wireless Telegraphy" tells us that it includes the transmission and reception not only of telegraphy, but also of telephony, visual images, and of signals for remote control and for direction or position finding.

On that question of definitions, an intriguing omission from the amateur licences both old and new, is any reference to "bicycle mobile" operation. The new amateur licence Clause 1. (9) (c) permits mobile operation, where "mobile" is defined as meaning in a vehicle, as a pedestrian or on a vessel, but what about the poor cyclist?

Now as I understand it, in the Road Traffic Acts, a bicycle is by definition not a vehicle. However, I am pleased to be able to tell bicycle mobile fanatics that the DTI says that for the purposes of Clause 1. (9) (c) of the Amateur Radio Licence a bicycle is considered to be a vehicle. So get pedalling—but no hand microphones, please!

Finally, to the infamous Clause (aa) of the Notes to Terms and Limitations Booklet BR68. This is causing some problems to a number of UK radio dealers and importers at the present time, and I think we shall be hearing much more of Clause (aa) and its associated *Wireless Telegraphy (Citizens' Band and Amateur Apparatus) (Various Provisions) Order 1988* otherwise known as Statutory Instrument 1988 No. 1215. Watch this space.

Geoff Arnold

potential converts to amateur radio, especially as radio communication is based on science, technology and logic.

I think that the Editor's comments to the published letter were unfair. It is true that c.w. is simpler, but surely the writer had in mind the major differences in construction for the widely differing frequencies of 144MHz and 1.8-14MHz. Having constructed many projects, particularly from *PW*, I would say that constructing h.f. band equipment, including s.s.b., is much simpler than 2m equipment for two specific reasons.

First, circuit layout and screening are far less important for 14MHz and below than for 144MHz and above. This makes a considerable difference for both basic construction and later modifications.

Secondly, the most important piece of test equipment available is the oscilloscope. A 20MHz bandwidth 'scope is within the range of equipment available to many keen constructors, and invaluable for testing and aligning h.f. equipment. The construction of any piece of radio gear must be significantly more

difficult without being able to use a 'scope to look at the waveforms involved.

Since passing the RAE I have stood on the sidelines, wishing that the time, energy and magazine space devoted to the licensing arguments had been in other directions. When all this is resolved what a void there will be! Like our present tax system, if no rules existed and we were starting from scratch we would never include this requirement.

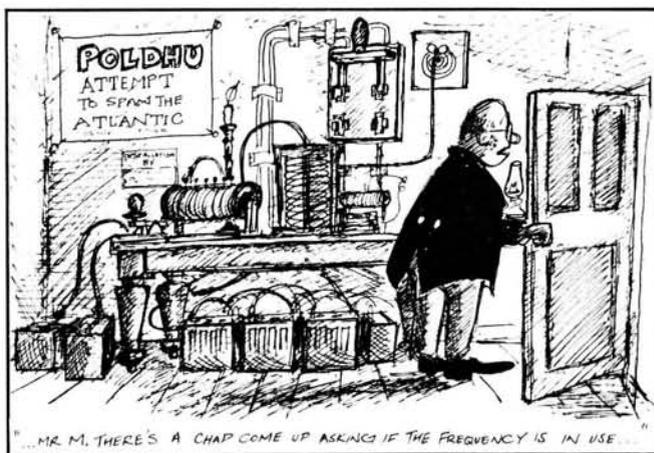
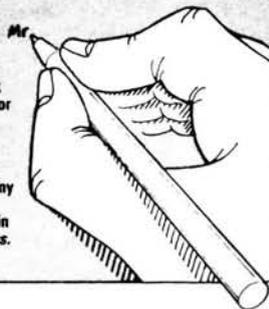
I'm sorry to spout on at such length, but I've followed the arguments for years as one of the silent majority, and I do feel that perhaps what the Editor referred to as an over-simple solution may well save amateur radio from disappearing into oblivion.

**J. S. Hind, BSc,
Nottingham.**

Despite Mr Hind's arguments, I stand by my comments to Mr Carr's letter. The principal result of opening up the h.f. bands to Class B licensees in that way would, I am sure, be to boost the sale of "black box" s.s.b. rigs. Whilst this would naturally be welcomed by the importers and dealers, it would do little to increase home construction and experimenting, and the understanding of radio

Send your letter to the Editorial Offices in Poole, the address is on our Contents page. Writer of the Star Letter each month will receive a voucher worth £10, to spend on items from our PCB or Book Services, or on *PW* back numbers, binders, reprints or computer program cassettes. And there's a £5 voucher for every other letter published.

Letters must be original, and not duplicated to other magazines. We reserve the right to edit or shorten any letter. Brief letters may be filed via our Prestel Mailbox number 202671191. The views expressed in letters are not necessarily those of *Practical Wireless*.



technology that goes with them, which must be the aim if we are to hold on to the privileges and bands which we enjoy at the moment. A c.w. transmitter is uncomplicated and easily built by a novice. Just one look at the circuits and plans of an s.s.b. transmitter is likely to frighten off anyone who is not already at home with radio technology and construction.—Ed.

Morse

I read with great enjoyment the letter from Tom Harrison GM3NHQ in November *PW*, and heartily concur with what he said.

You will see from my callign that I am new to amateur radio. I was, however, a Merchant Navy Radio Officer for a number of years, first with Marconi Marine and then freelance with Swedish, Finnish and Greek lines.

Far too many would-be c.w. operators fall by the wayside seduced by glowing accounts of decoders and Morse keyboards about which I shall say no more. Since leaving the sea, I have taught quite a few aspiring amateurs (a heart-breaking task), most of whom cover their inadequacies after passing the Morse test by stating casually that they intend to specialise in this, that and the next thing, expending large amounts of cash on expensive, high-power gear only to remain a bunch of up-market CB babblers.

As soon as I can get some gear together I shall use c.w. only, because good c.w. is music to the ears, and my minimum will be 20 w.p.m.

Keep your ears open, Tom, you will be hearing from me.

**John Hillerby GOKDU
St. Leonards-on-Sea.**

Morse

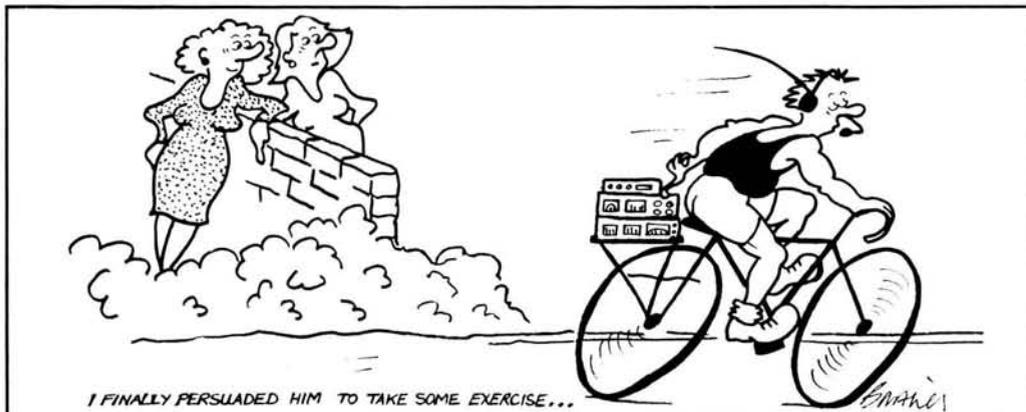
Having passed the RAE with relative ease in December 1987, I immediately began to study Morse code in order to get a Class A licence. As the weeks progressed my enthusiasm dwindled and the Morse tutor went back into the cupboard. After all, "I had no intention of using c.w. once I had passed the test."

This, it would appear, is the attitude adopted by many new licensees, Class A and B alike.

It is with this in mind that I agreed with some of the points made by D. J. Carr (*PW* Dec. 88). However, I do not expect h.f. to be opened to B licensees without a test of any description. I feel it would be far better to devise

another test system, to be taken in addition to the existing RAE, purely for prospective Class A amateurs. It is my opinion that Morse, although still widely practised, has had its day and that far more good could come from examining amateurs to a higher level.

**R. C. Moxham G7AXN,
Stoke-on-Trent.**



Forthcoming Rallies

January 29: The NARSA Norbreck Radio and Electronics Exhibition (formerly held at Belle Vue in Manchester) will be held in 1989 at the Norbreck Castle Exhibition Centre, Blackpool. Details can be obtained from: **Peter Denton G6CGF. Tel: 051-630 5790.**

February 26: The 2nd Taw and Torridge Rally will be held in the BAAC Halls, The Pill, Bideford in North Devon. These premises are larger than last year. The doors open at 10.30am with talk-in available on S22. There will be trade stands, a bring and buy, refreshments and a bar as well as ample parking. More details are available from: **GOAYM. Tel: 0805 23776.**

March 19: Wythall Radio Club will be holding their 4th Annual Radio Rally at Wythall Park, Silver Street, Wythall, Worcs. This is on the A345 south of Birmingham. Doors open at 11.30am. There will be three large halls, the usual trade stands, a flea market, a large Bring & Buy, snacks available and a bar. Talk-in on S22 with more free parking this year. Admission is 50p with more details from: **Chris GOEYO on 021-430 7267.**

March 26: The Cunningham & District ARC are starting a new rally at the Magnum Leisure Centre in Irvine to combat the shortage of rallies for Scottish amateurs. Doors open at 10.30am. More details from:

Bob Low on 0563 35738.

May 7: The Southend & District Mobile Rally will be held at Roach Way Youth Centre, Rochford, Essex. Doors open at 10am. More details from: **Ted G4TUO. Tel: 0702 202129.**

June 11: The Royal Naval Amateur Radio Society's annual rally is scheduled to be held at HMS Mercury again this year. More details nearer the date.

If you are organising a rally and would like it mentioned in *Practical Wireless*, then drop us a line at least 6 weeks in advance (marking your envelope Rally Calendar) and we'll do the rest.

24GHz DPDT Switch



Wavecom's standard d.p.d.t. transfer switch now has its upper frequency limit extended from 18GHz to 24GHz.

Fitted with SMA connectors, the switch can be specified with an extensive range of options including t.t.l. logic high or low, m.o.s.f.e.t. driver, indicator circuit, suppression diodes and self de-energising circuit. With a

bandwidth of 3 to 24GHz, the switch has a maximum v.s.w.r. from 1.2:1 to 1.6:1 and maximum insertion loss of 0.2 to 0.6dB. Isolation (minimum) is quoted from 80 to 50dB. Switching time is lower than 15ms.

**Anglia Microwaves Ltd.,
Radford Business Centre,
Radford Way,
Billericay,
Essex CM12 0BZ.
Tel: 0277 630000.**

Morsum Magnificat

The Autumn 1988 issue of *Morsum Magnificat* proved interesting reading, as always. There is a really interesting article on Earth Current Telegraphy, some brilliant cartoons by GW3COI (whose work is sometimes seen in *PW*). There is obviously much more in the issue, but space isn't that available here.

Morsum Magnificat was first published in Holland in

1983 by Rinus Hellemons PA0BFN. Now published in London, it provides international coverage of all aspects of Morse telegraphy, past—present—and future. It's for all Morse enthusiasts and a year's subscription costs £6.50 (UK); £7 for Europe (including Eire); £7 surface mail and £8.50 air mail for other countries.

**Tony Smith G4FAI,
1 Tash Place,
London N11 1PA.**

Expedition Group

The Scottish Tourist Board (Radio Amateur) Expedition Group has now been formed and will be active in 1989. The purpose of the group is: to activate amateur radio stations from locations in Scotland that are unusual, historic or pertaining to Scotland in any aspect; to make the public more aware of the hobby of amateur radio (all stations will be open to the public).

Members of this group will be taken from all over Scotland. They hope to activate two Malt Whisky Distilleries, an island, a world heritage site, a Robert Burns Station and a very rare castle. A full list of events will be available later.

Illegal Radio Car Alarms

Quite apart from saving you from the worry and inconvenience of having your car stolen, fitting it with an alarm might seem a good way to help beat crime. But, the DTI warns, if the alarm you have chosen is one which uses radio, and it is not approved, you could be breaking the law yourself.

A large number of illegal devices are now being advertised and sold, most of them imported, and their use could land you with a prosecution and a fine on conviction of up to £2000, three months imprisonment—or both.

There are two types of car alarms which use radio: the "car theft paging alarm" and the "radio key". It's mainly

College History

Are you an ex-student or ex-staff of the former Wireless College in Colwyn Bay? If so, Alan Twelves GW4ZWG would like to hear from you.

He is looking for historical, descriptive, reflective, illustrative, even nostalgic material. Apparently the Wireless College, overlooking the sea, displayed an amateur call sign—a G2 plus 2—Alan believes. All assistance will be acknowledged and followed up says Alan. So, if you can help Alan is QTHR.

Arrow and Ten-Tec

The Ten-Tec range of transceivers is now available from Arrow Electronics Ltd. The latest model, the Paragon, was recently on display at the Leicester show and is now available from stock.

The Ten-Tec range will be on display at the Arrow showrooms in Chelmsford & Glasgow, with sales service available from Arrow Agents in Anglesey, Wigan and Leicester. Apparently, due to the prompt availability of spares and service back-up in the UK from the previous sole agents, Arrow are able to guarantee their usual level of service support.

the former which could cause the trouble. If your car is tampered with, they will alert you by transmitting a radio signal which is picked up by a small receiver you are wearing. But, for such alarms to be legal they have to be approved.

To be on the safe side the only alarm of this type at the moment that is legal is called the "Page-Alarm". This is made by C-COM International.

All approved alarms must be marked to show that they are type approved and conform to the DTI specification. The "radio key" types use infra-red and ultrasonics and so are not tied by the same restrictions.

NBTVA

The Narrow Band TeleVision Association was founded in 1975 and exists to promote the development, study and widespread use of low definition and mechanical television. Membership is open worldwide to anyone interested at a current subscription of £3 (concessionary rates for students, pensioners and the unemployed available).

There is an annual exhibition and conference held in April/May and members receive quarterly newsletters (about 12 pages) containing technical articles, details of constructional projects, etc. The association also offers a number of special services to its members.

Activities include the building of experimental cameras, monitors, etc., and closed circuit demonstrations, tape correspondence (using audio recorders) as well as transmissions on the amateur radio bands—28 and 144MHz being favoured.

Enquiries regarding membership should be addressed to:

**N. Reynolds G8YXL,
6A Collingbourne Road,
London W12 0JQ.**

For information on Amateur Band NBTVA, write to:
**D. J. Sumner G3PVH,
20 Woodlands Way,
Southwater,
Horsham RH13 7HZ.**

Two Books from AMSAT

AMSAT-UK have two books written especially for the newcomer to amateur and weather satellites. *The Sheffield Project* deals with the very first principles of listening and taking data from UoSAT. The book starts by explaining what an antenna and a 2m receiver are, and follows on to the use of a simple computer and the programming needed.

The second book, *The SEUK, A Guide for Teachers* explains in layman's terms the use of all kinds of equipment that a school may acquire to teach pupils the basics of satellite watching,

Practical Wireless, February 1989

Dragon ARC

On 1 November 1988, Ron Horrocks GW2FLP (right) was presented with a celebratory gift from Dewi Roberts GWOABL, Chairman of the Dragon Amateur Radio Club. This was to celebrate the fact that Ron has held an amateur radio licence now for 50 years.

The Dragon ARC meets at the Four Crosses, Menai Bridge, Anglesey.

Photo by GW6PXF.



Old Service Manuals

Are you looking for service manuals for old or obscure equipment? Well, Mauritron Electronics think they may be able to help.

They have a library of over 100 000 different makes and models of equipment with an extensive section on

amateur and vintage radio. They produce a catalogue that is being constantly updated, so for details of this and their other services, contact:

**Mauritron Electronics Ltd.,
8 Cherry Tree Road,
Chinnor,
Oxfordshire OX9 4QY.
Tel: 0844 51694.**

Can You Help?

Recently, Les Caudell has obtained a Sony ICF6700L multiband receiver, unfortunately without the handbook. Does anyone have one of these with a handbook so that Les can either borrow or buy the handbook. He will answer all letters and says he'll repay postage. So, if you can help, contact: **Les G. Caudell, Caudell's Cottage, Strete, Nr Dartmouth, Devon TQ6 0RW.**

listening and data gathering.

Both books were written for the Education & School Establishments, so the contents could well assist others not in the teacher/pupil situation too.

Both books are available from AMSAT-UK and all profits go to help them fund future satellites. *The Sheffield Project* costs £2.20 and *The SEUK Teachers Guide* costs £2.60, both post and packing free in the UK—overseas £1.75 extra each book. If a club orders ten or more, then discounts are available.

**AMSAT-UK,
94 Herongate Road,
Wanstead Park,
London E12 5EQ.**

CQ-TV Award

This award is available to both transmitting and receiving enthusiasts, in any part of the world, whether they are members of the British Amateur Television Club or not. The award is for contacts made using fast-scan high definition television systems only.

Transmitting Award

For pictures transmitted which have been successfully identified by another station, claim 2 points per kilometre. If the contact becomes a successful two-way exchange of pictures, then 10 bonus points may be claimed by each station regardless of distance. For contacts on the 1.3GHz band, or above, points are doubled.

Receiving Award

For any picture positively identified, claim for a one-way contact. Otherwise rules are as for transmitting.

Points

The award is divided into different grades. For the Bronze—1000 points, for the Silver—5000 points, for the Gold—10000 points, for the Diamond—100000 points. Points already gained for an existing award may be added in when applying for a higher grade.

IRTS Yearbook

The Irish Radio Transmitters Society (IRTS) is the National Society of radio amateurs and experimenters in Ireland. It represents the interests of radio amateurs through the promotion of activities of interest to members and through the representation on amateur radio matters to the Department of Communication.

The IRTS Amateur Radio Yearbook contains all kinds of information: IRTS officials' names, a repeater map and the EI callbook listings for 1988. So if you regularly work EI land, this book will probably be of use to you. The cover price is £2, but contact IRTS about postage rates.

**IRTS Book Sales Manager,
Mr D. Peyton,
123 Springhill Avenue,
Blackrock,
Co. Dublin.**

Contacts

A station may be worked only once per day for the purpose of this award. It is quite possible for it to be gained by working the same station many times. Contacts through TV repeaters do not count.

The Award

Upon qualification for the Bronze award, a certificate will be issued together with a Bronze seal; the certificate may be up-graded later with Silver and Gold seals. The Diamond award is a specially crafted trophy.

Applications

Applications should include log details consisting of callsign, date of QSO, band, location of the station worked and points claimed. Contacts made from other than the home station should be clearly marked. QSL cards are not required, but the application should be checked and signed by either a licensed amateur or BADC member.

Certificate applications should include a large (12 x 8½ in) s.a.e. For upgrade seals an ordinary s.a.e. should be enclosed.

Applications to:
**Bob Webb G8VBA,
78 Station Road,
Rolleston-on-Dove,
Burton-on-Trent,
Staffs DE13 9AB.**

PW Reader Survey

Our thanks to all those readers who completed and returned the questionnaire which appeared in our October 1988 issue. The information and comments which you sent us will be of great help in shaping the future of the magazine.

Because of the effects of the postal strike in the UK, we extended the deadline for entry into the draw of returned questionnaires to the end of October. The ten lucky winners of a PW £10 voucher, drawn at random, were: Tom Valentine of Montrose, Keith Hewitt of Barnsley, W. G. Borland of Shipley, A. Digby of Southampton, Mr Hickman of Doncaster, Keith Robinson of Launceston, J. Brown of Falmouth, P. C. Cole of BFPO33, R. O. Ibbotson of Alford and B. Hitcham of Blackburn.

NiCad Hazard

With reference to the letter from Mr Ian Barnes, which appeared under the above heading on page 15 of the September 1988 issue of *Practical Wireless*, we have been asked by South Midlands Communications Ltd., importers of the Yaesu range of equipment, to point out the following:

1. The Yaesu FBA-10, which was the subject of the accident described in the letter, is a battery case rather than a battery pack, and is intended mainly for use with 1.5V dry cells, although it will of course accommodate NiCads of an equivalent size.
2. All current NiCad battery packs produced by Yaesu for use with their range of hand-portable equipment incorporated a self-resetting overload cutout.
3. All NiCad packs supplied by Yaesu for their current range of hand-portable equipment come with instruction sheets which include clear warnings to users that they should avoid short circuiting the battery terminals.

As mentioned in our response to Mr Barnes letter, it is of course good practice to protect the terminals of **any** power source against a short circuit. Secondary cells such as NiCads or lead-acid accumulators are particularly hazardous when short-circuited, because of their very low internal resistance, which will allow a very large current to flow. A strip of pvc insulating tape is adequate protection for a spare NiCad pack.

The next issue of *Practical Wireless* will include constructional details of a small unit which an enthusiast can build into a battery pack, and which will limit the current flow to a few micro-amps in the event of a short circuit across the output terminals.

Amiga SSTV

Following hot on the heels of the Amiga FAX software and interface package, ICS are now introducing AMIGA SSTV.

This has been written by the same author as AMIGA FAX and uses the same interface card. It implements all commonly used amateur slow-scan television protocols (colour and b/w) and permits images to be both sent and received. Transmitted images can be generated from Paint files or by inputting images from a TV camera via a digitiser.

AMIGA SSTV costs £99.95 including VAT plus £2.50 post and packing. For those who already have AMIGA FAX, the upgrade to AMIGA SSTV is available for £59.95.

ICS Electronics Ltd.,
PO Box 2,
Arundel,
West Sussex BN18 0NX.

Catalogues

West Hyde have recently published their 96-page catalogue. There's a quick reference section which allows the user to rapidly select the enclosure required for a particular job. All new products are illustrated together at the front for easy reference. The customising service is also fully described. The catalogue is available from:

West Hyde Developments Ltd.

Tel: 0296 20441.

Five Star Connectors have produced a new 446-page catalogue covering a comprehensive range of connectors from 16 of the world's leading manufacturers. It's fully illustrated and features many new products, also highlighted in the catalogue is Five Star Connectors' range of customer services including Customer Care, "Helpline" and Assembly. Copies are available, free of charge, from:

Five Star Connectors,
Edinburgh Way,

Harlow,

Essex CM20 2DF.

Tel: 0279 442851.

STS Instrument Services has produced its first full-colour catalogue which features a

vast selection of products from over 65 leading manufacturers. The 320-page publication highlights several new products, such as the Marconi 893B a.f. power meter, the Keithley 197 autoranging microvolt digital multimeter and the Hitachi VC6265 digital storage oscilloscope. Copies are available, free-of-charge, from:

STC Instrument Services,
Dewar House,

Central Road,

Harlow,

Essex CM20 2DF.

Tel: 0279 641641.

The 106-page Electrovalue catalogue (Oct 88-Sept 89) is now out and it's full of components, soldering irons, tools, multimeters and loads more.

Electrovalue Ltd.,
28 St Judes Road,

Engelfield Green,

Egham,

Surrey TW20 0HB.

Tel: 0784 33603.

Cirkit have their latest catalogue out now too. The 184-page catalogue not only contains details of their products but discount vouchers, a feature project (a programmable frequency generator) and a competition.

Cirkit,

Park Lane,

Broxbourne,

Herts EN10 7NQ.

Tel: 0992 444111 (sales)

441306 (enquiries).

One unusual catalogue to arrive on my desk was The Modern Book Co. Computer Catalogue. There are 51 pages of books listed, catalogued by languages (there's 11 major ones plus the miscellaneous ones), by topic (e.g. graphics, word processing, etc.) and by machine (Apple, Amstrad, IBM, etc.). Books can be ordered by credit card, FAX or by post and most books are in stock so are sent by return, those that have to be ordered take 2-3 weeks. You can write or telephone for a free copy of the catalogue from:

The Modern Book Co.,

19-21 Praed Street,

London W2 1NP.

Tel: 01-402 9176.

The C.M. Howes Communications Catalogue for 1989 contains details of receiving equipment, transmitting equipment and station accessories. There are five new kits too: a marine band receiver, an h.f. air band receiver, an 80/160m "phone" and c.w.

transmitter, a microphone amplifier and an active antenna amplifier. For more details, contact:

C. M. Howes,

Communications,

Eydon, Daventry,

Northants NN11 6PT.

Tel: 0327 60178.

Unitel has recently undertaken a considerable expansion of its stocked range of pot cores, RM cores, E cores, toroids and accessories. The full range is now covered in an 8-page, 4-colour catalogue. Not only will you find the full technical details in the catalogue, but also useful applications guide.

Unitel Ltd.,

Unitel House,

Fishers Green Road,

Stevenage, Herts SG1 2PT.

A new technical leaflet from A. F. Bulgin & Co. features the company's extensive range of robust Buccaneer connectors. Twelve full illustrated pages detail the various options which are available. Copies of the leaflet are available, on request, from:

A. F. Bulgin & Co. PLC,

Bypass Road,

Barking,

Essex IG11 0AZ.

Tel: 01-594 5588.

The Godiva Award

Coventry ARS have recently issued this new award that is available to all licensed operators and short wave listeners.

Contacts/stations heard must include: G2ASF or G7ASF or any special event callsign operated by Coventry ARS or at least two club members. Also a sufficient number of Coventry stations (i.e. located within the city boundary) to achieve the requisite number of points.

Each CARS callsign worked/heard = 5 points

Each CARS member worked/heard = 2 points

Each Coventry station worked/heard = 1 point.

Stations located within the British Isles require 20 points, stations within Europe require 15 points and stations outside Europe require 10 points.

All contacts must be made after 1 January 1988, with contacts via repeaters not acceptable. QSL cards are not required, but a data list (signed and verified by two other amateurs) is required. There is no time limit for the award.

Endorsements are available for: single band, single mode, using QRP (<5W). The award costs £1.50 (payable to Coventry ARS) and you should send your data list and payment to:

J. Ward G4HHT,
3 Shirley Road,
Coventry CV2 2EL.

Can You Help?

M. Gist collects old receivers and transmitters and is looking for information on two pieces: a Labgear LG300 and the Murphy BR1565 transmitter. If you

have details of this equipment, please let him know:

M. Gist G4KFX,
Sunnyside Cottage,
Hungus,
Threemilestone,
Truro TR3 6EQ.

Counter/Timer

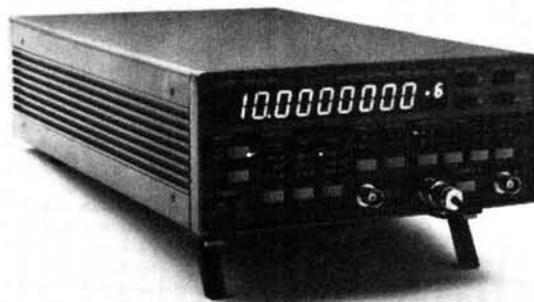
The 6010 is a fully programmable counter timer based on Global Specialties 6020 instrument. As it is without some of the 6020's advanced features and options, a price of £795 has been achieved.

The 6010 gives optimum resolution throughout a frequency range of 0.1Hz to 125MHz and utilises both conventional and reciprocal techniques. Using three independent channels and nine full-size l.e.d.s, thirteen different measuring functions can be provided

including time interval averaging, rise/fall time and peak voltage. Featured in the counter/timer are internally pre-selected intervals or external intervals ranging from 100s to 1000s.

A trigger level function is included for eliminating false triggering on unknown signals and a non-volatile memory is capable of storing up to ten complete front panel set-ups.

Global Specialties,
2nd Floor,
2-10 St. Johns Street,
Bedford MK42 0DH.



BNOS

In the BNOS advert in January PW, the headings and lists of BNOS 2m Linears, Filters and Transverters were mixed up.

Apologies to our readers, and to BNOS for any confusion caused. The correct list appears on page 65 of this issue.

New 3.4GHz Transverter System

LMW Electronics Ltd. have recently added a 3.4GHz (9cm) transceiver system kit to their range of kits for the u.h.f./s.h.f. enthusiast. It has a 70mW output, a 144MHz i.f. and costs £200.

Other kits they produce are a 1296MHz transverter kit, 500mW output, 144MHz i.f. at £133.40 and a 2320MHz transverter kit, 250mW output, 144MHz i.f. at £159.39. GaAs-f.e.t. pre-amplifiers for all bands and Meteoros are available at £43.75.

They have now opened a shop for kits and components, specialising in u.h.f./s.h.f. bits. The shop is easy to find as it's close to the M1, with shop hours being 10am to 4pm weekdays.

For fuller details of all the kits and products, contact the shop at:
LMW Electronics Ltd.,
12 Bideford Road,
Braunstone,
Leicester LE3 3AE.
Tel: 0533 630038.

SHORT WAVE MAGAZINE JANUARY ISSUE OUT NOW FOR THE RADIO LISTENER

REGULAR FEATURES
The ever popular SEEN & HEARD, AIRBAND and BANDSCAN continue to keep you informed.

ANTENNAS part 1
F.C. Judd G2BCX starts an important new series on the theory of antennas

GRUNDIG YACHT BOY 215
Portable short wave radio reviewed

WHAT SCANNER ?
Technical specifications of a selection of scanning receivers



Antenna Electrometer

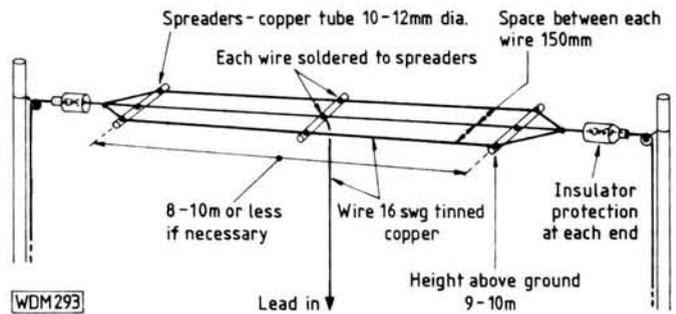
Having read the very informative article "Practical Antenna Electrometer" by Anthony Hopwood (*PW* Oct. 88), I decided to construct this instrument and at the same time erect a special antenna to operate with it. In my case the electrometer is coupled to a centre zero analogue meter, a positive/negative reading digital meter and a pen chart recorder with a sensitivity of 1mV or 10mV and an incorporated attenuator. It uses 10in wide graphed chart paper and the pen can be set at centre to read positive or negative voltages. Chart paper speeds from 5 seconds/in to 3 minutes/in are available.

The "electrometer" functions extremely well and although nothing dramatic has yet been observed, some interesting variations, mostly due to changing weather conditions, have been recorded. Another

radio amateur, G3MYA, located a few miles from my own QTH has been carrying out similar observations using a very high impedance input d.c. meter employing f.e.t.s. We are able to compare observations.

However, aside from having very good insulation at the "ends" of the antenna, protected as recommended in the article, it has been found that the antenna itself is best made from bare copper wire or tinned copper wire. If the wire is enamelled or pvc-covered, then its static electricity pick-up efficiency is greatly reduced. Tests have been carried out by the writer with antennas of identical length, and which could be quickly hoisted to the same height above ground; one was made from tinned copper wire, the other from pvc-insulated wire.

Changing from one to the other (lowering one and hoisting the other) during periods when the static



voltage reading has remained virtually constant, showed the tinned copper wire antenna to have a pick-up efficiency far, far greater than the one made from covered wire.

The antenna now being used and shown in the diagram, is one way of ensuring a large "pick-up" area in a small space, located as far as possible from other (h.f. and v.h.f.) antennas. Guy lines for the supporting masts and hoisting halyards are polypropylene rope.

F.C. Judd G2BCX
Cantley, Norfolk.

Some authorities recommend the use of insulated wire in preference to bare wire for receiving antennas in order to reduce the effects of "rain static". This is the hissing noise produced by the charged raindrops which can drown out signals in the low and medium frequency bands.

Some years ago when I was at sea, I did some tests of my own which proved that this idea does work. It was also effective against similar static noise problems experienced in sandstorms in the Suez Canal and Red Sea area.

—Ed.

OUR SERVICES

QUERIES

We will always try to help readers having difficulties with a *Practical Wireless* project, but please observe the following simple rules:

1. We cannot give advice on modifications to our designs, nor on commercial radio, TV or electronic equipment.
2. We cannot deal with technical queries over the telephone.
3. All letters asking for advice **must** be accompanied by a stamped, self-addressed envelope (or envelope plus International Reply Coupons for overseas readers).
4. Write to the Editor, "Practical Wireless", Enefco House, The Quay, Poole, Dorset BH15 1PP, giving a clear description of your problem.
5. Only one project per letter, please.

BACK NUMBERS AND BINDERS

Limited stocks of many issues of *PW* for the past 18 years (plus a few from earlier years) are available at £1.40 each, including post and packing to addresses at home and overseas (by surface mail).

Binders, each taking one volume of *PW* are available Price £3.50 plus £1 post and packing for one binder, £2 post and packing for two or more, UK or overseas. Prices include VAT where appropriate.

CONSTRUCTION RATING

Each constructional project is given a rating, to guide readers as to its complexity:

Beginner

A project that can be tackled by a beginner who is able to identify components and handle a soldering iron fairly competently.

Intermediate

A fair degree of experience in building electronic or radio projects is assumed, but only basic test equipment is needed to complete any tests and adjustments.

Advanced

A project likely to appeal to an experienced constructor, and often requiring access to workshop facilities and test equipment for construction, testing and alignment. Definitely not recommended for a beginner to tackle on his own.

COMPONENTS, KITS AND PCBs

Components for our projects are usually available from advertisers. For more difficult items, a source will be suggested in the article. Kits for our more recent projects are available from **CPL Electronics**, and from **FJP Kits** (see advertisements). The printed circuit boards are available from our **PCB SERVICE** (see page 47 of this issue).

CLUB NEWS

If you want news of radio club activities, please send a stamped, self-addressed envelope to **Club News**, "Practical Wireless", Enefco House, The Quay, Poole, Dorset BH15 1PP, stating the county or counties you're interested in.

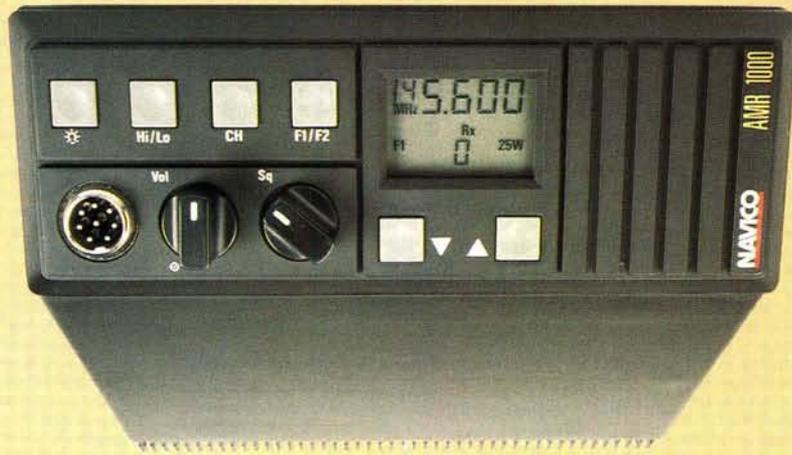
ORDERING

Orders for p.c.b.s, back numbers and binders, *PW* computer program cassettes and items from our Book Service, should be sent to **PW Publishing Ltd., FREE-POST, Post Sales Department, Enefco House, The Quay, Poole, Dorset BH15 1PP**, with details of your credit card or a cheque or postal order payable to *PW Publishing Ltd.* Cheques with overseas orders **must** be drawn on a London Clearing Bank.

Credit card orders (Access, Mastercard, Eurocard or Visa) are also welcome by telephone to Poole (0202) 678558. An answering machine will accept your order out of office hours.

SUBSCRIPTIONS

Subscriptions are available at £15.50 per annum to UK addresses, £18 to Europe, and £19 elsewhere (by Accelerated Surface Post). For further details, see the announcement on page 30 of this issue.



The new AMR1000/S

It checks out from every angle



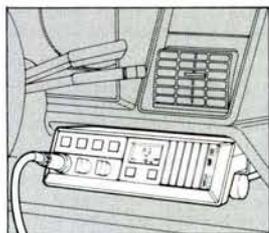
Whichever way you look at it, the Navico AMR1000/S sets new standards in 2m mobile transceivers.

The angled, reversible control panel, together with a range of inexpensive optional mounting brackets enables installation in any vehicle, whether under or on top of the dash, either side of a central console or even from the roof.

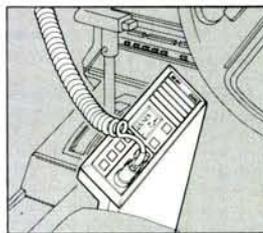
This means the display will always face you giving total access to the controls which are spaced to allow simple, safe, mobile operation. The front mounted loudspeaker will also face you, projecting the sound toward you and not at your feet or into the dashboard.

Combine this with the most sensitive and selective receiver, an audio response tailored for today's busy band and the unique, fully automatic repeater/simplex operating facilities and you have a truly remarkable mobile radio.

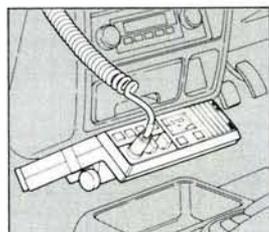
There is also a choice of models to suit your exact



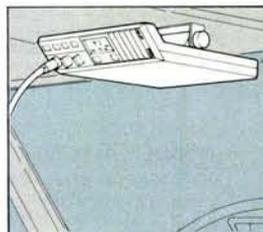
Under dash mounted (side)



Central console mounted



Under dash (central)



Roof mounted

needs. In the words of Chris Lorek of HRT about the Navico AMR1000/S "Not only does it out-perform its competition on technical grounds but it offers many very useful operating features not found on other rigs, and sells at what appears to be a very competitive price".

Check it out for yourself, prices start at just £247.25 (incl. VAT). For more details and to arrange a personal

demonstration clip the coupon today.

PRIORITY INFORMATION REQUEST

For full details send to:
Navico, Star Lane, Margate, Kent CT9 4NP,
United Kingdom. Telephone: 0843 290007.

Name _____

Address _____

Tel. _____

The professionals in amateur radio

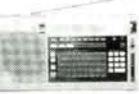
NAVICO

PW1-89

SONY

SONY ICF 2001D

76-108 MHz
116-136 AIRBAND
153kHz-29.995MHz
FM - AM - SSB 32 MEMORIES
INC PSU, CARRY STRAP
& EARPHONE



£295

Sony ICF 7600DS FM/AM/SSB £157
Sony SW1 150-30M C/S + FM Stereo-249 AM/FM £157
Sony Pro 80-150KC-108MHz, 115MHz-224MHz, AM-FM-SSB £295
Sony Air 7 £229
Sony Anti Active Antenna £49
Sony Accessories Available

SONY ICF 7600DS

76-108MHz
153kHz-29.995MHz
Complete with case,
mains power supply,
earphone and
frequency list.



£157

KENWOOD & SCANNERS

Kenwood RZ1 150kHz, 950MHz £425
Kenwood TS680 £799
Kenwood R5000 £799
New Bearcat UBC205XLT £249
Handheld 29-54MHz, 118-174MHz, 406-470MHz,
806-956MHz inc NiCad charger and Case.
Bearcats in Stock, Black Jaguar, etc.

191 FRANCIS ROAD
LEYTON · E10 6NQ · LONDON
TELEX 8953609 LEXTON G
PHONE 01-558 0854 01-556 1415
FAX 01-558 1298

DRESSLER ACTIVE ANTENNAS

ARA 900 ACTIVE ANTENNA



NEW



50MHz to 1300MHz
Gain 17dB Typical
TECHNICAL SPECIFICATIONS
Noise Figure
1dB at 50-180MHz
1.5dB below 300MHz
2.0dB below 350MHz
2.7dB below 400MHz
3.0dB below 500MHz
3.8dB below 650MHz
4.6dB below 1300MHz

£139.00 (PL259 Connectors)
£149.00 (N-Type Connectors)
Intercept Point 3rd Order +18dbm at Input
Post £3.00 or Secunor £7.00 extra

ARA 30 ACTIVE ANTENNA 50 kHz . . . 40 MHz WITH LIMITED PERFORMANCE UP TO 100MHz

Professional electronic circuitry with very wide dynamic range. Meets professional demands both in electronics and mechanical ruggedness. 1.2m long glass fibre rod. Circuit is built into waterproof 2.5 mm thick aluminium tube. Ideal for commercial and swi-receiving systems. £129. See Review in August 1985 Issue p.35 Both antennas come complete with 7 metres of cable, interface, power supply and brackets. Dressler preamps available.



£129

OPEN MON - SAT 9AM - 5.30PM
INTEREST FREE HP FACILITIES AVAILABLE
ON MANY ITEMS PROMPT MAIL ORDER



Prices correct at time of going to press. Please phone for latest quote.

ICOM

ICOM R71 General Coverage Receiver £855



FIRST CLASS SHORT WAVE RECEIVER.
BUY THIS FOR £855 AND RECEIVE AN
ARA 30 FREE. WORTH £129.

Also R7000 complete with ARA900 £999.
(ASK ABOUT THE NEW TV CONVERTER)
PHONE FOR BEST PRICE

ICOM IC32G ICOM IC3210
ICOM IC2GE ICOM IC761
ICOM IC228 ICOM IC781
ALL IN STOCK ICOM IC735

+ All ICOM models available. + YAESU
Accessories.

YAESU

FRG 9600M £475
FRG 8800 £585
FRV 8800 £100
FR767 + 2MTR £1599
FT23 + FNB108 Charger £259

C.M.HOWES COMMUNICATIONS



Eydon, Daventry,
Northants NN11 6PT
(mail order only)
Phone: 0327 60178

NEW KITS! NEW CATALOGUE!

Building and using your own equipment is interesting and offers a challenge and satisfaction missing with "black boxes". Our kits are designed to help you enjoy this aspect of the hobby. There are several new kits introduced in our latest catalogue, and hopefully there is one to tempt you! Have you chosen your winter project yet?

AT160 80 AND 160 METER AM/DSB/CW TRANSMITTER

This new transmitter offers both 'phone and CW on 80 and 160 Meter bands. Ideal for the club Top Band net, and general local nattering, as well as a nice sounding CW note for those longer distance contacts. There are front panel controls provided for both carrier level and RF output power (up to 10W PEP output). Broad-band circuitry eliminates the need for any tuned circuit alignment, whilst relay switched elliptical output filters are used on each band to ensure a clean signal. A PTT operated antenna relay is provided. A matching microphone amplifier, type MA4 has been introduced to suit this TX. We have been asked time and time again "when are you going to introduce a simple 'phone rig? ". Well here it is. It is not just a 'phone rig though, the CW is also rather good. We hope you like it.

AT160 Kit: £34.90 Assembled PCB: £53.90

MA4 MICROPHONE AMPLIFIER

The MA4 has been introduced to suit the modulation input of the new AT160 transmitter. It is designed to use a normal low or medium impedance hand mic, our CM2 desk/mobile mic kit or even an AP3 speech processor. The four stage circuit includes two stages of active low-pass filtering to help keep your transmitted signal bandwidth within tight limits. A gain control and RF filtering on the input are provided.

MA4 Kit: £5.60 Assembled PCB: £9.90

AA2 ACTIVE ANTENNA AMPLIFIER

The new HOWES AA2 kit enables you to build yourself a really compact HF reception antenna that can be accommodated in even the smallest QTH. Even if you have room for large antennas, you will still find this kit useful for building a rotary antenna for the lower frequency bands. Have you got a rotatable Top Band antenna? The advantage in being able to "null" QRM with a miniature rotary dipole should not be discounted. The AA2 has facilities for both short single wire and dipole inputs. The antenna length can be varied to suit your requirements, but about 6 to 8 feet is a good maximum length. The PCB is designed to fit inside standard 1.5" waste water pipe, so making for easy weather proof construction if required. Direct or Coaxial powering can be used, so the unit can be located next to the receiver, or remotely on a mast, chimney etc. It is also ideal for building a telescopic antenna facility into a homebrew portable. Features include a two stage amplifier with FET input, 50 Ohm coax output and two gain settings, it covers long wave to 30MHz applications.

AA2 Kit: £7.50 Assembled PCB: £11.50

MBRX MARINE BAND COMMUNICATIONS RECEIVER

The new HOWES MBRX kit is designed to enable you to build a receiver covering the whole Marine Band from 1.6 to 3.95MHz, including both the 160 and 80 Meter amateur bands. Modes covered are SSB and CW, although you can also use it for RTTY, FAX etc if you have a suitable terminal.

Features include:

☆ Switched input attenuator ☆ RF stage ☆ Balanced, Direct Conversion mixer ☆ 2 stage active SSB filter ☆ Stable FET oscillator ☆ Fine tune control ☆ Fast and Slow AGC ☆ 1W audio output ☆ Optional filters, signal meter etc. are available. Requires two 365pF (or 500pF) tuning capacitors. A kit to build a real communications receiver with good facilities and performance at a sensible price.

MBRX Kit: £29.90 Assembled PCB: £44.90

DcRx54 HF AIR BAND COMMUNICATIONS RECEIVER

So many customers have asked us how to modify our popular DcRx amateur band receivers to cover the 5.450 to 5.750 MHz band, that we decided we would introduce a version of the kit for this application. The DcRx features a stable FET oscillator and a balanced, direct conversion mixer. Up to 1W of output is available for driving headphones or loudspeaker. This receiver is simple and easy to build, but you will be amazed at the performance! Suitable tuning capacitors are available at £1.50 each (you need two per receiver). Single band DcRx kits are also available for 160, 80, 40, 20/30 Meter amateur bands.

DcRx Kit (all versions): £15.60 Assembled PCB: £21.50

All HOWES kits come with full, clear instructions, good quality glass fibre PCB (drilled and tinned with screen printed parts locations) and all board mounted components. Delivery is normally within 7 days. Help, advice and sales are only a phone call away (office hours), but please send an SAE if you would just like a catalogue, or specific product information sheets.

P&P is £1.00 per order.

73 from Dave G4KQH, Technical Manager



Crops and Coils Part 6

Super-regenerative and Superheterodyne

Before the war, the ultra high frequencies were largely an unknown part of the radio spectrum. Amateurs used to world wide communication on lower frequencies were not enamoured with the line-of-sight range of u.h.f. transmissions. It was also extremely difficult to construct stable oscillators because the crystals available at that time were unsuitable for generating such high harmonics, says George Pickworth.

Experimental transmitters for use above 100MHz were usually self excited and used resonant lines instead of tuning coils but as these were invariably made of copper, temperature variations caused significant changes to the resonant frequency making communication difficult. So, this band was largely neglected.

Nonetheless, the super-regenerative receiver, invented by Major Armstrong in the early 1920s had opened up the ultra high frequencies to those experimenters and amateurs interested in exploring and utilising this hitherto virtually unused part of the radio frequency spectrum. It was the most sensitive receiver available at that time and having broad band characteristics was ideal for use with transmitters where the frequency was somewhat unstable. In fact the American "National 1-10" super-regenerative receiver was the only commercial ultra short wave receiver manufactured in quantity before the war. It used plug-in coils and tuned from 28-300MHz.

The remarkable success of super-regenerative receivers was based on positive feed-back which dramatically raised the Q of tuning coils to such a level that early types of battery valves and small conventional tuning systems would work at frequencies as high as 100MHz. Many experimenters were able to tune to much higher frequencies by removing the bases from physically small triodes and soldering the leads directly into the circuit. High Q resonant lines, instead of tuning coils, further enhanced performance.

With regard to transmitters, resonant lines made it possible to generate appreciable r.f. with self excited designs using normal output valves. The major problem, however, was to determine wavelengths with sufficient accuracy to make communication possible, and the only practical method was to measure the distance between nodes along a pair of parallel wires.

Quenching

The super-regenerative receiver differs from a normal regenerative receiver in that feed-back is increased to the point where the detector oscillates continuously. To resolve signals, the valve is quenched, which means

that it is switched on and off at a supersonic frequency. The self-quenching design was the most popular as it only required a capacitor and resistor arrangement to deliver h.t. to the detector valve in supersonic pulses. The alternative design was to use a separate oscillator using a quench coil but this was more complicated and gave no improvement.

However, without an r.f. stage, super-regenerative receivers radiate considerable energy and while this was not serious before the war when I first made a breadboard "super-regenerator" the situation had changed rapidly and it was now most important that radiation be limited to an extremely low level. Ordinary pentodes were useless in r.f. stages but valves designed specially for very high frequencies were now being made and I was fortunate enough to acquire a pair of "acorn" valves. Unlike ordinary valves, their pins radiated from the side and fitted into a special circular holder.

As I wanted to explore the very highest frequencies I considered using a concentric resonant line instead of conventional tuning coils but as the slider would have to be in the shape of a washer I opted for a pair of parallel copper tubes 15mm diameter and 500mm long. Coarse tuning was by a slider which reduced their electrical length while a small variable capacitor connected across the opposite ends provided the fine tuning.

The actual wavelengths were determined by measuring the distance between nodes along a pair of wires stretched over a long board. In its simplest form, one end of the pair was loosely connected to the detector and a shorting wire was moved along until a point was found where the loading at resonance stopped the detector oscillating. A better method was to use a separate signal generator.

I accept that this might have caused a minute amount of radiation, but measurements were a very important part of being a serious experimenter.

The actual coverage was found to extend from about 600mm to 1600mm using the tuning capacitor alone and to 5m with additional padding capacitors clamped across the ends of the tubes. By replacing the shorting bar with a centre tapped loading coil, the range could be extended to 28MHz.

Coaxial cable was almost unknown to experimenters before the war. They normally used open feed lines, but these were unsuitable for very high frequencies. So, a steel tape measure, attached directly to the panel, was used as an antenna. By inclining the tape at a small angle so that it was self-supporting, it was extended to the optimum length.

I found this receiver in an attic many years later and motivated by nostalgia got it working again. Somewhat surprised, I found that it was not only very sensitive but capable of resolving f.m. transmissions which were only a

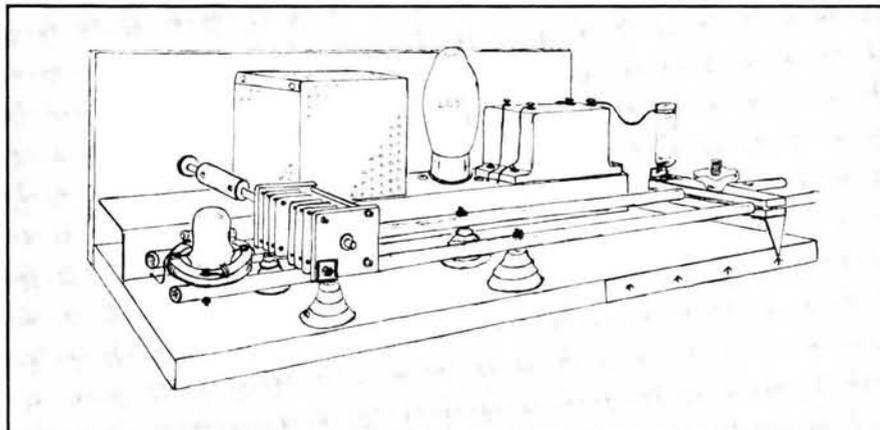


Fig. 6.1: The Super-regenerative receiver

dream when this receiver was made. Even more significant, radiation from the detector was extremely low, no doubt the result of good screening, and I could have used it without trepidation, but I had no way of knowing this. Notwithstanding the resonant lines making it cumbersome, it was ideal for scanning the u.h.f. bands before the arrival of sophisticated scanning receivers.

Supersonic Heterodynes

Many early experimenters appreciated the advantages of heterodyne direct conversion a.m. receivers but at that time it was extremely difficult though not impossible to keep the local oscillator in phase with the transmitter.

Although our simple receivers could be made to work they produced the most alarming shrieks, and possibly interference, during tuning so that they were not a practical method of reception. So direct conversion was virtually abandoned as a viable means of reception until it was re-discovered in more recent years.

Meanwhile, experiments with a supersonic beat note were being made. This was amplified and rectified to produce an audio signal but the design suffered greatly from images of other stations and lacked the elegance of direct conversion. Moreover, they were no better than straight t.r.f. receivers which did not have these vices.

Nonetheless it was soon discovered that by making the beat frequency high enough for tuned stages to be practical, originally about 50kHz, great amplification and selectivity was possible. Unfortunately, receivers using these low i.f.s also suffered severely from images, so a frequency of around 450kHz was adopted. This gave the best compromise when gain, selectivity and image rejection was taken into account. The word "sonic" was dropped and the term superheterodyne coined.

Before highly selective i.f. devices were available, experimenters and amateurs often made dual conversion receivers using a fairly high first i.f. stage to minimise images, followed by a very low i.f. stage to take advantage of their high selectivity. However, unless extremely well screened, which was not necessary in domestic receivers, i.f. stages radiate considerable power and to avoid interference with other stations were allocated their own frequency band.

Radiation was often so strong that it was used for detecting unlicensed receivers by using a directional antenna. Receivers used surreptitiously had well screened i.f. systems.

Last Year at School

Most of the Christmas holidays were spent alone ploughing windswept

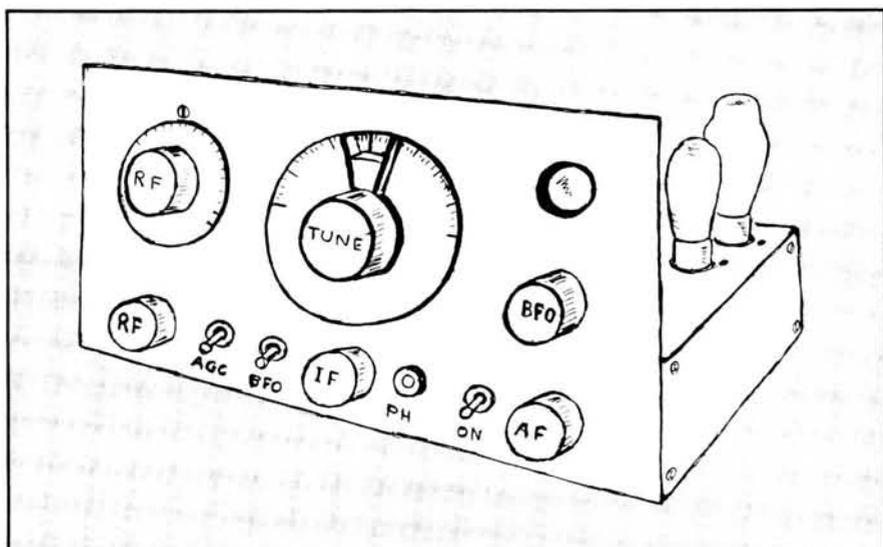


Fig. 6.2: The Superheterodyne receiver

fields with a magnificent Cast tractor and I was now in my final year at school. As it would almost certainly be my last year at home I planned to devote the Easter holidays to building a high performance communications type superheterodyne.

Bandswitching was generally too complex for amateur-made receivers. Moreover, the switches and leads introduced losses that were avoided with plug-in coils. However, the problem with plug-in coils was to maintain correct alignment (depending upon the i.f. frequency chosen) of the oscillator and r.f. stages over the whole of the frequency range covered by each coil.

A popular design had separate tuning controls for the oscillator and the r.f. stages. These were used as bandset controls in conjunction with ganged bandspread capacitors. It was developed primarily for amateurs where the bandspread was just sufficient to cover individual bands, thus any error in the alignment of the r.f. and mixer stages over this very narrow frequency range was insignificant.

A different approach was to use crystal controlled oscillators in conjunction with tuned i.f. stages. This, too, was ideally suited to amateur bands as the crystals gave precise frequency markers and generated very pure waveforms and I doubt if this technique can be improved upon for covering limited sectors of the band. However, it was unsuitable for general short wave coverage. A more suitable design used the oscillator as the main tuning control, while the ganged r.f. and mixer stage was tuned independently, much the same as with the r.f. stage on my first regenerative receiver. I opted for this design.

Tuning

The main tuning control was an Eddystone 0.00016 μ F tuning capacitor mated to a Premier Radio 100:1 slow motion drive. I did not wish to dismantle the regenerative receiver and was unable to buy another Raymart dial. The r.f. stage used a pair of ganged

Raymart capacitors together with four sets of Raymart tuning coils. The i.f. transformers were also Eddystone. They had air-spaced trimmers and were of extremely high quality.

Fourteen Valves

The two tuned r.f. stages, separate oscillator and mixer valves, three i.f. stages, detector, a.g.c., b.f.o. low power a.f. stage for headphones and high power output stage, accounted for 12 valves. Taking the "magic eye" tuning indicator and rectifier valve into account, it made a total of 14 valves.

Notwithstanding the rather inelegant tuning arrangement, performance was almost certainly equal to any commercial receiver made at that time.

It reminded me of that magnificent Cast tractor—massive, powerful, reliable and did everything it was designed to do without question or complaint. On the other hand, the regenerative receiver was more like a spirited horse we used to have—she had a mind of her own and needed to be coaxed and understood so that a relationship could be established, then she would give her very best. That receiver remained my favourite.

The superheterodyne was my last major construction project but unfortunately I had little time to use it for it was now a critical period before my final exams and I had to devote my time to studying. It was too big to take with me when I left home so building this magnificent receiver had really been an end in itself.

Having said that, I had been lucky to have lived in an environment that allowed me to develop my interest in radio and science in general, and even more fortunate to be encouraged by farm workers and many other craftsmen to use tools, and develop practical skills. These skills not only made it possible for me to construct these receivers but were of immense value during my career as an agricultural adviser in many parts of the world. **PW**

Practical Wireless, February 1989

RAYCOM

COMMUNICATIONS SYSTEMS LTD

Raycom wish all their Customers,
Past, Present and Future,
a very happy and prosperous New Year

New opening hours:

9.00 a.m. - 5.30 p.m. 5 days, late night Friday (until 7.00 p.m.)
CLOSED ALL DAY THURSDAYS.

Limited stocks of Christmas Boxes still available.

SCANNER PACKAGE

Challenger BJ 200 Mk2
HF/VHF Scanning
Receiver

- ★ 26-520Mhz (with gaps)
- ★ 16 memory channels
- Search scan priority, function and delay
- ★ Includes civil and most of military bands
- ★ C/W Free Raycom Air Band antenna

£189.00 + p&p £10



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
VHF/UHF cont
coverage receiver

- ★ Inc. Free Royal 1300 discone ant. (AH7000)
- ★ All modes
- ★ 25-1300 MHz (2GHz)

£925.00 Carr. £10.00 (Limited stocks)



ICOM ICR71 S.W. RECEIVER

- ★ Free long wire receiving antenna
- ★ Covers all short wave bands

£825.00 Carr. £10.00 (Limited stocks)



RAYCOM NEWS BOX ROYAL 1300



**RAYCOM IS
SAVING YOU
MONEY AGAIN**

£65 **£59.50**
P&P £5.00

CTE1600

Handheld
(same as IC2E)

- ★ Inc Free 2 mtr magmount ant.
 - ★ 144-148 MHz, c/w nicad charger
 - ★ 2.5 watts output
 - ★ Ideal, mobile portable use
- £149.00 + p&p £10.00**
(While present stocks last)



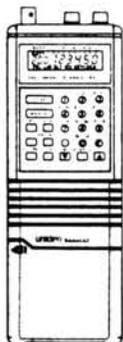
Bearcat (authorized UK distributor) BC 200XLT

BEARCAT UBC200XLT

The Super New
Scanning Receiver

- ★ C/W Free mobile antenna
- ★ 29-956 MHz (with gaps)
- ★ 200 memory channels
- ★ Detachable Nicad
- ★ C/W nicad/charger

£239.00 + p&p £10.00



HF STATION PACKAGE

Yaesu FT747GX All
Band/Mode
Transceiver

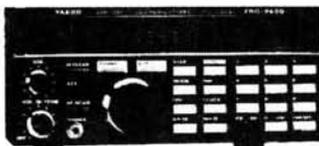
- ★ C/W Free 20A regulated PSU
- ★ Inc. Raycom Mk2 RX mod. for better RX performance
- ★ 120W RF output
- ★ Continuous coverage receiver

£725.00 Carr. £12.50 (Limited supplies)



OUR FAMOUS YAESU FRG9600 PACKAGES

- ★ Free Royal 1300 25-1300 MHz discone
 - ★ Supplied with free mains PSU
 - ★ Improved receiver specification
 - ★ Wide choice of options
- MK2 60-950 MHz @ **£545.00**
MK5 100 KHz-950 MHz @ **£699.00 + p&p £10**



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 M.R.P. PRICES, 50% DEPOSIT AND SIX MONTHLY PAYMENTS. PLEASE TELEPHONE FOR MORE DETAILS AND APPLICATION FORMS.

TEL: 021 544 6767



FOR THE BEST IN AMATEUR RADIO
Raycom are authorized dealer/distributors for all of the products we sell.

ORDERING INFORMATION

ALL PRODUCTS WE ADVERTISE ARE NORMAL STOCK ITEMS. OUR NEW MAIL ORDER DEPARTMENT CAN NOW DESPATCH MANY ITEMS SAME DAY, BUT PLEASE ALLOW UP TO 14 DAYS. DELIVERY TIME IS 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 CHECKES 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 US NOW FOR DETAILS.

Chicken-wire Discone

The discone wide-band antenna has been around for many years, but unfortunately it's been portrayed too often as a complex mechanical design. This is rather sad as the antenna is a good performer and has lots of latitude for mechanical variation, as Tony Gilbey G4YTG shows in the following article.

An experimenter friend of the author wrote to him recently asking if he had a discone design which could be built for installation in the loft.

Eventually a copy of an article that appeared in an American magazine was dispatched, showing a skeleton type discone using aluminium rods to form the antenna elements. The author pointed out that if the antenna was to be installed in the loft, the design need not be so mechanically rigid, this is when the G4YTG cheap chicken-wire discone was born.

The antenna's performance so surprised the author that he felt he had to pass on the design to his fellow amateurs. The design is ideal for those people that prefer to put their antennas in the loft and who also have an aversion to spending lots of money on antennas.

All that is required to build the project is approximately £6 for materials, a large soldering iron, pliers and a pair of tin snips.

The author's loft mounted, chicken-wire discone provides wide-band omnidirectional coverage of frequencies from 75MHz to 800MHz, as well as

showing a v.s.w.r. of better than 1.2:1 when used in conjunction with 144MHz and 430MHz transmitters.

Construction

First unroll the wire mesh and cut out the shapes to the dimensions given in Fig. 1. Next lay the "cut edge" of one of the large pieces over the wire edge of the other to make a semicircle shape, and "blob-solder" together at every other loop crossing. Then form the semicircle of wire mesh up into a cone shape and solder down the other overlapped joint in a similar way.

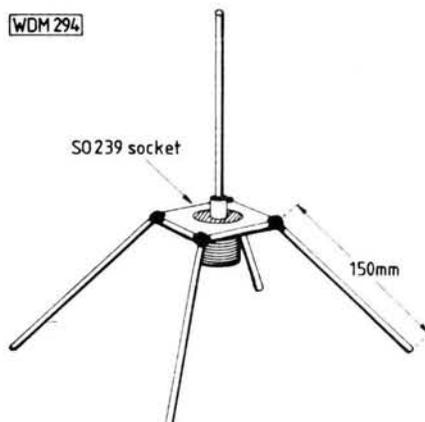
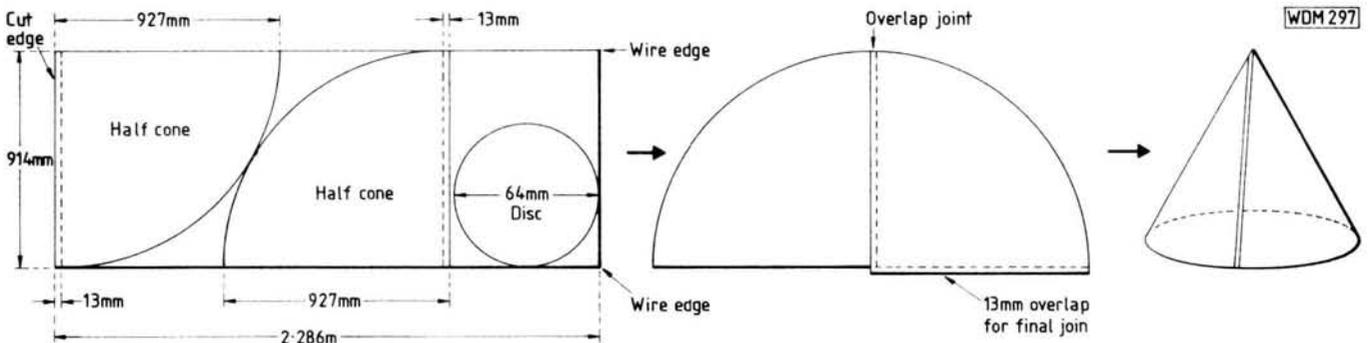
Cut five 150mm lengths of 16 s.w.g. tinned copper wire, and solder four of them, one to each corner of a four-hole fixing SO239 socket, as shown in Fig. 2. Then bend the four wires out to form a four-sided 60° skeleton pyramid and solder the fifth piece of wire on to the centre connection of the socket. Next take the pyramid-shaped socket assembly and insert it into the apex of the wire mesh cone, then solder the wire mesh to the four lengths of tinned copper wire. Finally form the open ends of the wire mesh neatly around

the back of the socket, making sure that none of them shorts to the centre conductor.

Having completed the cone assembly, now construct the disc. The disc consists of a 250mm diameter circle of tin plated steel, the top of an old biscuit tin, soldered to the underside of a 642mm dia. circle of wire mesh. The wire mesh need only be soldered around the edge of the tin plated steel disc. Next drill a 4mm dia hole in the centre of the disc assembly and then solder over the hole the brass insert from a 5 amp "chocblock" terminal strip (Fig. 3). This will provide fixing and distance adjustment between the disc and cone assemblies.

Assembly and Installation

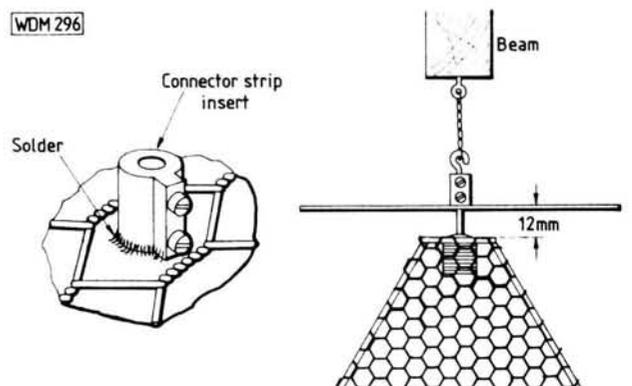
Place the centre of the completed disc over the vertical wire of the cone assembly, leaving a 12mm gap between the disc and cone. Tighten up the two screws in the connector insert and there you have it, a completed chicken-wire discone.



▲ Fig. 1: Cutting and assembling the wire mesh

◀ Fig. 2: Connection pattern for SO239 socket

Fig. 3: Final assembly of discone antenna showing connector block installation ▶



Materials

2.3m of small mesh chicken wire; approximately 250mm diameter tin plated steel; 1 4-hole fixing SO239 u.h.f. socket (silver plated brass type); 750mm of 16 s.w.g. tinned copper wire; heavy gauge cored solder; 1 block of 5 amp "chocblock" terminal strip.

The shape of the discone lends itself to being installed in the apex of a roof, this is in fact where the author has installed his. A small hook was screwed into the roof's ridge timber and the centre vertical wire of the antenna was

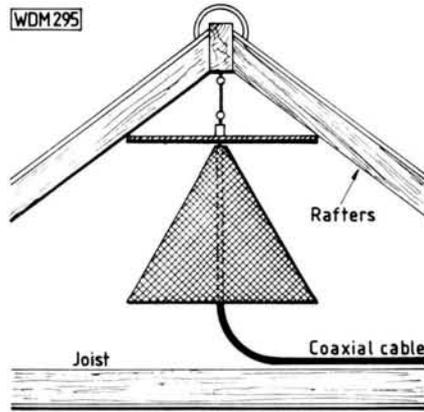


Fig. 4: Typical roof installation of antenna

formed into a small loop, enabling the antenna to be suspended by a length of nylon cord (Fig. 4). The length of the cord should be adjusted so that the disc section of the antenna just clears the rafters. The antenna will work just resting on the roof joists, however if it is to be used for both transmit and receive it should be kept well away from mains wiring.

Because the antenna covers frequencies well into the u.h.f. region it should be fed with good-quality coaxial cable, UR67 or better.

There is one more advantage to be emphasised about this design; if your loft hatch is too small to take the ready-built antenna, it can at least be folded up to fit. **PW**

Feature

Practically Yours

By Glen Ross G8MWR

This month we are going to look at a useful technique which is, to say the least, a little off the beaten track. The requirement to bypass r.f. from various points in a circuit is fairly common. As long as the operating frequencies are fairly low (h.f.), the normal method of using a disc ceramic capacitor usually does the trick.

On v.h.f. bands the problem becomes more severe, especially when dealing with transistorised equipment. The difficulty here is that these circuits are inherently of very low impedance. Whereas a residual impedance in the decoupling circuit of a few ohms may work well in high impedance valve circuitry, it will certainly cause problems in solid state equipment.

Inductance

Most of the problems we run into are actually caused by the inductance of the leads of the capacitor. The nice point is that if we take this one step further we can actually use this inductance in combination with the capacitance to form a series tuned circuit. You may remember that at resonance a series tuned circuit has virtually zero impedance, except for the small resistive element involved. Using short lead lengths, this effect can be ignored.

Limitations

There is a price to pay when using this technique. If you try to use it on

the h.f. bands the value of capacitance and the lead lengths involved are too great to be practical. If you try and use it much above 150MHz then the opposite applies. This leaves us, then, with a useful range from about 50 to 200MHz and in this area the technique is supreme.

Bandwidth

The frequency of resonance will depend somewhat on how the leads are placed with reference to other components, etc. Due to the fact that series resonance of this type is fairly broadband, it is unlikely that special tuning will be required. One thing to bear in mind is that to reduce unwanted coupling effects it is always better to use a

large value capacitor with short lead lengths.

Comparison

To demonstrate how well the system can work, let us take a common example of a 1nF capacitor with leads 6.5mm long. This would have an impedance on 144MHz of about 10 ohms, which is hardly a short circuit. Using a 25pF capacitor with leads 25mm long would result in an impedance of virtually zero ohms.

The lead lengths and capacitance values given in Table 1 are for use with popular v.h.f. frequency bands. The dimensions shown are the total lead length and may be subdivided as is convenient. For example, if you need a series tuned circuit resonant at 144MHz, then a 50pF capacitor with a total lead length of 25mm (1in) will be needed. For ease of physical positioning, one lead of the capacitor may need to be 20mm long and the other 5mm. This is perfectly acceptable, as the total lead length is still 25mm.

If you're in some doubt as to the resonant point of a capacitor used in this manner, first solder the capacitor in position, then with no power applied to the equipment, place a heavy short across the points where the capacitor is connected. Next, take your g.d.o. and place the instrument's coil near the capacitor; by sweeping the oscillator a broad dip should be noted at the required frequency. **PW**

Table 1

MHz	Total lead length		
	13mm	25mm	50mm
50	800pF	400pF	200pF
70	400pF	200pF	100pF
100	200pF	100pF	50pF
144	100pF	50pF	25pF

Where an exact value is not available, try the nearest preferred value. The above values only hold true for "dog bone" type tubular ceramics and 7mm dia disc ceramics.

Reading & Understanding Circuit Diagrams

(with a bit of theory thrown in)

In Part 11 of this series, R.F. Fautley G3ASG takes a look at r.f. power amplifiers, starting with Class A operation.

A drive unit for the r.f. power amplifier will be ignored at this time so as to keep the description to the minimum necessary for the understanding of the simplest (and cheapest!) Morse transmitter.

So, we will go straight into the bit providing the power which, we hope, will leave the antenna and shower the world with dots and dashes. (Don't forget there's the Radio Amateurs' Examination first before you can go on the air at all, not to mention a Morse test before you can operate on amateur bands below 30MHz.)

This is where the amateur is best advised to leave semiconductors alone unless interested in QRP operation (low power), say up to about ten watts. This 10W is quite an arbitrary figure and it is very much open to argument at which power level transistors should be dropped in favour of valves. That's if they should be dropped at all. It is, however, generally agreed that valve amplifiers are electrically more rugged than semiconductor types. This means that valves stand more in the way of output circuit mis-tuning and mismatching (and general bad treatment) than is the case with transistors. This was one reason I decided to describe valve amplifiers in this series. Another is that it is much easier for the beginner to build an amplifier which is likely to work right from the start. Perhaps not perfectly, but it will enable him or her to alter circuit values and generally experiment without an early demise of the main component, the valve.

With semiconductors, although the voltages used are very much lower and therefore safer for the handler, the devices will not put up with excessive voltage or current without the likelihood of disaster, mostly evident as a dead transistor. This is my opinion only and no doubt many arguments could be made in favour of the semiconductor at high power levels. Indeed, most modern h.f. transceivers use transistors for their 100W power amplifier stages.

Let's get back to the simple valve r.f. power amplifier which is illustrated in Fig. 11.1. This shows two new circuit symbols, M1 for a meter and V1 for a valve, in this case a tetrode.

The term "tetrode" simply indicates that the valve has four electrodes, whereas a "triode" valve has three. The four electrodes of the tetrode are:

- (i) Control Grid—usually just called grid
- (ii) Cathode
- (iii) Anode — in our circuit it's the valve type with the anode brought out to a cap at the top of the valve, rather than to one of its base pins
- (iv) Screen—or Screen Grid

But what about the other bit at the bottom of the valve symbol designated "heater"? Well, this bit is often ignored as its only function is to heat the metal cathode, which gives off electrons when heated. The heating is provided by passing a current through the heater. Although the heater is quite thin and it glows visibly, it doesn't actually burn itself out (unless the voltage ap-

plied to it is much higher than it's supposed to be) because it's mounted within an evacuated glass bulb, called an envelope.

So, all valves have heaters and they have to be provided with their own power supply which is usually quite a low voltage, 6.3V being a popular value. Alternating current is usually used for this supply as it is easily available as a winding on the power supply mains transformer.

Look at the circuit diagram, Fig. 11.1. Output from the Morse generator is fed to the amplifier input via the low impedance "link" (or coupling) winding, L1, to the tuned circuit, L2/C2, and so to the grid of the valve V1. As both grid and anode circuits are tuned to the same frequency, it is necessary to ensure that there is **minimum** possible coupling between them or our amplifier could turn into a power **oscillator!** This is rarely indicated on a circuit diagram and instability could result if the physical layout of the components is not considered. One method of ensuring good isolation between input and output is shown in Fig. 11.2. A metal sheet, perpendicular to the chassis, is fitted with the valve mounted horizontally through a hole cut into it. With the grid circuit on one side and the anode circuit on the other, the metal sheet acts as an "electrostatic" screen. This prevents electrostatic fields (fields due to electric potential) on one side of the screen interacting with those on the other side. Although the screening is not perfect, the degree

Fig. 11.1

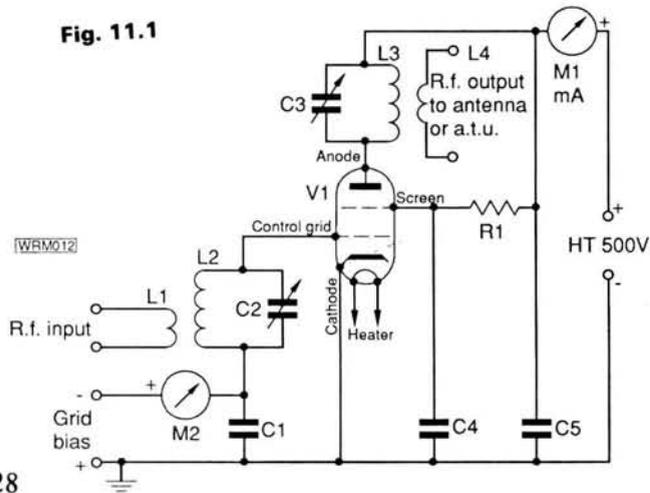
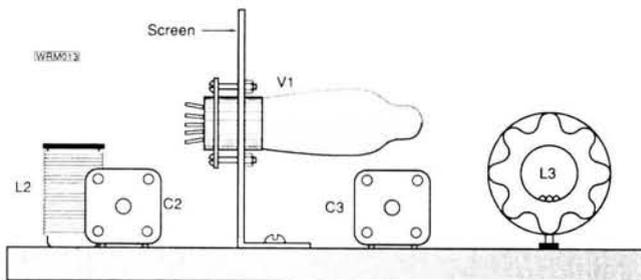


Fig. 11.2



of attenuation introduced is usually sufficient for stable operation.

That's not all. Another type of possible unwanted coupling is "magnetic" or inductive. The best way to prevent interaction between the magnetic fields surrounding inductors (in our case between L2 and L3) is to mount them as far apart as physically possible and fit them with their windings at right angles to each other as in the layout of Fig. 11.2.

Another well-used component layout is to mount the valve vertically in the usual way on the chassis, the grid tuned circuit being below the chassis and the anode circuit above. The chassis then acts as a screen.

Just a note about the other few components. Screen current (d.c.) flowing through R1 drops the supply voltage (500V) to the maker's recommended voltage for the screen grid and r.f. decoupling is provided by C1, C4 and C5.

Now for a bit more theory, very necessary for understanding the operation of an r.f. power stage. There are several different types, called **classes**, of amplifier which have almost identical circuits. In fact, the major differences between amplifiers operating in different classes are just component and voltage values.

The **class** in which an amplifier falls depends on how **much** of one complete input cycle produced anode current.

Just try and get that in your mind and what follows will begin to make sense. So, here we go with the main power amplifier classes:

Class A—anode current flows during the whole of the input cycle (360°).

Class AB—anode current flows during about $\frac{2}{3}$ of the input cycle (240°).

Class B—anode current flows during about $\frac{1}{2}$ of the input cycle (180°).

Class C—anode current flows during about $\frac{1}{3}$ of the input cycle (120°).

Class A

What is meant by anode current flows throughout the whole of the input cycle? It means that the input (or grid) voltage is varied within certain limits to **ensure** that anode current, which though varying in amplitude, flows the whole time. Why should this be?

Have a look at Fig. 11.3, looks a bit technical doesn't it? Well, it is a little, but let's take it bit by bit. First look at the two axes on the graph. The horizontal axis represents the voltage at the grid of the valve relative to its cathode, V_G , it may be any value from negative through zero to positive. The vertical axis represents anode current, I_A , increasing from zero.

Now look at the curve. It shows the value of anode current that would be produced by any particular grid voltage if the anode voltage, V_A , remained

at a fixed value, say 500V. Point A shows that if the grid voltage was set at -10V then 50mA of anode current would flow; Point B that -15V would produce 10mA and Point C, -5V for 90mA. You can check this by following the vertical and horizontal lines from the A, B and C points on the curve to the axes.

What does all this tell us? It shows that if we were to adjust the d.c. voltage between grid and cathode so that the grid was -10V relative to the cathode and the d.c. anode voltage was +500V to the cathode, then the anode current would be 50mA. This would be the "quiescent" or "zero-signal" current, i.e. the anode current flowing in the absence of any input signal at the grid. This value of d.c. grid voltage is referred to as the "grid bias".

Now if a sinewave signal of 5V peak (about 3.54V r.m.s.) were to be applied to the grid, this varying signal voltage would be **added** to the existing grid bias of -10V d.c., thus swinging the grid potential above and below the grid bias point, as in the table shown here as well as Fig. 11.4.

Grid Bias	Input Signal	Effective Grid Voltage	Graph Point
-10V	0V	-10 + 0 = -10V	G1
-10V	+5V	-10 + 5 = -5V	G2
-10V	0V	-10 + 0 = -10V	G3
-10V	-5V	-10 - 5 = -15V	G4
-10V	0V	-10 + 0 = -10V	G5

and so on.

You can see that Fig. 11.4 is just Fig. 11.3 with the addition of the **input signals and the resulting anode current**. The latter can be seen to be a complete sinewave, exactly the same **shape** as the grid voltage waveform. Check that this is so by comparing the following tabulated points on Fig. 11.4.

Point on V_G Waveform	Point on I_A Waveform
G1	A1
G2	A2
G3	A3
G4	A4
G5	A5

This will only be true if the part of the curve in Fig. 11.4 between X and Y is a **straight line**, that is the relationship between V_G and I_A is a **linear function**. For the mathematically minded, the straight line part of the valve curve is a curve of the form $y = mx + c$, or a linear equation. If this were not so, the **output** waveform would be different, i.e. distorted, as in Fig. 11.5 which represents one form of a non-linear characteristic. Note that the anode current waveform is certainly not the same shape as the sinewave at the grid.

This distortion will consist of harmonics of the frequency of the grid input signal and for an r.f. power

Fig. 11.3

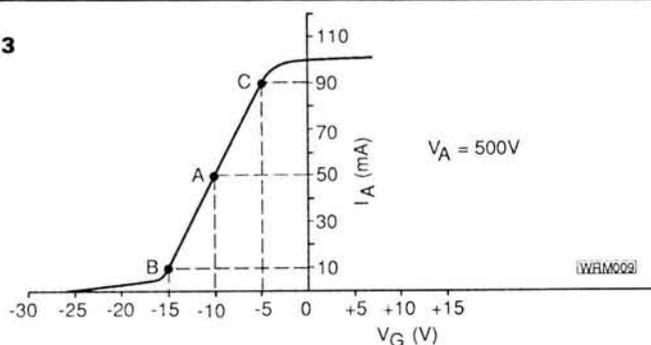
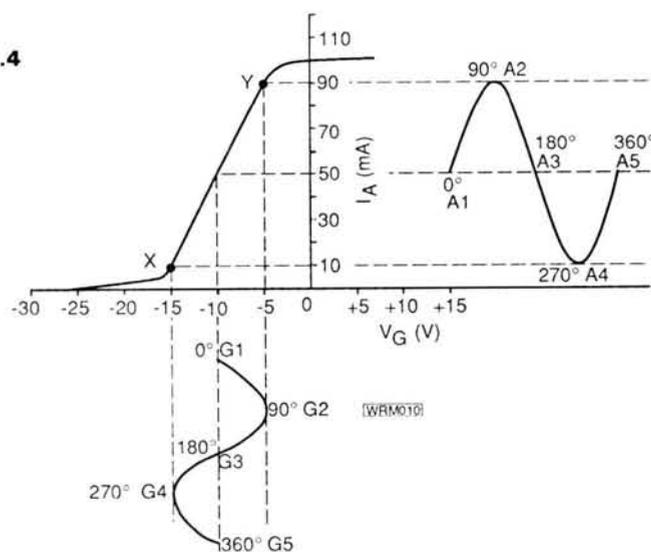


Fig. 11.4



amplifier could produce radiated signals capable of causing interference to other services.

For correct Class A operation the mean value of anode current—the current read by a meter in the anode d.c. supply lead (M1 in Fig. 11.1)—does not change, whether a signal is present at the grid or not. Why doesn't it change? As the anode current swings from a minimum of 10mA to a maximum of 90mA (see Fig. 11.4) the average anode current is:

$$\frac{10 + 90}{2} = \frac{100}{2} = 50\text{mA}$$

which is the same as the quiescent value! So, whether a signal is present or not, the anode current is constant.

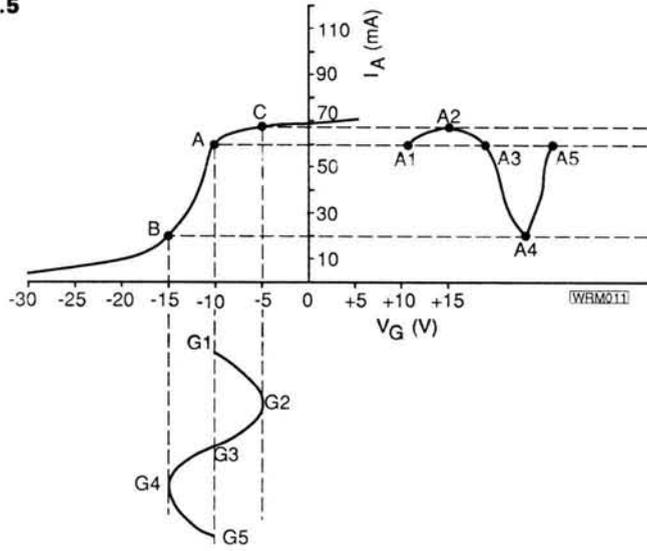
As its theoretical efficiency does not exceed 50 per cent, it is rarely used as a power amplifier at radio frequencies, but is nearly always used for hi-fi valved a.f. amplifiers. Theoretical efficiency? Yet another term to explain.

An r.f. amplifier's efficiency is a measure of its ability to convert d.c. power into r.f. power. For example, if a valve amplifier has a d.c. supply of 500V and the anode current meter indicates 50mA, the anode input power will be:

$$V_A \times I_A = P_A$$

$$500 \times \frac{50}{1000} = \frac{500 \times 50}{1000} = 25\text{W}$$

Fig. 11.5



If the r.f. output power from the amplifier, measured on an r.f. power meter is 10W, then the efficiency of the amplifier (η) is:

$$\eta\% = \frac{P_{out}}{P_{in}} \times 100$$

$$= \frac{P_{RF}}{P_{DC}} \times 100$$

$$= \frac{10 \times 100}{25} = 40\%$$

With an input power of 25W and an output of only 10W—where does the other 15W go? The answer is that it stays inside the valve heating up the anode and is called the “anode dissipation”. For safe operation, the valve in our example should have an anode dissipation rating of at least 15W.

Information supplied by valve manufacturers always includes this important rating which should never be exceeded.

In Part 12 we will look at Class B, AB and C operation.

SUBSCRIPTION OFFER

One Year — £15.50
Three Years — £40.00

Wherever you live, a Postal Subscription will ensure that you receive your copies of PRACTICAL WIRELESS and/or SHORT WAVE MAGAZINE regularly, through your own letterbox, before it gets onto your newsagent's shelf. Order a Joint Subscription and you will qualify for the Special Discount.

Fill in the Order Form below and post it to: PW Publishing Ltd., FREEPOST, Subscriptions Dept., Enefco House, The Quay, Poole, Dorset BH1 5 1PP (no stamp required). Credit Card Orders taken on (0202) 678558.

Overseas subscriptions outside Europe are now despatched by Accelerated Surface Post for faster delivery.

Please indicate the type of subscription required:



- Special Joint Subscription
- See above (UK)
 - £17.00 (UK)
 - £28.00 (UK)
 - £18.00 (Europe)
 - £19.00 (Overseas)
 - £32.00 (Overseas)
 - £19.00 (Overseas)
- (Prices correct at November 1988)

To commence with issue dated

To: PW Publishing Ltd., FREEPOST, Subscriptions Dept., Enefco House, The Quay, Poole, Dorset BH1 5 1PP (no stamp required).

Name

Address

.....

.....

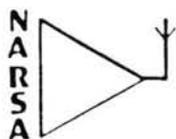
I enclose cheque/PO (Payable to PW Publishing Ltd) £

Charge to my Access/Visa Card the amount of £

Card No.

Valid from

Signature



NORBRECK RADIO AND ELECTRONICS EXHIBITION

by the Northern Amateur Radio Societies Association

at the

NORBRECK CASTLE HOTEL EXHIBITION CENTRE
QUEENS PROMENADE, NORTH SHORE, BLACKPOOL
(Formerly held at Belle Vue, Manchester)

on **Sunday, January 29th, 1989,**

Doors open at 11 am

The North's Premier Amateur Radio & Electronics Event

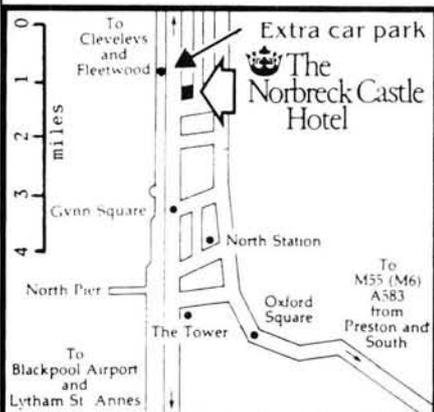
- ★ Construction Competition
- ★ Grand Raffle
- ★ Restaurant & Bar
- ★ Bring & Buy Stall
- ★ Amateur Computer Stands
- ★ Free car parking
- ★ R.S.G.B. Book Stall
- ★ Club Stands
- ★ Overnight Accommodation at reduced rates (contact hotel directly)

★ ALL THE USUAL "BELLE VUE" TRADERS ★

RADIO TALK-IN ON S22 and SU22

ADMISSION £1 (OAP's 50p, under 14's free) BY RAFFLE TICKET AND EXHIBITION PLAN

Exhibition Manager: Peter Denton G6CGF 051-630-5790



Tidy up your shack

PW BINDERS

Only £3.50 each (plus
£1 p. & p. for one binder, £2 p. & p.
for two or more, UK or overseas)

Are you tired of sifting through cardboard boxes and carrier bags to find that useful item in PW?

Our **smart new style** binders, covered in blue plastics, are a must for your library, keeping your radio magazines in good condition and easily accessible.

Plus!

Tidy up those other mags too. Plain binders to take any A4 size magazines—no names, no pack drill!

HOW TO ORDER

Send a postal order, cheque or international money order with your order, stating number and type required to **PW Publishing Limited, FREEPOST, Enefco House, The Quay, Poole, Dorset BH15 1PP.** Payment by Access, Mastercard, Eurocard or Visa also accepted on telephone orders to Poole (0202) 678558. Normally despatched by return of post but please allow 28 days for delivery. Prices include VAT where appropriate.



0202 678558



(24 hour Answer Service)

PW REVIEW

The Standard C5200ED VHF/UHF Transceiver

If you're looking for the latest in dual band v.h.f./u.h.f. rigs, the Standard C5200ED reviewed here by Mike Richards, could be just what you've been waiting for.

The C5200ED from Standard is one of the latest in the continuing development of dual band f.m. rigs. The C5200ED is actually called a twin bander which is significant as it really is virtually two separate rigs in one case, the only shared component sections are the loudspeaker, microphone, logic and power supply. Although intended as a mobile rig it can be quickly detached from its mobile mount for use as a base station.

The Manual

With any complicated equipment a good manual is essential in order to obtain success quickly. The C5200ED manual comprises an A4 book containing some 41 pages of reasonable English, with a few notable exceptions, i.e. "Is not the battery consumed?"

The first section deals with the installation of the rig and covers both mobile and base station use. The text is very well supported with plenty of diagrams and they have even managed a touch of humour which makes a pleasant change. This is followed by sections covering the controls and operation of the rig and again very good use is made of diagrams. The next section is also well presented and gives a selection of operating tips including how to use repeaters.

Standard have also not forgotten to include a help section for when the rig appears to be faulty, but you are not sure if it might be something you have done. However this section has come out worst of all in the translation and may cause more confusion than it clears!

As with most Japanese rigs there is a full circuit and block diagram supplied on fold-out sheets. The print quality of these diagrams was very good and they were perfectly readable without a magnifying glass! There were even a few test voltages thrown in for good measure.



Installation

As the C5200ED is primarily intended as a mobile rig, the mounting brackets and associated hardware are very important. I'm sure that most people purchasing a sophisticated transceiver like the C5200ED would like to be able to use it both as a base station and a mobile rig. In order to achieve this, a quick release mounting bracket is required. Fortunately Standard have put quite a bit of thought into their mobile mount and it performs very well.

The C5200ED is held in place by four rubber pads which grip the outer case of the rig. To release it you simply squeeze two clips, one on each side of the mount, the pressure is released and the rig can be removed. I thought that this was a very ingenious technique and meant that there was minimal risk of scratching the outer case of the rig, which often happens with mobile mounts. In addition to this mount, there was an extra bracket supplied which is used if you want to mount the rig at an angle to a panel, as opposed to parallel to it. All the mounting brackets were very substantial, being made of 1.5mm steel and painted the same colour as the rig. Just to complete the picture they even supplied a selection of nuts and bolts along with a hexagonal wrench to tighten them!

Once the rig has been transported into the shack the next problem is usually finding a way of propping it up so that you can see the display and hear some audio (the speaker's mounted on the bottom). Again Standard have done their homework and provided a very neat wire stand that clips into the sides of the C5200ED and leaves it at an ideal angle for shack use.

Having sorted out the mount, the next stage was to connect up. As the C5200ED has a fairly hefty current demand (10.5 amps), it's best to provide separate wiring from the rig directly to the battery. The supplied 2m of power cable proved to be ideal for this and was even fitted with a 12 amp fuse in each leg. To allow the rig to be easily removed from the car a pair of insulated "bullet" connectors were used at the radio end of the lead. Although these were perfectly adequate from a current handling point of view, I would have preferred to see a dedicated plug and socket which would have been the "icing on the cake".

The antenna connection was quite simple and comprised a pair of flying leads fitted with SO-239 (UHF) sockets marked 144MHz and 432MHz. I decided to use a diplexer in conjunction with the mag-mounted dual band collinear for my installation.

Practical Wireless, February 1989

The only other connection you may need is for an external speaker. I must admit I didn't find a need for an external speaker, as the sound quality and volume from the internal unit was perfectly adequate. If you do feel the need for an external speaker though, there are two sockets on the rear panel which are wired to give some very clever combinations. If you plug an external speaker in the 144MHz socket then, as you would expect, 144MHz signals are heard via this speaker but 423MHz signals are still heard via the internal speaker. If, on the other hand, you plug the speaker in the 432MHz socket, the internal speaker is disabled and signals from both bands use the external speaker. Are you confused yet! Finally, if you connect two external speakers, one to the 144MHz socket and the other to the 432MHz socket, then only 144MHz signals are heard on the 144MHz speaker and vice versa! I think someone at Standard must have sat down for quite some time to work that lot out.

The CMP838 hand microphone was supplied with the rig and this was fitted with a novel bracket which could be reversed to give a large or small ring. The large ring was ideally dimensioned to fit over a cigar lighter which was really quite convenient. Personally though, I don't like using hand held mics in the car and would normally use a headset for hands free operation.

Controls and Display

The controls are generally well laid out though some are a bit fiddly for mobile use, but more of that later. As I mentioned at the start of the review the C5200ED is a true twin bander and as such there are separate volume and squelch controls for each band. These are the conventional concentric controls with volume and squelch for 144MHz on the left hand side of the front panel and 432MHz on the right. The main tuning control is a 20mm knob on the left of the front panel which has twenty steps to its movement. Mounted concentrically with the tuning knob is a switch which defines the effect of the tuning knob, i.e. normal tuning, fast tuning or memory tuning.

The remaining controls are all push buttons with all but two positioned directly underneath the main display. The two exceptions are the low power/

audio mute buttons which are located next to the volume control for each band. To help minimise the number of controls, whilst maintaining the maximum number of features, many of the buttons have dual functions. The secondary function is obtained by pressing a button marked SP first.

One criticism I have concerns the CALL button which appears on the front panel and the microphone, unfortunately these two buttons have totally different effects. The CALL button on the front panel puts the rig into transmit and sends a 1750Hz repeater access tone, whilst the CALL button on the microphone recalls a memory! I think one of these needs to be renamed to overcome this unnecessary confusion.

The fluorescent display is quite rightly the centre piece of the C5200ED and contains a wealth of useful information. Being a twin bander the display is actually split in two with 144MHz information on the left and 432MHz on the right. The range of information shown on the display is identical for each band, which successfully overcomes the problems associated with dual band rigs using shared displays.

In addition to the frequency, each half of the display has its own S-meter along with a variety of letter indicators to show what options have been selected. One special indication is a red box marked MAIN, this shows which band is currently selected. This is necessary as despite the C5200ED's flexibility you can only transmit on one band at a time and the MAIN indicator shows what band will respond to the p.t.t. Although the display characters were quite small, the result was very clear. One problem that often shows up under mobile conditions is that if the display is bright enough to be read in sunlight it is too bright for night use. This is not a problem with the C5200ED as the display can easily be dimmed if required.

Circuit Description

The C5200ED is far too complicated for me to give a full description here but it is appropriate to outline the important points.

Starting with the u.h.f. section, the antenna is fed via a diode change-over switch and band-pass filter to the first of two r.f. amplifiers. The first r.f.

amplifier uses a dual-gate m.o.s.f.e.t., and the second a junction f.e.t. After the r.f. amplifiers, the first mixer produces an i.f. of 21.8MHz, which is where the main filtering is carried out. After amplification, this is fed to a dedicated n.b.f.m. integrated circuit where the signal is amplified, filtered and demodulated. This dedicated i.c. (TK10420M) also controlled the squelch operation which, in the review model, was excellent. I'm sure you have noticed that most rigs give out a fairly loud burst of noise when the squelch closes at the end of a transmission. Not so with the C5200ED, the noise burst has been reduced to the point where it is hardly noticeable. The recovered audio is finally amplified by a μ PC2002H, before passing to the speaker.

The transmit side starts, fairly obviously, with a microphone pre-amplifier, which is used to produce f.m. by modulating the main carrier v.c.o. This is somewhat unusual as the majority of modern rigs actually use phase modulation as opposed to the true f.m. used here. One other point is that when in transmit this v.c.o. generates the final carrier frequency, so there are no mixer stages in the transmit chain. Final amplification to 40/50W is achieved using the seemingly standard hybrid p.a. module.

The v.h.f. section is entirely separate, but very similar to the u.h.f. section. The main difference is that one r.f. amplifier is employed and the first i.f. is 10.7MHz.

The only common sections in the C5200ED are the power supply and the microprocessor. Even so, the latter can control the two bands independently. All variable frequency generation is achieved using v.c.o.s and p.l.l.s under the control of the microprocessor.

The C5200ED makes extensive use of voltage regulators to tame the raw vehicle power supply. Another good feature from the reliability point of view is that there are no relay contacts in the C5200ED, with diode switches being used instead.

With 40/50W of power available, the p.a. stages are obviously going to get rather warm, especially in a mobile environment with very little ventilation. To overcome this, the C5200ED is fitted with a miniature fan which is used to circulate air directly over the main cooling fins. As cars can be notorious for the amount of dust, the

★ SPECIFICATION

Frequency range: 144MHz to 147.995MHz
430MHz to 439.995MHz

Modulation: F3

Supply voltage: 13.8 V d.c. \pm 15%

Current consumption: 10.5A @ 50 watts
9.5A @ 40 watts
3.5A @ 5 watts
600mA receive

Sensitivity: 0.158 μ V for 12dB SINAD

Selectivity: 12kHz @ -6dB
24kHz @ -60dB

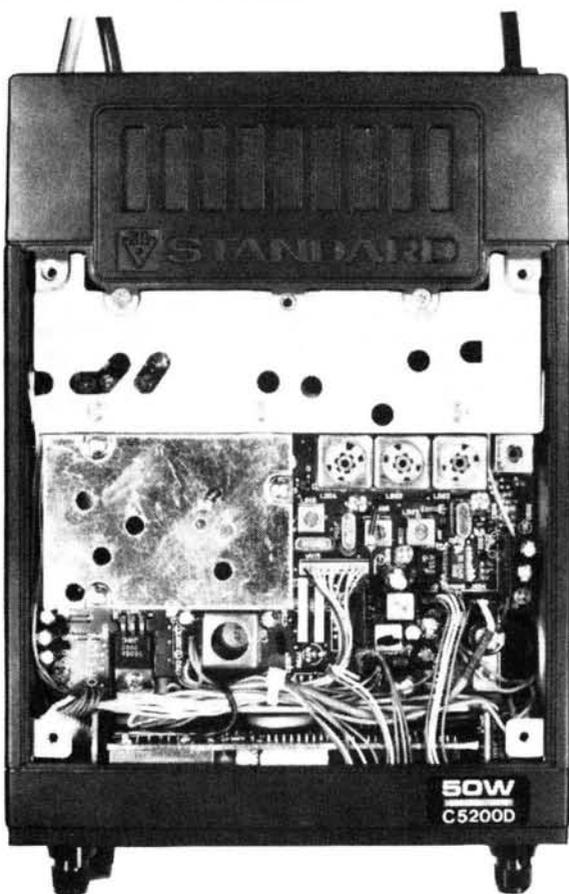
Audio output: 3 watts

RF power output: 50 watts 144MHz
40 watts 432MHz

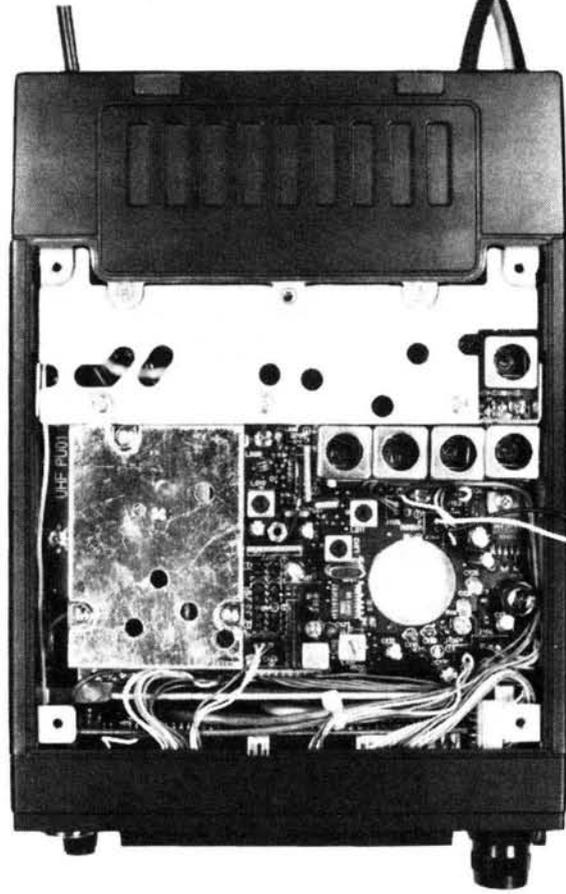
Spurious outputs: -60dB

Dimensions: 150Wx50Hx205D mm

Weight: 2.0kg



Left and right internal views of the C5200



air input to the cooling fan is fitted with a filter to stop the rig getting clogged up with dust. Although this is a good feature, it only stays that way if you remember to unplug the filter from time to time.

Operation

Whilst the rig was on review, I had plenty of chances to try it out both mobile and in the shack. I found that the tuning control on the rig had both good and bad points. First the bad, it had a rather unusual "springy" feel which wasn't positive enough for me—although I imagine you would get used to it in time. The good points were the tuning rates available, the channel steps could be set to one of five options between 5kHz and 25kHz. Additionally you could change this to 100kHz or 1MHz per step just by moving a small switch. This was great for moving around the band quickly—especially under mobile operation. You could also tune the C5200ED by using the UP and DOWN buttons on the microphone.

One other interesting tuning mode which really demonstrated the C5200ED's capabilities was the SUB-band mode. This is activated by pressing the SUB button on the front panel whereupon a flashing SUB appears on the display. Whilst this is flashing you can alter the frequency of the unselected band. This may seem a bit of an odd facility at first, but I found that it was great when you wanted to QSY between bands. I was able to successfully search 432MHz for a free channel whilst still transmitting on 144MHz which I think is pretty impressive!

To begin with I found the memory operation of the C5200ED a little

confusing. There are ten independent memories for each of the two bands, each one retains the frequency and any repeater shift necessary. The thing I found confusing was having to remember to operate the small switch on the edge of the tuning control. This takes you in and out of the memory functions and to store a frequency you have to move this switch twice. After a few frequencies had been stored the confusion disappeared and I got used to it.

As you tune through the memories, the frequency stored is displayed as well as the letter M. If you tune through an empty memory channel the display reverts to the v.f.o. frequency and the letter M flashes to let you know this channel is empty. This is very useful as it helps prevent you overwriting any memories you particularly want to keep. There's a lithium battery in the C5200ED which maintains the memory contents when the power supply is disconnected.

In addition to the basic memories there are two others, CALL and RMR (repeater memory). The CALL memory can only be recalled by pressing the CALL button on the microphone and I found it very useful for storing the calling channel, i.e. S20 on 145.5MHz, particularly when operating mobile. The RMR memory is slightly different in that it is recalled by pressing the RMR button on the front panel. As the name suggests its intended use is to hold a repeater frequency and again was particularly useful when operating mobile. By the way, these two memories can hold a different frequency for each band.

Another very useful facility is the REV button which allows you to reverse the transmit and receive repeater frequencies, ideal for when you want to

check the input signal to see if you could operate simplex. This button has a toggle action, i.e. the first press reverses the frequencies and the second restores them to normal.

Whilst on the subject of repeaters the microprocessor logic has been set up so that it is impossible to transmit accidentally out-of-band, which is quite easy to do if you operate below say 145MHz with a -600kHz repeater shift!

You have probably gathered by now that this rig is ideally suited to anyone with a split personality. One of the initial problems I had, particularly when monitoring a 144MHz and 432MHz repeater, was trying to work out which station I was actually listening to, as both signals appear from the same speaker. Yet again Standard have thought of this problem and have provided a selectable audio mute facility. This can be set-up on either of the two bands and means that the band of your choice becomes the dominant one and any transmission on that band mutes the audio from the other.

Back in the car, mobile operation was very successful once I became familiar with the layout and general operation. The hefty output of 40/50 watts was particularly useful under mobile conditions, but of course high output power is of little use if the receiver cannot match it in terms of sensitivity. I found that the receive performance was very good indeed and I didn't suffer any problems working simplex or repeater QSOs. I did have a few problems in the car at night as, despite the excellent display illumination, the small mode buttons were not at all easy to identify. Having said that though I'm sure you would soon learn how to find them given time. 42 ►

New REALISTIC® PORTABLE SCANNING RECEIVER

- Frequency Synthesized - No Crystals To Buy
- 68-88 MHz VHF-Lo
- 108-136 MHz (AM) Aircraft
- 136.005-174 MHz VHF-Hi
- 380-512 MHz UHF
- 806-960 MHz

Realistic Pro-34. Catch all the action on this hand-held programmable scanner. Features extended frequency coverage, including the new 800 MHz band! Scan up to 200 channels in 10 bands or search for new bands. Store frequencies in a special monitor band for one-key transfer to permanent memory. Lock-out key temporarily bypasses unwanted channels.

The Key To Better Listening

Also features large LCD display showing channels and frequencies being scanned, monitored or programmed and has a switchable backlight for night viewing. Squelch control, built-in speaker, 1/8" earphone socket, flexible aerial and belt-clip. Includes BNC jack for adding external aerial.

Tandy®

Tune in to Tandy TODAY!

Over 400 Stores
And Dealers Nationwide
Prices may vary at Dealers. Offers subject to availability.
Tandy, Tandy Centre, Leamore Lane,
Walsall, West Midlands. WS2 7PS



Realistic PRO-34 £249.95.
Cat. No. 20-9135

The British ATV Crowd Invade Dayton

The USA was "found" by Christopher Columbus in 1492: for the BATC this discovery came a little later. For a while the club had been thinking of ways of expanding the membership. It occurred to the giant brains of the club that North America was a huge area populated (among others) by ATVers who spoke and could read English. Sure, they were already served by *Spec-Com* magazine and the US ATV Society, but their appetite for things ATV might be big enough to stomach a bit more besides. We already had a handful of members in the States and Canada and had advertised the club in *Spec-Com*, but there was nothing like taking the product to the market for stimulating volume sales.

And so it came to pass that Trevor Brown G8CJS and Andy Emmerson G8PTH were despatched to the 1988 Dayton Hamvention to drum up a little business. The club would make a contribution to travel expenses and, very conveniently, we could share a stand with Sue and Don Miller (Wyman Research). They were long-term BATC members and had just offered to act as American representatives for the club. To add to the fun, Steve Mitchell G8JMJ decided he would take his family over to the States at the same time and would give us a hand on the stand. All the omens were fine . . .

To Business

To justify our trip we had to publicise the BATC and we did this from the safe base of the Wyman Research stand. The visiting BATC sales team numbered four in all: G8CJS, G8JMJ, G8PTH and, surprise, surprise—Michael Sheffield ZL1ABS had made the trip all the way from New Zealand, giving the BATC a formidable presence.

Don Miller W9NTP and his wife Sue W9YL made us very welcome on the stand (booth if you're American) and helped us sell BATC books and sign up new members. In turn we helped them sell the various v.h.f. and u.h.f. equipment they dealt in, including some Wood & Douglas gear.

Our stand, by the way, was not too distant from some familiar names—LMW Electronics and Microwave Modules were there doing business, and I believe the G-QRP Club were around somewhere. Also not far away was BATC member Tom W6ORG using a hand-portable TV camera and

Andy Emmerson G8PTH and Trevor Brown G8CJS tell us what happened when the BATC (British Amateur Television Club) went to the Dayton Rally in 1988.

430MHz band ATV rig (Kreepie-Pee-pee, to use the vernacular) to send pictures of Don's stand back to his own. This may have been industrial espionage at work, because both these well-known ATVers run rival ATV companies (Wyman Research and PC Electronics).

Another essential part of the three day event was talking. Tom W6ORG had thoughtfully got us onto the official Dayton lecture timetable and we were able to present a resumé of ATV operation in Europe. The lecture timetable is perhaps an understatement: there were several streams of lectures going on simultaneously and just for the ATV mode there was a whole afternoon of information. Too bad if you wanted to listen to packet or RTTY people as well!

Tom W6ORG from LA—"the smog capital of the world"—explained that the unhealthy atmosphere there had

one advantage, at least for ATVers. The virtually permanent smog created an inversion layer, which gave daily ducting. Image that—tropo DX every day! He also explained that NASA (and the FCC—Federal Communications Commission) had given the ATV community blanket permission to re-transmit video from the Space Shuttle. ATV took a high profile in his part of the world, assisting a lot of public service and emergency communications work, this helped ATV achieve a positive and good public image.

Bill Brown WB8ELK described his exploits with an ATV beacon sent aloft in a weather balloon. By studying wind speeds and directions he determined the best time to launch the balloon. Having planned the "expedition" down to the last degree he was rewarded by amazing success. The 1W video transmitter was seen 500km away, while the 100mW 144MHz audio beacon was heard in two places 645km distant. His project is a balloon which would stay in earth orbit for two years—or until someone shot it down!

Steve Goode distributed copies of a very detailed study of the possibilities for ATV on the next Space Shuttle flight. Very detailed calculations showed that many options were open and that uplink and downlinking on the 430MHz band a.m. were quite feasible.

That was the official lecture stream in the Hamvention site proper; it is also the custom for speciality modes to have their own shows in local hotels. Mike Stone W8OQCD, publisher of *Spec-Com* magazine, did the business in the Ramada Inn North. Not only did he lay on two nights of ATV chat, there were book sales, as much beer as you could drink and a glamour show thrown in! Admission was one dollar and the drink was at cost price, too. He really put himself out to make sure everyone had a good time. He had also booked rooms for us to sleep in this hotel. The rooms were next-door to the ATV session—clearly Mike didn't intend us to miss anything!

SSTV

Not to be outdone, the slow-scanners had their own "do" in the Holiday Inn on Friday night, and to do justice to both modes we agreed to split forces. Trevor covered the SSTV meeting and Andy the fast-scan workshop. Friday, April 29 was the evening when all the

Practical Wireless, February 1989



The BATC was domiciled on the Wyman Research stand. Here Don Miller W9NTP gives the sales patter while Sue W9YL checks out the sale price list

top SSTV operators met, including HB9ANT who must be the only person to come further than me (Trevor) to this gathering.

Formal lectures started with a discussion of the Martin Emmerson G3OQD ROM (no, he's not a relation). This software extends the Robot 1200C's capabilities by interfacing an Atari mouse and providing on-screen drawing facilities. The G3OQD software also allows the Robot to run the European standard line or frame sequential colour, without which it would not be possible to interchange colour pictures with the Volker Wraase screen converter.

Don Miller W9NTP then gave a short lecture on possible future developments in the field of SSTV. Main topics were the idea of replacing lines lost in QRM and sound-in-picture systems. Tom Hibben KB9MC and Steve Cupp N9NCT demonstrated the use of a Commodore 128 to control a Robot 1200C. The hardware is available from Robot and the software is written in BASIC. The results are a very flexible SSTV system with full digital effects and picture manipulation, coupled with disk storage of pictures.

The coffee break is always my favourite spot, where one can give and receive feedback. I managed to come away from this with some very clever 3-D SSTV pictures (screen shots) which needed to be viewed through red and blue glasses. The results were excellent and apparently the work of Clay Abrams K6AEP. W8ASF presented a video tape demonstration of the Australian LM900 in action. This scan converter appears so similar to a Robot I am surprised they are not fighting it out in the high court.

Video Phone

The next demonstration was by Mitsubishi of their video phone. This small unit connects to any phone in the world and sends a 96×96 pixel picture using 32 levels of grey. The unit is self-contained with its own built-in TV camera and a fast-scan display to compose your image on. The transmission time is 5.5 seconds and uses an a.m. system. As yet, there appears to be no standard for this kind of equipment (it's coming—G8PTH) and none of this equipment is compatible across manufacturers.

I (G8CJS) could not let the evening pass without a turn at the lectern. I introduced the *Slow Scan Companion*, explained the projects and outlined some of the chapters. I knew this was a smart crowd and they bought lots of books—lucky I had taken a plentiful supply. It was past midnight when the meeting closed and I left for the Ramada Inn and a few ZZZZZs. But, as I thought, the fast scanners had more staying power, their meeting was still going strong and another three hours passed before I managed to power down for the evening!

Practical Wireless, February 1989



Don's ATV shack is well-equipped by any standard. He works fast, medium and slow-scan with a Red Indian skull as the station mascot. Both he and his wife are keen archaeologists

Flashing back a few hours to 4pm, Friday's FSTV session opened and was scheduled to finish at 11.30pm (actual finish 2am and then more eating, drinking and talking); Saturday's started an hour later (and finished an hour later, at 3am). Apart from the fashion show, there were talks by BATC members, technical lectures, heated arguments (sorry, discussions) over "future mode" versus "ancient modulation" and lots of video replays. Mike made the annual "Good Image" presentation to the amateur who had made the best contribution to raising the profile of ATV. The trophy is a camera tube (image orthicon actually) on a polished wooden base, with engraved plaque: it was won by Bill WB8ELK for his signal success with the weather balloon TV experiment.

Incidental Intelligence

In the Flea Market it was a pleasure to meet two of our American members, John KD0LO and Dave WB0ZJP. Dave is the one who produced the ATV picture reporting chart that we all have hanging up in our shacks. Like most of us, he has changed, so perhaps Dave it's time to remake the chart so we can all recognise you. How about a chart of f.m. while you're about it?

We picked up a lot of interesting info about practical ATV operation in the States. In the midwest the terrain is very flat, which means that what we might consider DX on the 430MHz band is a daily occurrence—certainly 160km is not difficult under flat conditions. During openings, hook-ups over 645km have been made, even 930km with P3 pictures. There is less (TV) activity on the 1296MHz band, though there are 225 aircraft radars across the States which share the band. Dave WB0ZJP and John KD0LO said they had had some fun with one of these radars in St. Louis, Missouri. It oper-

ates alternately on 1297 and 1303MHz and the receiver tracks the magnetron (which is apt to drift) with a 12MHz wide receive window. Apparently Dave and John were causing the radar people no little worry until they found out about ATV; apparently the ATV signal appeared on the radar screens as a wedge of blips, looking exactly like a dozen 747s coming right at them!

This duo also had some fun on 2305MHz ATV. They were troubled by an annoying 60Hz hum bar on pictures, which irritated this pair of technical perfectionists. Dave tore apart his power supply, transmitter and camera looking for the cause, while John checked out his receiver. No fault was found and it was driving them crazy! The cause suddenly came to light when John's wife put the baby's bottle in the microwave oven to heat it up . . . bang, terrific QRM. The source of the "mains hum" was out-of-band radiation from microwave ovens: apparently the effect is chronic at supper time, the only safe time to play microwave ATV is after 2am, unless someone is suffering from night starvation and gets up for a midnight snack, that is.

Was it all worth it? Of course it was! As far as the visit was concerned, we would rate it extremely successful in terms of cementing international relations, in making an impact on our potential North American market and promoting our style of amateur television. The only snag is that we all want to go back there next year—and how on earth can we afford it? **PW**

BATC membership details from D Lawton GOANO, Grenehurst, Pinewood Road, High Wycombe, Bucks HP12 4DD. Please include an s.a.e.

**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.

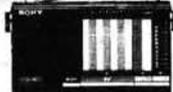
Tru-Fi Sound & Vision, 10 Church Street, Leatherhead, Surrey.

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

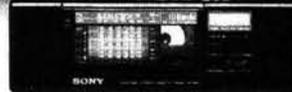
Weybridge Audio, 5/6 Waterloo Terrace, Baker Street, Weybridge, Surrey.



ICF SW1



ICF 5100



WA 8000



ICF 2001D

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 1OE.

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.

Clearstone Ltd., Manchester Sony Centre, 65/68 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 Rawlinton 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, Bridgford, Mid. Glamorgan CF31 1DD.

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

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

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

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

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

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



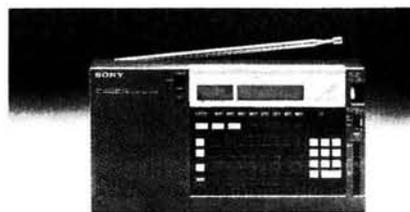
00A



ICF 7601L



ICF 7600DS



ICF 20010



0202 678558

Practical Wireless

0202 678558 

BOOK SERVICE

The books listed have been selected as being of special interest to our readers. They are supplied from our editorial address direct to your door. Some titles are overseas in origin.

HOW TO ORDER

Add 75p per order postage (overseas readers add £1.50 for surface mail postage) and send a postal order, cheque or international money order with your order (quoting book titles and quantities) to **PW Publishing Limited, FREEPOST, Enefco House, The Quay, Poole, Dorset BH15 1PP**. Payment by Access, Mastercard, Eurocard or Visa also accepted on telephone orders to Poole (0202) 678558. Books normally despatched by return of post but please allow 28 days for delivery.

★ A recent addition to our Book Service. O/P = Out of print, O/S = Out of stock.

RADIO

AIR & METEO CODE MANUAL

Joerg Klingenfuss 10th edition
Contains detailed description of the World Meteorological Organisation Global Telecommunication System operating FAX and RTTY meteo stations, and of its message format with decoding examples. Also contains detailed description of the Aeronautical Fixed Telecommunication Network amongst others. 293 pages £14.00

BETTER RADIO/TV RECEPTION

A. Nallawalla, A. T. Cushen and B. D. Clark
An Australian publication giving guidance and advice both to listeners seeking reliable reception of some distant radio station, and to DX listening hobbyists. 134 pages £9.95

BETTER SHORTWAVE RECEPTION (USA)

W. S. Orr W6SAI & S. D. Cowan W2LX
Receivers, antennas, propagation, DX listening techniques for the short waves and v.h.f. 158 pages £5.50

★ PASSPORT TO WORLD BAND RADIO 1989

This book gives you the information you need to explore and enjoy the world of broadcast band listening. It includes features on different international radio stations, receiver reviews and advice as well as the hours and language of broadcast stations by frequency. 416 pages £12.95

SCANNERS (updated)

Peter Rouse GU1DKD
A guide for users of scanning receivers, covering hardware, antennas, accessories, frequency allocations and operating procedure. 177 pages £7.95

SCANNERS 2

Peter Rouse GU1DKD
The companion to Scanners, this provides even more information on the use of v.h.f. and u.h.f. communications band and gives constructional details for accessories to improve the performance of scanning equipment. 216 pages £9.95

SHORT WAVE RADIO LISTENERS' HANDBOOK

Arthur Miller
In easy-to-read and non-technical language, the author guides the reader through the mysteries of amateur, broadcast and CB transmissions. 207 pages £6.99

RADIOTELETYPE CODE MANUAL

10th Edition
Joerg Klingenfuss
This book provides detailed descriptions of the characteristics of telegraph transmission on short waves, with all commercial modulation types including voice frequency telegraphy. It provides comprehensive information on all RTTY systems and c.w. alphabets. 96 pages £8.00

THE SATELLITE EXPERIMENTER'S HANDBOOK (USA)

A guide to understanding and using amateur radio, weather and TV broadcast satellites. 207 pages £9.25

BEGINNERS

AN INTRODUCTION TO RADIO DXING (BP91)

R. A. Panfold
How to find a particular station, country or type of broadcast and to receive it as clearly as possible. 112 pages £1.95

BEGINNER'S GUIDE TO RADIO (9th Edition)

Gordon J. King
Radio signals, transmitters, receivers, antennas, components, valves and semiconductors, CB and amateur radio are all dealt with here. 266 pages £6.95

BEGINNER'S GUIDE TO ELECTRONICS

Owen Bishop
For youngsters thinking of a career in electronics; theory and applications in computers, radio, TV, recording, medical and industrial electronics. 240 pages £5.95

ELECTRONICS SIMPLIFIED—CRYSTAL SET CONSTRUCTION (BP92)

F. A. Wilson
This is a book especially written for those who wish to

take part in basic radio building. All the crystal sets in the book are from old designs but updated to take account of modern components. 72 pages £1.75

QUESTIONS & ANSWERS RADIO

Eugene Trundle
Basics of electrical theory, radio and semiconductors, receivers, amateur and CB radio, and test equipment. 110 pages £3.95

THE SIMPLE ELECTRONIC CIRCUIT AND COMPONENTS Book 1 (BP62)

The aim of this book is to provide an inexpensive but comprehensive introduction to modern electronics. 209 pages £3.50

TELEVISION

AN INTRODUCTION TO SATELLITE TELEVISION (BP195)

F. A. Wilson
Answers all kinds of questions about satellite television. For the beginner thinking about hiring or purchasing a satellite TV system there are details to help you along. For the engineer there are technical details including calculations, formulae and tables. Plenty of advice for the d.i.y. enthusiast. 104 pages £5.95

A TV-DXERS HANDBOOK (BP176)

R. Bunney
Information on transmission standards, propagation, receivers including multi-standard, colour, satellites, antennas, photography, station identification, interference, etc. Revised and updated 1986. 87 pages £5.95

SATELLITE TELEVISION

Peter S. Pearson
How satellite TV works, setting up your own TVRO terminal, the costs, the programmes available. 72 pages £4.95

GUIDE TO WORLD-WIDE TELEVISION TEST CARDS

Edition 2
Keith Hamer and Garry Smith
The main purpose of this book is to assist long distance television enthusiasts (TV DXers) around the world with signal identification. There are 240 test cards, identification slides and clock captions pictured. It is in "semi-alphabetical" order, that is the stations are in alphabetical order in their geographical sections. 52 pages O/P

THEORY

COMMUNICATION (BP89)

(Elements of Electronics—Book 5)
F. A. Wilson
Fundamentals of line, microwave, submarine, satellite, digital multiplex, radio and telegraphy systems are covered, without the more complicated theory or mathematics. 256 pages £2.95

FOUNDATIONS OF WIRELESS AND ELECTRONICS (10th Edition)

M. G. Scroggie and S. W. Amos
Covering d.c. and a.c. circuits, L, C, tuned circuits and selectivity, valves, semiconductors, transmission lines, antennas, radiation, oscillation, modulation, detection, amplification, superhet receivers, c.r.t.s, waveform generators and switches, computers and power supplies. 551 pages O/P

LEVEL II RADIO & ELECTRONICS THEORY

Ian Ridpath ZL1BCG
A sequel to Amateur Radio & Electronics Study Course, this book covers advanced theory up to a level needed on most technician courses. The handwritten format is designed to make the student feel as though the pages are his own notes. 169 pages £6.70

PRACTICAL ELECTRONICS CALCULATIONS AND FORMULAE (BP53)

F. A. Wilson
This has been written as a workshop manual for the electronics enthusiast. There is a strong practical bias and higher mathematics have been avoided where possible. 249 pages £3.95

SOLID STATE DESIGN FOR THE RADIO AMATEUR

Wes Hayward W7ZOI and Doug DeMaw W1FB
Back in print by popular demand! A revised and corrected edition of this useful reference book covering all aspects of solid-state design. 256 pages £10.95

LISTENING GUIDES

AIR BAND RADIO HANDBOOK

David J. Smith
With air band radio you can eavesdrop on the conversations between aircraft and those on the ground who control them. The author, an air traffic controller, explains more about this listening hobby. 174 pages £5.99.

DIAL SEARCH (5th Edition 1988/89)

George Wilcox
The listener's check list and guide to European broadcasting. Covers medium wave, long wave, v.h.f. and short wave, including two special maps, making the most of your portable and many more. 46 pages £3.25

AIR TRAFFIC CONTROL

David Adair
A guide to air traffic control with maps, drawings and photographs explaining how aircraft are guided through crowded airspace. 176 pages £6.99

GUIDE TO BROADCASTING STATIONS

19th Edition (1987/88)
Philip Darrington
Frequency and station data, receivers, antennas, Latin American DXing, reporting, computers in radio, etc. 240 pages £6.95

GUIDE TO FACSIMILE STATIONS

8th Edition
Joerg Klingenfuss
This manual is the basic reference book for everyone interested in FAX. Frequency, call sign, name of the station, ITU country/geographical symbol, technical parameters of the emission are all listed. All frequencies have been measured to the nearest 100Hz. 262 pages £12.00

GUIDE TO FORMER UTILITY TRANSMISSIONS

3rd Edition
Joerg Klingenfuss
This manual is built on continuous monitoring of the radio spectrum from the sixties until the recent past. It is a useful summary of former activities of utility stations and provides information to the active radio monitor in the classification and identification of radio signals. 126 pages £8.00

GUIDE TO UTILITY STATIONS

7th Edition
Joerg Klingenfuss
This book covers the complete short wave range from 3 to 30MHz plus the adjacent frequency bands from 0 to 150kHz and from 1.6 to 3MHz. It includes details on all types of utility stations including FAX and RTTY. There are 15802 entries in the frequency list and 3123 in the alphabetical call sign list plus press services and meteorological stations. 494 pages £19.00

HF OCEANIC AIRBAND COMMUNICATIONS (3rd Edn.)

Bill Laver
Aircraft channels by frequency and band, main ground radio stations, European R/T networks, North Atlantic control frequencies. 29 pages £3.50

INTERNATIONAL RADIO STATIONS GUIDE (BP255)

Updated and completely re-written in June 1988. It provides the casual listener and DXer with an essential reference work designed to guide them around the ever more complex radio bands. 312 pages £4.95

THE COMPLETE VHF/UHF FREQUENCY GUIDE

Updated 1988
This book gives details of frequencies from 26-2250MHz with no gaps and who uses what. Recently updated, there are chapters on equipment requirements as well as antennas, etc. 88 pages £5.95

THE INTERNATIONAL VHF FM GUIDE

7th Edition
Julian Baldwin G3UHK & Kris Partridge G8AUU
The latest edition of this useful book gives concise details of repeaters and beacons worldwide plus coverage maps and further information on UK repeaters. 70 pages £2.85

THE POCKET GUIDE TO RTTY AND FAX STATIONS

Bill Laver
A handy reference book listing RTTY and FAX stations, together with modes and other essential information. The listing is in ascending frequency order, from 1.6 to 27.1MHz. 46 pages £2.95

UK LISTENERS CONFIDENTIAL FREQUENCY LIST (5th Edition)

Bill Laver

Covering the services and transmission modes that can be heard on the bands between 1.635 and 29.7MHz. 147 pages £6.95

VHF/UHF AIRBAND FREQUENCY GUIDE (Second edition)

A complete guide to the airband frequencies including how to receive the signals, the frequencies and services, VOLMET and much more about the interesting subject of airband radio. 74 pages. £5.95

WORLD RADIO TV HANDBOOK 1988

Country-by-country listings of long, medium and short wave broadcasters and TV stations. Receiver test reports. English language broadcasts. The s.w.l.'s "bible". 576 pages O/P

INTERFERENCE

INTERFERENCE HANDBOOK (USA)

William R. Nelson WA6FQG

How to locate and cure r.f.i. for radio amateurs, CBers and TV and stereo owners. 253 pages £6.75

RADIO FREQUENCY INTERFERENCE (USA)

What causes r.f.i.? Are all r.f.i. problems difficult, expensive and time-consuming to cure? These questions and many more are answered in this book. 84 pages £4.30

TELEVISION INTERFERENCE MANUAL (RSGB)

B. Priestley

TV channels and systems, spurious-radiation TVI, strong-signal TVI, audio breakthrough, transmitter design. 78 pages £2.94

AMATEUR RADIO

AMATEUR RADIO CALL BOOK (RSGB)

Winter 87/88 Edition

This useful work now incorporates a 48-page reference section of useful information for amateur radio enthusiasts. 310 pages O/P

AMATEUR RADIO LOGBOOK

Standard logbook for the transmitting amateur in horizontal A4 format. 25 lines per page. 96 pages £2.30

AMATEUR RADIO OPERATING MANUAL (RSGB)

A mine of information on just about every aspect of amateur operating, including international call sign series holders, prefix lists, DXCC countries list, etc. 204 pages £6.16

AMATEUR RADIO SATELLITES the first 25 years

Arthur C. Gee G2UK

The material in this souvenir publication is drawn from the author's archives. It is mainly a pictorial account on the pattern of developments which have occurred over the last 25 years. 34 pages £2.25

CARE AND FEEDING OF POWER GRID TUBES (USA)

This handbook analyses the operation of EIMAC power grid valves and provides design and application information to assist the user of these valves. 156 pages £6.75

PRACTICAL IDEAS FOR RADIO AMATEURS

Ian Poole G3YWX

Offers a wealth of hints, tips and general practical advice for all transmitting amateurs and short wave listeners. 128 pages £5.95

PASSPORT TO AMATEUR RADIO

Reprinted from PW 1981-1982

The famous series by GW3JGA, used by thousands of successful RAE candidates as an aid to their studies. Plus other useful articles for students of amateur radio. 96 pages £1.50

QUESTIONS & ANSWERS

AMATEUR RADIO

F. C. Judd G2BCX

What is amateur radio? The Radio Amateurs' Exam and Licence. The technology, equipment, antennas, operating procedure and codes used by amateurs. 122 pages £3.95

RADIO AMATEUR'S GUIDE

RADIO WAVE PROPAGATION

(HF Bands)

F. C. Judd G2BCX

The how and why of the mechanism and variations of propagation in the h.f. bands. 144 pages £8.95

RADIO AMATEUR'S MAP OF

NORTH AMERICA (USA)

Shows radio amateur prefix boundaries, continental boundaries and zone boundaries. 760 x 636mm £2.50

RADIO AMATEUR'S

PREFIX MAP OF THE WORLD (USA)

Showing prefixes and countries, plus listings by order of country and of prefix. 1014 x 711mm £2.95

RADIO AMATEUR'S WORLD ATLAS (USA)

17 pages of maps, including the world-polar projection. Also includes the table of allocation of international call sign series. £3.50

THE RADIO AMATEUR'S DX GUIDE (USA)

15th Edition

The guide contains information not easily obtained elsewhere and is intended as an aid and quick reference for all radio amateurs interested in DX. 38 pages. £2.95

THE RADIO AMATEUR'S QUESTIONS & ANSWER REFERENCE MANUAL 3rd Edition

R.E.G. Petri G8CCJ

This book has been compiled especially for students of the City and Guilds of London Institute RAE. It is structured, with carefully selected multiple choice questions, to progress with any recognised course of instruction, although it is not intended as a text book. 258 pages £6.95

THE 1988 ARRL HANDBOOK FOR THE RADIO AMATEUR

This, the sixty-fifth edition is available only in hardback, the first time the ARRL have done this. New construction projects are the theme of this edition, there is a deluxe memory keyer, receiver projects, a linear QSK converter, a low-powered balanced Transmatch and a d.t.m.f. decoder. Updated every year, this provides useful reference material for the radio amateur. It also includes 18 pages of p.c.b. track pattern for you to build your own boards. 1157 pages O/P

VHF HANDBOOK FOR RADIO AMATEURS (USA)

H. S. Brier W9EGQ & W. I. Orr W6SAI

VHF/UHF propagation, including moonbounce and satellite, equipment and antennas. 335 pages £7.95

VHF/UHF MANUAL (RSGB)

G. R. Jessop G6JP

Theory and practice of amateur radio reception and transmission, between 30MHz and 24GHz. 520 pages £7.95

DATA & REFERENCE

DIGITAL IC EQUIVALENTS AND PIN CONNECTIONS (BP140)

A. Michaels

Equivalents and pin connections of a popular selection of European, American and Japanese digital i.c.s. 256 pages £5.95

INTERNATIONAL DIODE EQUIVALENTS GUIDE (BP108)

A. Michaels

Possible substitutes for a large selection of many different types of semiconductor diodes. 144 pages £2.25

INTERNATIONAL TRANSISTOR EQUIVALENTS GUIDE (BP85)

A. Michaels

Possible substitutes for a popular selection of European, American and Japanese transistors. 320 pages £3.50

LINEAR IC EQUIVALENTS AND PIN CONNECTIONS (BP141)

A. Michaels

Equivalents and pin connections of a popular selection of European, American and Japanese linear i.c.s. 320 pages £5.95

NEWNES AUDIO & HI-FI ENGINEER'S POCKET BOOK

Vivian Capel

This is a concise collection of practical and relevant data for anyone working on sound systems. The topics covered include microphones, gramophones, CDs to name a few. 190 pages Hardback £9.95

NEWNES COMPUTER ENGINEER'S POCKET BOOK

This is an invaluable compendium of facts, figures, circuits and data and is indispensable to the designer, student, service engineer and all those interested in computer and microprocessor systems. 203 pages Hardback £8.95

NEWNES ELECTRONICS POCKET BOOK

5th Edition

Presenting all aspects of electronics in a readable and largely non-mathematical form for both the enthusiast and the professional engineer. 315 pages Hardback £8.95

NEWNES RADIO AMATEUR AND LISTENER'S POCKET BOOK

Steve Money G3FZX

This book is a collection of useful and intriguing data for the traditional and modern radio amateur as well as the short wave listener. Topics such as AMTOR, packet radio, SSTV, computer communications, airband and maritime communications are all covered. 160 pages Hardback £8.95

NEWNES RADIO AND ELECTRONICS ENGINEER'S POCKET BOOK

(17th Edition)

Keith Brindley

Useful data covering maths, abbreviations, codes, symbols, frequency bands/allocations, UK broadcasting stations, semiconductors, components, etc. 201 pages Hardback £6.95

NEWNES TELEVISION AND VIDEO ENGINEER'S POCKET BOOK

Eugene Trundle

This is a valuable reference source for practitioners in "entertainment" electronic equipment. It covers TV reception from v.h.f. to s.h.f., display tubes, colour camera technology, video recorder and video disc equipment, video text and hi-fi sound. 323 pages Hardback £9.95

POWER SELECTOR GUIDE (BP235)

J. C. J. Van de Ven

This guide has the information on all kinds of power devices in useful categories (other than the usual alpha numeric sort) such as voltage and power properties making selection of replacements easier. 160 pages £4.95

RSGB RADIO DATA REFERENCE BOOK

G. R. Jessop G6JP

The 5th Edition of an essential book for the radio amateur's or experimenter's workbench. 244 pages Hardback £8.56

SEMICONDUCTOR DATA BOOK

A. M. Ball

Characteristics of about 10 000 transistors, f.e.t.s, u.j.t.s, diodes, rectifiers, triacs and s.c.r.s. 175 pages £9.95

TRANSISTOR SELECTOR GUIDE (BP234)

J. C. J. Van de Ven

This guide has the information on all kinds of transistors in useful categories (other than the usual alpha numeric sort) such as voltage and power properties making selection of replacements easier. 192 pages £4.95

FAULT-FINDING

ARE THE VOLTAGES CORRECT?

Reprinted from PW 1982-1983

How to use a multimeter to fault-find on electronic and radio equipment, from simple resistive dividers through circuits using diodes, transistors, i.c.s and valves. 44 pages £1.50

GETTING THE MOST FROM YOUR MULTIMETER (BP239)

R. A. Penfold

This book is primarily aimed at beginners. It covers both analogue and digital multimeters and their respective limitations. All kinds of testing is explained too. No previous knowledge is required or assumed. 102 pages £2.95

OSCILLOSCOPES, HOW TO USE THEM, HOW THEY WORK (Revised 2nd Edition)

Ian Hickman

This book describes oscilloscopes ranging from basic to advanced models and the accessories to go with them. 133 pages £6.95

PRACTICAL HANDBOOK OF VALVE RADIO REPAIR

Chas E Miller

The definitive work on repairing and restoring valved broadcast receivers dating from the 1930s to the 60s. Appendices giving intermediate frequencies, valve characteristic data and base connections. 230 pages Hardback £17.50

QUESTIONS & ANSWERS RADIO REPAIR

Les Lawry-Johns

How to fault-find and repair valved and transistorised receivers, car radios and unit audio equipment. Suggested lists of tools and spare parts. 106 pages £3.95

SERVICING RADIO, HI-FI AND TV EQUIPMENT

Gordon J King

A very practical book looking at semiconductor characteristics, d.c. and signal tests, fault-finding techniques for audio, video, r.f. and oscillator stages and their application to transistor radios and hi-fi. 205 pages £9.95

TRANSISTOR RADIO FAULT FINDING CHART (BP70)

C. E. Miller

Used properly, should enable most common faults to be traced reasonably quickly. Selecting the appropriate fault description at the head of the chart, the reader is led through a sequence of suggested checks until the fault is cleared. 635 x 455mm (approx) £0.95

PROJECT CONSTRUCTION

HOW TO BUILD ADVANCED SHORT WAVE RECEIVERS (BP226)

R. A. Penfold

Greater satisfaction can be gained from the hobby of shortwave listening when using home constructed equipment. This book gives full practical constructional details of a number of receivers as well as some add-on circuits like S-meters and noise limiters. 118 pages £2.95

HOW TO DESIGN AND MAKE YOUR OWN P.C.B.s (BP121)

R. A. Penfold

Designing or copying printed circuit board designs from magazines, including photographic methods. 80 pages £2.50

INTRODUCING QRP

Collected Articles from PW 1983-1985

An introduction to low-power transmission, including constructional details of designs by Rev. George Dobbs G3RJV for transmitters and transceivers from Top Band to 14MHz, and test equipment by Tony Smith G4FAI. 64 pages £1.50

MORE ADVANCED POWER SUPPLY PROJECTS (BP192)

R. A. Penfold

The practical and theoretical aspects of the circuits are covered in some detail. Topics include switched mode power supplies, precision regulators, dual tracking regulators and computer controlled power supplies, etc. 92 pages £2.95

POWER SUPPLY PROJECTS BP76

R. A. Penfold

This book gives a number of power supply designs including simple unregulated types, fixed voltage regulated types and variable voltage stabilised designs. 97 pages £2.50

PRACTICAL POWER SUPPLIES

Collected Articles from *PW* 1978-1985

Characteristics of batteries, transformers, rectifiers, fuses and heatsinks, plus designs for a variety of mains-driven power supplies, including the PW "Marchwood" giving a fully stabilised and protected 12V 30A d.c. 48 pages £1.25

PROJECTS IN AMATEUR RADIO AND SHORT WAVE LISTENING

F. G. Rayer G3OGR

Full constructional details are given for all projects, including housing the units in a suitable case. All the projects are either on p.c.b. or matrix board. 90 pages £4.95

QRP NOTEBOOK

Doug DeMaw W1FB

This book deals with the building and operating of a successful QRP station. Lots of advice is given by the author who has spent years as an ardent QRP'er. All the text is easy to read and the drawings are large and clear. 77 pages £3.95

SOLID STATE SHORT WAVE RECEIVERS FOR BEGINNERS (BP222)

R. A. Penfold

There is a strange fascination in listening to a broadcast which has been transmitted over many thousands of kilometres. This is even more the case when you've built the receiver yourself. This book contains several designs that will give a fairly high level of performance. 93 pages £2.95

AUDIO FREQUENCIES

AUDIO (BP111)

(Elements of Electronics—Book 6)

F. A. Wilson

This book studies sound and hearing, and the operation of microphones, loudspeakers, amplifiers, oscillators, and both disc and magnetic recording. 320 pages £3.50

ANTENNAS (AERIALS)

AERIAL PROJECTS (BP105)

R. A. Penfold

Practical designs including active, loop and ferrite aerials plus accessory units. 96 pages £2.50

ALL ABOUT CUBICAL QUAD ANTENNAS (USA)

W. I. Orr W6SAI and S. D. Cowan W2LX

Theory, design, construction, adjustment and operation of quads. Quads vs. Yagis. Gain Figures. 109 pages £5.50

ALL ABOUT VERTICAL ANTENNAS (USA)

W. I. Orr W6SAI and S. D. Cowan W2LX

Theory, design, construction, operation, the secrets of making vertical work. 191 pages £7.50

AN INTRODUCTION TO ANTENNA THEORY

(BP198)

H. C. Wright

This book deals with the basic concepts relevant to receiving and transmitting antennas. Lots of diagrams reduce the amount of mathematics involved. 86 pages £2.95

BEAM ANTENNA HANDBOOK (USA)

W. I. Orr W6SAI & S. D. Cowan W2LX

Design, construction, adjustment and installation of h.f. beam antennas. 198 pages £6.75

HF ANTENNAS

FOR ALL LOCATIONS (RSGB)

L. A. Moxon G6XN

Taking a new look at how h.f. antennas work, and putting theory into practice. 260 pages £5.69

OUT OF THIN AIR

Collected Antenna Articles from *PW* 1977-1980

Including such favourites as the ZL Special and "2BCX 16-element beams for 2m, and the famous "Slim Jim", designed by Fred Judd G2BCX. Also features systems for Top Band, medium wave/long wave loop designs and a v.h.f. direction finding loop. Plus items on propagation, accessories and antenna design. 80 pages £1.80

SIMPLE, LOW-COST WIRE ANTENNAS FOR RADIO AMATEURS (USA)

W. I. Orr W6SAI and S. D. Cowan W2LX

Efficient antennas for Top Band to 2m, including "invisible" antennas for difficult station locations. 191 pages £6.75

THE ARRL ANTENNA BOOK

15th Edition (USA)

A station is only as effective as its antenna system. This book covers propagation, practical constructional details of almost every type of antenna, test equipment and formulas and programs for beam heading calculations. 327 pages £14.95

THE ARRL ANTENNA COMPENDIUM Volume 1 (USA)

This book makes fascinating reading of hitherto unpublished material. Among topics discussed are quads and loops, log periodic arrays, beam and multi-band antennas, verticals and reduced size antennas. 175 pages £9.25

THE RADIO AMATEUR ANTENNA HANDBOOK

William I. Orr W6SAI & Stuart D. Cowan W2LX

Yagi, quad, quagi, i-p, vertical, horizontal and "sloper" antennas are all covered. Also towers, grounds and rotators. 190 pages £6.75

TWO-METRE ANTENNA HANDBOOK

F. C. Judd wrote this book for radio amateurs new to the 144-146MHz band. The range of antennas described will cater for most situations, particularly those where space is a problem. 157 pages £6.95

WIRES & WAVES

Collected Antenna Articles from *PW* 1980-1984

Antenna and propagation theory, including NBS Yagi design data. Practical designs for antennas from medium waves to microwaves, plus accessories such as a t.u.s., s.w.r. and power meters, and a noise bridge. Dealing with TVI. 160 pages £3.00

W1FB'S ANTENNA NOTEBOOK

Doug DeMaw W1FB

This book provides lots of designs, in simple and easy-to-read terms, for simple wire and tubing antennas. All drawings are large and clear making construction much easier. 124 pages £5.95

25 SIMPLE AMATEUR BAND AERIALS (BP125)

E. M. Noll

How to build 25 simple and inexpensive aerials, from a simple dipole through beam and triangle designs to a mini-rhombic. Dimensions for specific spot frequencies, including the WARC bands. 80 pages £1.95

25 SIMPLE INDOOR AND WINDOW AERIALS (BP136)

E. M. Noll

Designs for people who live in flats or have no gardens, etc., giving surprisingly good results considering their limited dimensions. 64 pages 0/P

25 SIMPLE SHORT WAVE BROADCAST BAND AERIALS (BP132)

E. M. Noll

Designs for 25 different aerials, from a simple dipole through helical designs to a multi-band umbrella. 80 pages £1.95

25 SIMPLE TROPICAL AND MW BAND AERIALS (BP145)

E. M. Noll

Simple and inexpensive aerials for the broadcast bands from medium wave to 49m. 64 pages £1.75

COMPUTING

AN INTRODUCTION TO COMPUTER COMMUNICATIONS (BP177)

R. A. Penfold

Details of various types of modem and their applications, plus how to interconnect computers, modems, and the telephone system. Also networking systems and RTTY. 96 pages £2.95

AN INTRODUCTION TO COMPUTER PERIPHERALS (BP170)

J. W. Penfold

Covers monitors, printers, disk drives, cassette recorders, modems, etc., explaining what they are, how to use them and the various types of standards. 80 pages £2.50

MICROPROCESSING SYSTEMS AND CIRCUITS (BP77)

(Elements of Electronics—Book 4)

F. A. Wilson

A comprehensive guide to the elements of microprocessing systems, which are becoming ever more involved in radio systems and equipment. 256 pages £2.95

MORSE

INTRODUCING MORSE

Collected Articles from *PW* 1982-1985

Ways of learning the Morse Code, followed by constructional details of a variety of keys including Iambic, Triambic, and an Electronic Bug with a 528-bit memory. 48 pages £1.25

THE MORSE CODE FOR RADIO AMATEURS (RSGB)

Margaret Mills G3ACC

A guide to learning to send and receive Morse code signals up to the 12 w.p.m. required for the RAE. 19 pages £2.88

THE SECRET OF LEARNING MORSE CODE

Mark Francis

Designed to make you proficient in Morse code in the shortest possible time, this book points out many of the pitfalls that beset the student. 87 pages £4.95

► 34 My only other gripe regarding mobile use was the CALL button, the one on the front panel that is, this puts the rig into transmit and sends a 1750Hz repeater access tone. The problem is that if you press the microphone p.t.t. before you release the CALL button the tone stays on throughout your transmission. To be fair this point is mentioned in the manual but nevertheless I hit the problem on several occasions.

Moving on to the performance in the shack, I was pleased to see that the output power could easily be reduced to 5 watts by a simple press of a button.

Whilst in the shack I hooked-up my Siskin TNC-220 to see how the C5200ED performed in Packet radio. This turned out to be a very easy operation as all the necessary connections (speaker output, mic input and p.t.t.) were available on the microphone socket. This means that you only have to wire-up one simple lead and makes changeover from Packet to phone very quick and easy. The

performance on Packet was, as expected, very good with no problems at all.

Conclusion

The C5200ED has proved itself, at least to me, to be a very strong contender in the dual band mobile/base station market. The facilities available combined with the versatility of full dual band operation make this one a winner. There were a few niggles which

I'm sure the manufacturers will address, but none of these was serious.

So as you've probably gathered I was impressed with C5200ED and was very sorry to see it returned, perhaps I'll have to have a word with Santa!

The C5200ED costs £599.00 and is available from Lee Electronics, 400 Edgeware Road, London W2, telephone 01-723 5521, to whom we offer our thanks for the loan of the review model. **PW**



BARGAIN CORNER

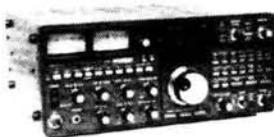
Now's the chance to obtain one of the most coveted Transceivers ever manufactured by Yaesu and at an incredibly low price that will bring a smile to your face while leaving the VAT man thinking he's in the middle of a depression!

Supplies of both these classic Transceivers are very limited so give us a call today to avoid disappointment.



**FT ONE. PREVIOUS
PRICE £1995
NOW ONLY £1395**

**FT980. PREVIOUS
PRICE £1795
NOW ONLY £1395**



PRICES SUBJECT TO AVAILABILITY

SOUTH MIDLANDS COMMUNICATIONS LIMITED

S M HOUSE, SCHOOL CLOSE, CHANDLERS FORD INDUSTRIAL ESTATE, EASTLEIGH, HANTS
TEL: (0703) 255111 TLX: 477351 SMCMM G FAX: (0703) 263507

COMM RXs. Rascal RA 17L general coverage 500Kc to 30 Megs in 30 bands as film scale tuning approx 45ft per band var selectivity 6 pos 100c/s to 13Kc, BFO, N Lim, Man or AVC, crystal cal, tuning meter, int spk etc supplied checked and aligned with book & leads. £255 **CONT METER No. 1.** general purpose portable Geiger Counter with meter indication 0.1 to 10 Mill Rongt two part unit with separate head unit with G.M. tube also provision for use with phones, these are normally powered by 2 x 150v dry batt but details are supplied to construct transis conv to enable use from 9v batt, supplied tested with Inst-Service book & test source, complete with carrying case. £45 **SIG GENs** Marconi TF995 A2 good class AM-FM sig gen 1.5 to 220 Megs with var AM & Deviation, carrier meter, var atten, int crystal cal, 50 or 75 ohm O.P. for 240v tested with book. £115 **CRYSTAL CAL UNITS.** standard 100Kc unit with close tol oven incorporates 1" CRT unit & 100Kc amp unit to enable phase checks to be made, provides 100K x 0.P at low level for 240v with connec tested. £28 **VIDE RECORDERS** Sony portable for use on 12v DC use 5" dia spools of 1/2" tape inc sound size 10 x 12 x 6" supplied tested with circ. £65 mains p.u. charger £15. **RF ASS** spare front ends for R210 Rx tunes 2/16 meg in 7 bands 450/470Kc out with valves & circ. £17.50 **AERIAL SWT TYPE J** for use with R1155/11154 inst good cond. £16.50 **RESISTORS** non inductive 150 ohm nom 40w ea 3 for £11.50. **POWER UNIT** general purpose bench unit O.Ps 250/300v DC at 250 Ma smoothed & 6.3v AC at 5 amps in neat case with screw term connec size 10 x 10 x 10" tested. £28 **LENS UNIT** two lenses in brass tube 1 3/4 x 4" new £5.50. **BLOWERS** for 220v 50c single ended outlet 2 x 2 1/2" £8.50, also Tangential type outlet 7 x 1 1/2" £6.50. **MICRO SWTS** misc types mixed all V.3 new 10 for £3. **TIMER** Elec cooker type new £2.50 ea 2 for £4. **TRANS ISOL** 240/240v at 500 watt cased. £17.50, also 200/250 to 115v 560 watt auto enc. £18.

Above prices include carr/postage & VAT. Goods ex equipment unless stated new.
SAE with enquiry or 2 x 19p stamps for List 43

A.H. SUPPLIES

Unit 12, Bankside Works, Darnall Rd, Sheffield S9 5HA. Ph. 444278 (0742)
Also at Newark Market on Mondays.

**PLEASE MENTION
PRACTICAL WIRELESS
WHEN REPLYING TO
ADVERTISEMENTS**

**TX - 3
RTTY/CW/ASCII TRANSCEIVE**

The high performance, low cost system

Split-screen, type-ahead operation, receive screen unwrap, 24 large memories, clock, review store, callsign capture, RTTY auto CR/LF, CW software filtering and much more. Needs interface or T.U. **BBC-B/Master** and **CBM64** tape £20, disc £22. **SPECTRUM** tape £35, +3 disc £37 inc. adapter board (needs interface/TU also).

See reviews Dec 87 & Jan 88 issues.

For **VIC20** we have our RTTY/CW transceive program. Tape £20.

**RX - 4
RTTY/CW/SSTV/AMTOR RECEIVE**

This is still a best-selling program and it's easy to see why. Superb performance on 4 modes, switch modes at a keypress to catch all the action. Text and picture store with dump to screen, printer or tape/disc. An essential piece of software for trawling the bands. Needs interface. **BBC-B/Master**, **CBM64** tape £25, disc £27. **VIC20** tape £25. **SPECTRUM** tape £40, +3 disc £42 inc. adapter board (needs interface also). The **SPECTRUM** software-only version (input to EAR socket) is still available £25.

TIF1 INTERFACE Perfect for TX3 and RX4, it has 2-stage RTTY and CW filters and computer noise reduction for excellent reception. Transmit outputs for MIC, PTT and KEY. Kit £20 (assembled PCB + cables, connectors) or ready-made £40, boxed with all connections. Extra MIC leads for extra rigs £3 each. State rig(s). Interface available only with TX-3 or RX-4 software.

WORLD AND UK/EUROPE MAP LOCATOR Maps, great circles, distances, bearings, contest scores. Lat/long, locators, NGR, hundreds of placenames. **BBC-B/Master**, **ELECTRON ONLY**. Tape £10.

LOCATOR Distances, bearings, contest scores. Lat/long, locators. **SPECTRUM**, **CBM64**, **VIC20** tape £7.

And for **BBC-B/Master**, **SPECTRUM**, **ELECTRON**, **CBM64**, **VIC20**.

MORSE TUTOR 1-40 wpm. Learn by ear, practise using random letters, figures, punctuation, words. 40 plain language texts supplied or type your own. With learning guide, tape £6.

LOGBOOK Date, band, mode, call and remarks. Instant callsearch. Log printout. Tape £8.

RAE MATHS Unlimited practice and testing for the exam calculations. Tape £9.

All **BBC** and **CBM64** programs are available on **DISC** at £2 extra.

NEW!! PEP BOARD Converts any RF power meter to read p.e.p. Assembled and tested PCB + mounting kit and instruction £12.

Prices include VAT and p&p, 1st Class inland, airmail overseas, normally by return. Eire, C.I., BFPO deduct 13%.

 **technical software (P.W.)** 
Fron, Upper Llandwrog, Caernarfon LL54 7RF.
Tel. 0286 881886

Introduction to Digital Communications

What does digital mean? Basically anything which can only take certain fixed values is said to be digital. Analogue is the opposite of digital and describes things which can be varied continuously, at least over a limited range. Stairs and ramps are examples of digital and analogue devices. When you climb stairs you can only stop at fixed heights above the ground, the heights of the steps themselves. On a ramp you can pause at any height you choose.

The word digital has come into common usage with the popularisation of computers and so many people link the two topics together. Although computers are based upon digital techniques, digital processes occur in many other areas of life as the example previously shows.

The Original Digital Mode

Many people do not realise that c.w. (Morse code) is a form of digital communication. When you press the key, you turn on the carrier, when you release it the carrier drops, two positions—on and off.

Early telegraphy was a relatively slow and therefore expensive process which required highly skilled operators to both send and receive the messages. It was therefore natural for machines to be developed which would be faster than human operators and also not be prone to human error. By the 1930s, these teleprinter machines were quite sophisticated and were capable of rapid automatic transmission and reception, requiring less skilled staff to operate them.

Baudot and Binary

Morse code is really quite complicated. Not only does it require the signals to be turned on and off, but parts of the "on" have to be longer than others. This is illustrated in Fig. 1(a), which is a representation of the letters CW in Morse code in which time is measured in distance from left to right. In telegraphy, "on" is commonly referred to as "mark" and "off" as "space".

A more straightforward approach was proposed by the French telegraphist Emile Baudot in 1874. In his code, each unit of information, or bit, was distinguished by being either on or off, rather than by its length as with Morse's "dits" and "dahs". Using this technique, the code for each letter was

Perhaps the best place to start learning about digital communications is at the beginning, says J. Huggins BSc G0DZX, and this means starting by explaining what is meant by the term digital.

the same length—five units or bits. This is one advantage which makes Baudot's code more effective for mechanical sending.

Baudot's code is an example of a binary code. Binary simply means two possible positions. Many people say that they don't understand binary codes. Yet, nearly every time they go out in their cars they interpret a binary code—traffic lights. Traffic lights are designed to give us one of four messages or instructions.

One lamp can be either on or off, so it can indicate one of two possibilities (stop/go, enter/wait, etc.). Three lamps have eight possible arrangements or combinations, see Fig. 2, and five lamps (or bits) can have thirty-two different possible combinations. This is greater than the number of letters in the alphabet and is the basis of Baudot's binary code. In this code, or more correctly its modern successor the International Telegraph Alphabet No. 2

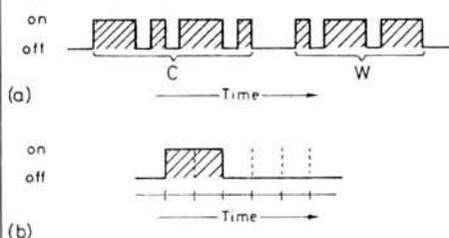


Fig. 1

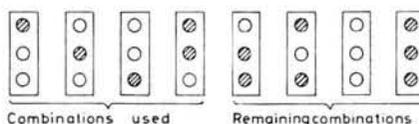


Fig. 2

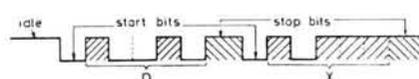


Fig. 3

or ITA 2, the letter "A" would be represented by the first two lamps being on and the last three being off. Similarly, every other letter of the alphabet is associated with a different, unique combination of "on's" and "off's". To send "A" using the ITA 2 code we simply decide the length of a "bit", turn on the carrier for twice this period and then turn it off for three times this period, see Fig. 1(b).

Suppose the receiver tunes into the transmission while it is in progress. How will it know when one letter ends and the next begins? Looking at Fig. 3, you can see that before the code for a letter is sent, the carrier is switched off for one normal "bit" and this **start bit** indicates to the receiver that a symbol is about to be sent. Similarly a **stop bit** which is one and a half times the length of a normal bit is sent when the five bits of the letter have been completed.

Control Codes & Other Problems

Two important control codes are carriage return and line feed as these move the printer head to the start of the line and feed the paper up for a new line. These control codes are also Baudot combinations, two of the "left over" ones.

You will have noticed that there are too few combinations left to represent numbers and punctuation marks. Well, just as most keys on a typewriter have two functions (by using the shift key), so each combination in the Baudot code also represents two characters. So, for example, the combination for "R" (off, on, off, on, off) also represents the number "4". Similarly both "Y" and "6" share the same combination (on, off, on, off, on). To distinguish between the two possible characters, two further control codes are used. These are known as **figures** (or figs) and **letters** (or ltrs). This means if the letters code is received the teleprinter will print letters until the figures code is received and vice versa.

Many RTTY operators begin their transmission with a row of RYs. This is because this transmission consists of a series of alternate "ons" and "offs" which helps with initial tuning. Sometimes this appears as 4646464646 and this is because either the "ltrs" command has been missed at the beginning of the transmission or the teleprinter (or computer) has mistaken some noise for the "figs" command.

Practical Wireless, February 1989

If a nasty bit of QRM pops up during a carrier off period, the receiving teleprinter will misinterpret the noise as carrier. As a result it will read the data wrongly. For example, "P" (on, off, on, on, off) could be read as "Q" (on, off, on, on, on) if noise occurred during the period when the last bit of the code was transferred.

The major problem is that not only does an error occur, but that there is no way of detecting it. In plain text, the error will probably show up, but not when a series of numbers or coded information is transmitted.

To reduce the degree of disruption from QRM (noise), frequency shift keying (f.s.k.) was introduced. Here, the carrier is not simply switched on and off, instead it remains on constantly but it is switched from one frequency to another. The separation of the frequencies is generally quite small—usually 170Hz for amateurs and 425 or 850Hz for commercial systems. This way efficient use is made of the radio spectrum.

Most amateurs use a modified form of f.s.k. known as audio frequency shift keying (a.f.s.k.). With minor exceptions, f.s.k. and a.s.f.k. give the same result. In a typical amateur a.f.s.k. system, a two-tone audio oscillator is used to generate 1445Hz (mark) and 1275Hz (space) tones as required. These tones are then fed to the microphone socket on the transceiver, which in turn is set in single sideband mode. If, for example, the transceiver was set to 14.100MHz in upper sideband mode, then modulation with the **mark** tone would result in an r.f. signal being produced at 14.101445MHz, while the **space** tone would generate the signal at 14.101275MHz. The two r.f. signals would still be 170Hz apart, but unlike f.s.k. signals they would be produced at slightly different frequencies to that indicated on the transceiver display.

Speeds & Baud Rate

Teletype speeds are usually measured in "bits per second" or **bauds**. This is the number of the on/off pulses which can be sent in each second. Baud rate cannot simply be converted into words per minute as the stop bits are one and half bits and the exact ratio varies from one convention to another. Most amateur systems use speeds of 45.45 baud on the h.f. bands, but 50 baud is common on the v.h.f./u.h.f. frequencies.

Setting Up a RTTY Station

If you fancy trying RTTY then, in principle, all you need is a transceiver, a microcomputer, a suitable program and connecting leads. Probably the best place to start is on v.h.f. where the bands are quieter, 144.600MHz is the generally accepted calling frequency for s.s.b. work. There is also some activity on 145.300MHz (Channel *Practical Wireless*, February 1989

S12) using f.m. If there is local RTTY f.m. activity, then this is the place to start as the tuning requirements in this mode are not so critical as on s.s.b.

The program you have chosen may require a **terminal unit** and in its simplest form this is a filtering device based upon tuned circuits or operational amplifiers. A lead from the extension speaker socket is brought into the filter unit which is normally designed to filter out all sound other than tones of 1445 and 1275Hz. These pure tones are then passed on to the computer for translation. It is also common to include some kind of tuning aid, as tuning is very critical indeed in this situation. Terminal units also often include an audio oscillator to generate the tones required for a.s.f.k. transmissions.

I think any serious attempt at RTTY will really require the use of a terminal unit of some kind. This may be a sophisticated device capable of running all sorts of digicomms such as the PK-232, or it can be a relatively cheap, home-brewed job. BARTG⁽¹⁾ (British Amateur Radio Teledata Group) market kits and p.c.b.s for ST5C terminal unit and John Morris G3LIV⁽²⁾ can supply a p.c.b. and instructions for another terminal. Home-brewed terminals should be considered seriously as they are not difficult to construct, they are relatively cheap and normally have excellent performance on RTTY.

There are several sources for programs, the TX-3 by Technical Software⁽³⁾ being quite popular, as are J&P Electronics⁽⁴⁾. There are also several programs produced by Dr P. Harris G3WHO⁽⁵⁾ and M. J. Kerry G3BMK⁽⁶⁾.

There are a number of points to look for in a good RTTY program. First, split screen display and type ahead facilities are important. One half of the screen (usually the top) displays the incoming message while the other contains the text to be transmitted, this allows the operator to prepare the reply whilst reading the incoming text. Very few operators can type fast enough to keep up with the rate at which RTTY is transmitted so this reduces the pressure of typing and the frustration at the receiving end.

Memories

Memories are also important. Most programs contain commonly used messages such as RYRYRYRY and CQ CQ CQ DE which can be sent using one key. This saves a lot of time, but other memories that you can program are also useful. A real-time clock is another facility offered by many programs and this allows you to make a note of the start and finish times of the QSO for logging. Better programs store the QSO in memory and label the beginning of each transmission with the time for later review.

A "callsign capture" is also a help. Programs with this facility "look" for "DE" in the incoming text and store the callsign which follows it. Finally,

and perhaps most important, check that the program automatically sends CR/LF codes after 65 characters have been sent. Older, mechanical teleprinters do not automatically CR/LF and so you might end up with a very irate operator of a mechanical teleprinter at the other end!

The ability of a good RTTY station to "pull" signals out of the background hash never ceases to amaze me. Strong QRM can make life difficult, but deep and slow fading is a real problem. If the signal completely fades into the background noise for several seconds than large chunks of text are lost and make the QSO meaningless. Yet there are modes that overcome this problem.

Error Correcting Systems

SITOR is a commercial system designed to overcome the shortcomings of RTTY. AMTOR (AMateur Teleprinting Over Radio) is a system which was derived from SITOR in the early 1980s mainly by Peter Martinez G3PLX.

It uses a seven-bit code rather than the five-bit system of RTTY, which means 128 different possible arrangements. Only those arrangements that have four marks and three spaces are used though, and there are 35 of those. This means that if QRM corrupts a character as it is received, the chances of the result "looking" like another legitimate character are just under 4:1 against.

It's fine to know that a mistake has been made, but it is just as important to be able to correct the fault, or at least to be able to get the character repeated. AMTOR has two different modes of operation which approach this part of the problem of error-free reception differently. The simplest form to understand is called **forward error correction** (FEC). This technique is very much like normal RTTY, the difference lies in the fact that each character is sent twice with a gap of about one third of a second separating the two characters. To do this, the system sends characters in groups of four, leaving a short pause before repeating the group.

The second approach is restricted to use between two stations which are in direct contact with each other. It is known as **automatic repeat request** (ARQ) and is much more complicated. First, the system is in a synchronous mode unlike RTTY which is said to be asynchronous. The AMTOR system doesn't use stop and start bits, but relies on good time-keeping between transmitting and receiving stations. Secondly, the two stations "lock" onto each other, sending and receiving groups of three characters in a 450 millisecond cycle. In each cycle the transmitting station must send three characters and quickly turn over to receive. The receiving station must read the characters, check they are legitimate and go over to send an

acknowledgement. Then, if all is well, both stations start all over again with the next three characters.

The checking system depends on the use of two control codes, I'll call them CS1 and CS2, which must be sent alternately if all is well. Before we work through an example, there are two other terms I should explain. The station which makes the original transmission is called the **master** and the other station is called the **slave**.

Using Fig. 4, the master would send the first three letter group (GOO) and would wait for confirmation before continuing. The slave, having received the group correctly, would send CS1. Provided that the master receives CS1, it "knows" all is well and sends the next three letter group (D M). If this is also received correctly, the slave sends an acknowledgement, this time CS2. The master expects this code and so continues with ORN.

Suppose the letter R is corrupted, the slave should detect this and will indicate the problem by repeating the previous control code—CS2. As the master is expecting CS1, it therefore "knows" there is a problem and repeats the group ORN. If this is received correctly, the slave sends CS1 and so the master carries on with sending ING. Again, if the slave receives this correctly it replies with CS2.

If the master fails to receive this acknowledgement, it sends a third control code, RQ, which asks for a repeat acknowledgment. The slave repeats the control code and so the master continues, if it sent the other control code the master would repeat the last three characters again. In this way the message is checked and if necessary corrected every three characters.

Sending messages by ARQ AMTOR may not be perfectly error free, but it isn't far short! AMTOR is sent at 75 baud, but as it uses a longer code and pauses for acknowledgements, its real speed is about half this value. In poor conditions where many repeat requests are sent, the speed may be much lower than this.

AMTOR Operation

Many RTTY programs are also capable of decoding and sending AMTOR signals. So it's often not difficult to convert a RTTY station to AMTOR use. There are two major problems. First, to be effective in ARQ mode, a transceiver must be capable of rapidly changing from transmit to receive and vice versa. Many rigs do not possess this ability, but most can be easily modified to cope. In many cases it means changing a couple of capacitors. The modifications for most rigs are well established and easily obtainable from the AMTOR community.

The second problem is one of synchronization. This is usually achieved by adding a crystal controlled timing board to the terminal unit. Again, expensive multimode terminal units will already have such devices, but for

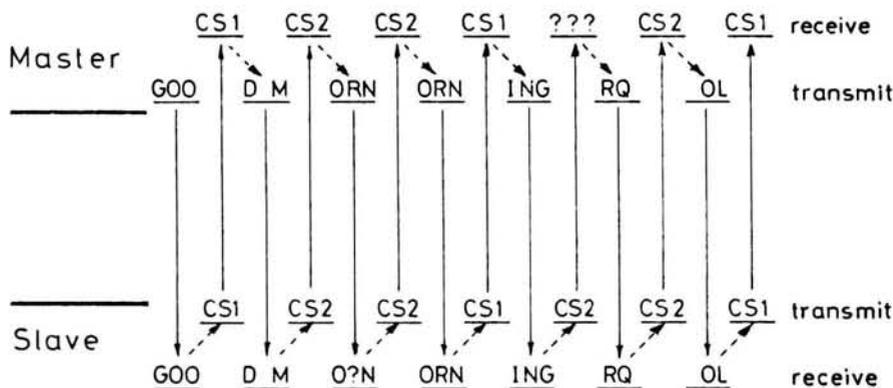


Fig. 4

home-brew specialists, John Morris G3LIV⁽²⁾ can supply an additional clock p.c.b. and instructions to work with his and other terminals designed for asynchronous use.

Packet Radio

No discussion of digital communications today would be complete without a consideration of packet radio. The basic idea was to attempt to use a single frequency for several different, but simultaneous, QSOs as a possible way of reducing overcrowding in the v.h.f. region of the radio spectrum. To achieve this aim, data was sent at very high baud rates. As a result, messages could be sent in quite short bursts or **packets** rather than the more or less continuous stream of data which occurs with AMTOR and RTTY.

Current amateur packet systems typically send data at 1200 baud using a.s.f.k. tones of 1200 and 2200Hz at frequencies above 30MHz—although some systems run considerably faster. For h.f. work, 300 baud is employed with correspondingly smaller tone separation. Obviously two communicating stations must use the same code, frequency, baud rate, etc. These values are those generally used according to current convention. In packet circles, conventions tend to be called protocols.

The structure of a "packet" is also defined by a convention. The structure of a typical AX.25 packet is illustrated in Fig. 5. You can see the packet of information contains more than the message being sent. The following data is sent in each packet:

Flag: This is the first part of the transmission and consists of a coded message warning the receiving station that information is about to follow.

Address: The second part contains the callsigns of the station sending the message and the station it is being sent to. It is possible for other stations to relay the message if a direct link is not possible. If this is the case, this section also includes the callsigns of up to eight stations making up the relay chain. This section enables stations not involved in the QSO to ignore it.

Control: This indicates the purpose of the packet—it may be to start or end a QSO, to carry a message, to ask for a repeat, to acknowledge, etc.

Information: This contains up to 256

characters and is the message being sent, or at least part of it.

FCS: This stands for frame check sequence and is a number calculated by the transmitting station based on the code in which the message is sent. This value is also calculated by the receiving station as it receives the message. If the value sent is the same as the value calculated then the receiving station "knows" that the message is error free and sends an acknowledgement. If the values differ the receiving station requests a repeat of the packet.

Flag: This is the same as the first flag, but now indicates the end of the transmission.

Terminal Node Controllers

It is quite possible to program a microprocessor to operate packet radio but this would leave precious little computer time for other facilities. Such a system would not be very "user friendly", so it's usual to use a second computer for the purpose. This computer is already programmed and can do only one job, run packet radio. Such machines are called terminal node controllers or TNCs. They are usually controlled by your own home computer, so the usual set-up for packet radio is that shown in Fig. 6.

Digipeaters, Mailboxes & More

As I mentioned earlier, stations not directly taking part in a QSO can relay messages on. This is probably the most exciting feature of packet radio. In theory, provided a suitable network of relay stations exists, a low power v.h.f. station can initiate a QSO which can

Flag	Address	Control	Information	FCS	Flag
1 byte	14-70 bytes	1 byte	up to 256 bytes	2 bytes	1 byte

A typical AX.25 packet

Fig. 5

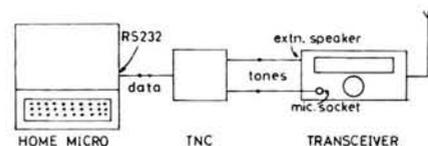


Fig. 6

be relayed nationwide (worldwide?) with all of the relaying stations using the same frequency. A station which can recognise its callsign in the address section of a packet, and then automatically repeat the message so that it is received by a more distant station, is called a digipeater.

Mailbox or bulletin board systems are becoming very popular these days. These are basically packet radio (or RTTY/AMTOR) stations which are automatically operated by computer and are active for most, or all, of the day. When called, the bulletin board will respond and store a message for another operator, or perhaps just general information, on computer disk.

This information can then be retrieved by the other station at some later date.

Finally the term **gateway** often crops up in the context of packet radio. This is simply a packet station which has access to two different frequencies — typically 144MHz and 14MHz. Gateways are very useful for v.h.f. operators as they can be used to relay messages worldwide via an h.f. network.

Starting next month Packet Radio Update

References

- 1: BARTG, c/o Mrs P. Beedie, Ffynonlas, Salem, Llandeilo, Wales SA19 7NP.
- 2: J. Morris G3LIV, 2 Salters Court, Gosforth, Newcastle, Tyne & Wear NE3 5BH.
- 3: Technical Software, Fron, Upper Llandwrog, Caernarfon, Gwynedd LL54 7RF.
- 4: J & P Electronics Ltd., Unit 45, Meadowhill Est., Dixon Street, Kidderminster DY10 1WW.
- 5: Dr P. Harris G3WHO, 10 Appleby Close, Great Alne, Alcester, Warks B49 6HJ.
- 6: M. Kerry G4BMK, 2 Beacon Close, Seaford, East Sussex BN25 2JZ.

**REVISED SERVICE!
LOWER PRICES!**

Practical Wireless

VISA **0202 678558**

PCB SERVICE

Printed circuit boards for *Practical Wireless* constructional projects are available from the PW PCB SERVICE. The boards are made in 1.5mm glass-fibre, and are fully tinned and drilled. All prices include postage, packing and VAT for UK orders. Please add £2.00 per order for despatch to overseas addresses.

Orders and remittances should be sent to: **PW Publishing Limited, FREEPOST, Enefco House, The Quay, Poole, Dorset BH15 1PP**, marking your envelope **PCB SERVICE**. Cheques should be crossed and made payable to PW Publishing Ltd.

When ordering, please state the Article Title and Issue Date as well as the Board Number. Please print your name and address clearly in block letters, and do not send any other correspondence with your order. You may telephone your order using Access or Visa. A telephone answering machine will accept your order outside office hours.

Please allow 28 days for delivery. Always check the latest issue of PW for the current details of price and availability. Please enquire for p.c.b.s not listed here.

Board Number	Title of Article	Issue Dated	Price (£)
WR068	AF Speech Processor	Jan 80	5.20
WR095	Transceiver Power Supply	Sep 80	3.85
WR126	"Exe" 10GHz Transceiver	Aug 81	7.70
WR144	Iambic Keyer	Mar 82	6.50
WR143	ATV Converter	Apr 82	7.10
WR156	Repeater Time-out Alarm	Nov 82	5.20
WR160	LMS Regenerative Receiver	Feb 83	5.20
WR167	RTTY Terminal Unit for ZX81	June 83	7.80
WR165	"Severn" (VFO)	June 83	5.20
WR166	"Severn" (Receiver/Audio)	Jun 83	6.50
WR168	"Severn" (Ch. over/Sidetone)	Jul 83	6.50
WR169	"Severn" (Transmitter)	Jul 83	6.50
WR165 etc set	"Severn" 7MHz QRP TX/RX	—	14.90
WR161	"Marchwood" 12V 30A PSU	Jul 83	2.40
WR179	Transceiver VOX Unit	Mar 84	6.50
WR183	Top-band DF Receiver	Apr 84	6.50
WR184	Simple Top-band Receiver	Jun 84	6.50
WR185	Auto-notch Filter	Jun 84	6.50
WR187	Morse Sending Trainer	Jul 84	4.50
WR190	Mod FRG-7 (Switching)	Oct 84	4.50
WR189/192 pr	Bug Key with 528-bit memory	Oct 84	8.50
WR194	Mod FRG-7 (FM/squelch)	Nov 84	4.50
WR195	Stable Toneburst	Nov 84	2.60
WR196	"Teme" 7/14MHz QRP(TX)	Nov 84	3.70
WAD246	"Dart" Follow-up	Dec 84	4.00
WA001	"Teme" (VFO/Doubler)	Dec 84	2.80
WA002	"Teme" (Receiver)	Jan 85	4.30
WAD280**	Triambic Keyer	Feb 85	7.10
WAD249	Mod FRG-7 (BFO)	Feb 85	3.00
A004	"Colne" 3.5/14MHz RX (RF Amp)	Apr 85	3.10
A005	"Colne" (VFO)	Apr 85	3.10

Board Number	Title of Article	Issue Dated	Price (£)
WR198	"Colne" (Product Det/Audio)	May 85	3.90
WR197	"Colne" (Oscill/Converter)	Jun 85	3.90
WAD302	Battery Charger Controller	Jun 85	3.00
WR200	Low-cost Crystal Tester	Jul 85	2.50
WR201	Add-on BFO	Aug 85	2.50
WR202	Economy UHF Pre-scaler	Sep 85	3.70
WR199	"Meon" 50MHz Transverter	Oct 85	6.70
WR203	Simple Capacitance Meter	Oct 85	2.80
WR204	WQ Medium Wave Loop	Nov 85	3.00
WR205	RTTY/Morse Modem	Jan 86	5.40
WR206	RTTY/Morse Modem (plug-in)	Jan 86	2.80
WR207	Crystal Calibrator	Jan 86	2.10
WR208	RF Speech Processor	Mar 86	4.10
WR209	Simple Audio Oscillator	Mar 86	4.30
WR211	"Meon" Filter	Apr 86	3.10
WR210	"Arun" Parametric Filter	May 86	8.10
WR213	Mod FRG-7 (Carrier Osc)	Jun 86	2.70
WR215	Simple 50MHz Converter	Sep 86	3.60
WR217	Automatic NiCad Charger	Oct 86	2.40
WR220	Get Started Low-cost Converter	Oct 86	2.40
WR216	LF Bands Active Antenna	Nov 86	2.40
WR222	"Taw" VLF Converter	Nov 86	2.80
WR223	High-imp MOSFET Voltmeter	Dec 86	2.90
WR214	Mod SRX-30D (Audio)	Dec 86	3.00
WR224	"Westbury" Basic Wobbulator	Jan 87	3.50
WR218	Masthead Pre-amp for 144MHz	Feb 87	4.20
WR219	Masthead Pre-amp PSU	Feb 87	2.50
WR225	"Woodstock" SW Converter	Mar 87	4.10
WR298	"Itchen" LCR Bridge	Apr 87	3.40
WR226-8 set	"Blandford" Rcvr Converter	Apr 87	9.70
WR230-2 set	"Axe" Signal Tracer	May 87	9.20
WR233	"Downton" F-V Converter	Jun 87	3.90
WR234	Side-tone Oscillator	Jun 87	2.70
WR235	Mains on/off for Batt Radios	Sep 87	3.00
WR236	"Blenheim" VHF Converter	Sep 87	4.50
KANGA	High Stability VFO (see issue)	Oct 87	—
WR237	RTTY Tuning Indicator	Nov 87	5.20
WR238	"Otter" 50MHz Receiver	Jan 88	7.10
WR239-241 set	"Orwell" Medium Wave Rcvr	Mar 88	9.10
WR242	"Orwell" Varicap Tune Option	Mar 88	2.90
WR243	VHF Monitor Receiver (Audio)	Apr 88	2.30
WR245	Stopband filter for PW Blenheim	Jun 88	2.90
WR244	Practice Morse Key	Jul 88	2.96
WR246	"Portland" RF Voltmeter	Jul 88	3.59
WR247	Zener Diode Tester	Aug 88	3.56
WR248	"Badger" 144MHz Receiver	Oct 88	9.10
WR249	"Marlborough" MF Converter	Dec 88	4.60
WR250	DC/AC Power Converter	Jan 89	3.22
WR251	RF Operated Relay	Feb 89	3.80

Amateur Radio in Spain

Our intrepid Australian author Greg Baker reports to us this time from the sunny climes of EA land; giving us the low-down on the state of amateur radio in Spain.

My first experience with amateur radio in Spain was on a Madrid street about halfway between the Puerta del Sol in the heart of the city and the main post office. It is here that the Madrid branch of the Union de Radioaficionados Espanoles (URE) (Spain's RSGB equivalent) has its offices. That's a useful place for it to be. It's also a few dozen metres from one of the red light areas, which is interesting but not particularly useful.

Facing the street is a barred door, securely locked, a name plate, door bell and an intercom. For me it's hard enough using my crude Spanish face to face where communication is made easier through eye contact and gestures. This was daunting. In true amateur fashion I keyed the microphone.

"Soy escritor de Australia. Quiero hablar," I stumbled. I am an Australian writer. I want to talk.

The speaker squawked back at me, signal RST 345. Here my Spanish deserted me. My XYL, whose Spanish is adequate to the task, elbowed me aside and took over. It seemed the man was alone, the office not open. Could we return the next night at 1930 local?

We could and did, conquering the door and intercom with the ease of practice. Upstairs we entered the plush offices of the Madrid chapter. In an inner room classes were in progress, but Victrenano Pascual Llorca EB4BCN, Jose J. Ordas Medina EA4DNT and Aniceto Martin Gil were there to talk with us. We sat in a room beside the Madrid QSL bureau and talked. Only Aniceto spoke any English but, nonetheless, we were prepared, our minds and notebooks bulging with questions and vocabulary.

They plied us with information and directed us to the national office of URE for further information.

The next day it was the suggested office at Maiquez, 48, 1st Floor. Here we spent time with Juan Martin, the administrative secretary, filling in the details of amateur radio in Spain. Juan, too, bombarded us with information and the kids with key rings and URE car window stickers.

Examinations and licences

All amateurs must be licensed. Licences are issued by the Ministerio



The author

de Transportes, Turismo y Comunicaciones (MTTC) who conduct examinations three times per year in February, June and October. It is usual, though not obligatory, to attend classes like those we saw at the Madrid branch of URE. There are four examinations: (i) regulations, (ii) theory, (iii) Morse code, both receiving and sending, and (iv) operating procedures. This latter mightn't be a bad idea in a few other countries as well!

Three classes of licence are issued: Class A, Class B and Class C. There are about 25000 A class licences on issue, about 10000 B class and about 5000 C class. This makes about 40000 radio amateurs for Spain's population of 39 million.

Class A licences are unrestricted licences. Morse required is 12 words per minute and power output limited to 250 watts. Class C licences are for those whose Morse is only 8 words per minute and power is restricted to 20 watts. B class licence holders operate v.h.f. and above only and need no Morse. Their power output is limited to 50 watts. In addition, Class C licence holders are restricted to the band sub-segments 3.55 to 3.6, 7.02 to 7.03 and 21.03 to 21.15MHz in telegraphy and 3.6 to 3.7, 21.15 to 21.20 and 28.90 to 29.10MHz on phone.

Annual licence fees are about £17 for Class A, £9 for Class B and £4 for Class C. These are reduced by 90 per cent for pensioners, those who have retired and

those over 65 years of age. That would go down well in the rest of the amateur world, I'll bet! Sitting exams costs about £3 each. Repeaters with wide coverage have a licence fee of £25 and this falls to £10 for local coverage repeaters.

Callsigns

Spanish callsigns are predominantly allocated from the block EAA to EZZ and take the form $ELnxy$ or $ELnxyz$ where L is A, B or C, n is a number in the range 0 to 9 and x, y, z are letters of the alphabet.

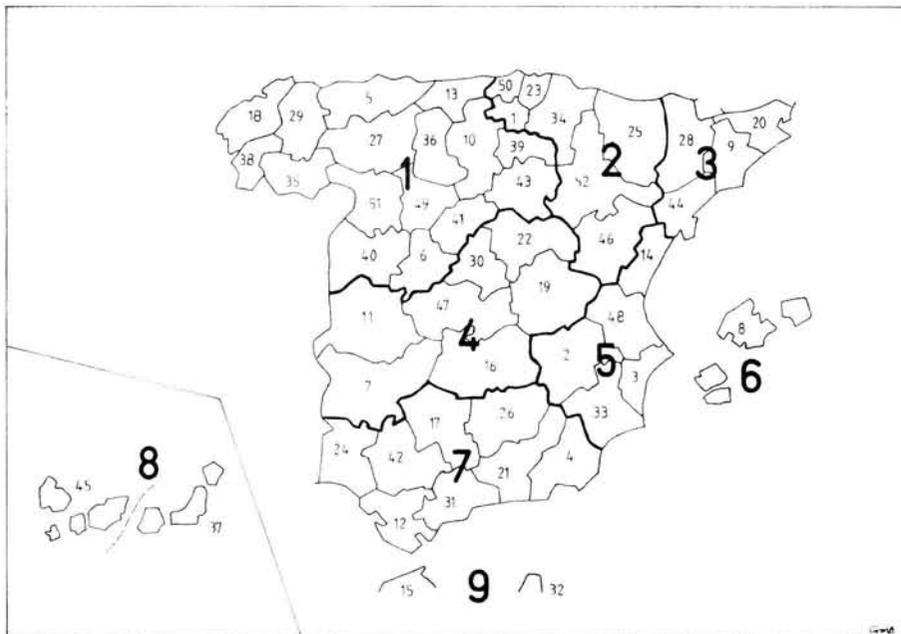
A Class licence holders have the forms $EAnxy$ and $EAnxyz$, B Class licence holders have the forms $EBnxy$ and $EBnxyz$ and C Class licence holders have the forms $ECnxy$ and $ECnxyz$.

Calls beginning EDn , EE_n , EF_n , etc., are used for special event callsigns. Recent examples are ED1FPB for the Fair of Peñaranda del Bracamonte, a town in the province of Salamanca, west of Madrid; ED3IMG, EE3IMG and EF3IMG for the amateur expedition to the Costa Brava island Medes; ED2IZO for an expedition to Iزارo, a 500m x 100m island off the Basque coast and ED1AI for an amateur expedition to Arosa Island off the coast of the province of Pontevedra, north-west of Madrid. Amateurs are hoping to be allocated EG, EH, etc., calls and AM, AN (also allocated to Spain) for the 1992 Barcelona Olympics.

The number n indicates the region. Spain is divided into 9 regions representing four countries on the DX countries list. EA6, EB6 and EC6 are from the Balearic Islands, the Spanish islands off the east coast of the mainland, EA8, EB8 and EC8 are from the Canary Islands in the Atlantic Ocean and EA9, EB9 and EC9 are from Ceuta and Melilla, the two Spanish enclaves on the north coast of Africa. All other districts are on the Iberian peninsula (see Fig. 1), except that the district numeral 0 is used for Antarctic operations such as ED0BAE, the special call for the Spanish base "Juan Carlos I".

An exception to this seems to be the callsign EA0JC, held by an honorary president of URE, His Majesty Juan Carlos I, King of Spain. I don't know if he uses it or not, or whether it is honorary, too, but I'd love to have a QSL.

Practical Wireless, February 1989



**TABLE 1:
PROVINCE LIST**

1	VI	Alava	EA2
2	AB	Albacete	EA5
3	A	Alicante	EA5
4	AL	Almeria	EA7
5	O	Asturias	EA1
6	AV	Avila	EA1
7	BA	Badajoz	EA4
8	PM	Baleares	EA6
9	B	Barcelona	EA3
10	BU	Burgos	EA1
11	CC	Caceres	EA4
12	CA	Cadiz	EA7
13	S	Cantabria	EA1
14	CS	Castellon	EA5
15	CE	Ceuta	EA9
16	CR	Ciudad Real	EA4
17	CO	Cordoba	EA7
18	C	La Coruna	EA1
19	CU	Cuenca	EA4
20	GE	Gerona	EA3
21	GR	Granada	EA7
22	GU	Guadalajara	EA4
23	SS	Guipuzcoa	EA2
24	H	Huelva	EA7
25	HU	Huesca	EA2
26	J	Jaen	EA7
27	LE	Leon	EA1
28	L	Lerida	EA3
29	LU	Lugo	EA1
30	M	Madrid	EA4
31	MA	Malaga	EA7
32	ML	Melilla	EA9
33	MU	Murcia	EA5
34	NA	Navarra	EA2
35	OR	Orense	EA1
36	P	Palencia	EA1
37	GC	Las Palmas	EA8
38	PO	Pontevedra	EA1
39	LO	La Rioja	EA1
40	SA	Salamanca	EA1
41	SG	Segovia	EA1
42	SE	Sevilla	EA7
43	SO	Soria	EA1
44	T	Tarragona	EA3
45	TF	Tenerife	EA8
46	TE	Teruel	EA2
47	TO	Toledo	EA4
48	V	Valencia	EA5
49	VA	Valladolid	EA1
50	BI	Vizcaya	EA2
51	ZA	Zamora	EA1
52	Z	Zaragoza	EA2

Note that the province numbers above are not the same as Spanish postal code district numbers.

English (and Spanish) language electronics and computer magazines.

While I'm on the subject of prices, a couple of prices from the consumer market: 12in black and white television £67, 16in colour television from £225 to £240 and 20in colour television £300.

Organisations

Amateurs are represented to government and the IARU by URE, the Spanish equivalent of the RSGB. It costs £17 per year to join. For this fee, amateurs receive an un-named monthly magazine, a free QSL bureau, and free antenna insurance. The latter is essential for radio amateurs. The URE

The licence document in Spain shows not only the name, address and call sign of the licence holder, but also the equipment they possess. All gear must be registered by make, model and serial number with MTTC and sales and purchases must be notified and amended on the licence document. Licences for mobile equipment show vehicle make and model and registration number.

In addition, a plan of all new installations must be sent to MTTC and be inspected by an official from MTTC to ensure it complies with regulations. It is permissible to possess amateur transmitting equipment without holding a licence. Many people, such as Aniceto Martin Gil at URE Madrid, buy and instal their equipment concurrently with attending classes and passing exams.

Spain does not allow amateurs to handle third party traffic. However, amateurs work closely with the Spanish Red Cross and civil defence authorities to provide emergency communication in times of need. Amateurs co-operating in this way carry a special civil defence pass issued by their municipal authority. This pass identifies them, their civil defence function and, in the case of radio amateurs, their special civil defence call sign. This civil defence traffic is using the amateur's own equipment and is usually on 144MHz.

Equipment

Equipment is in general more expensive than in the UK. Some retail prices are: Yaesu FT-980 all-bells-and-whistles transceiver £1850; Kenwood TS-430S £915; Kenwood TS-440S £1050; Yaesu FRG-9600 £640; Yaesu FT-270R 144MHz mobile £560; Icom IC-28E 144MHz mobile £470.

An offer of gear from one shop had three "complete" stations: (i) Kenwood TS-440S, 5-band vertical DX antenna, 30A power supply, 25m of coaxial cable and 2 PL-259s for just

under £1500; (ii) Kenwood TS-530SP, 5-band vertical DX antenna, 25m of coaxial cable and 2 PL-259s for just under £1000; and (iii) Kenwood TH-221S 144MHz transceiver, mobile antenna, 10A power supply, 25m of coaxial cable and 2 PL-259s for just over £400.

There are four or five shops in Madrid and the same number in Barcelona selling amateur equipment, as well as a few scattered through the provinces. These include the big department store El Corte Ingles. Shops selling electronic components are more widespread. Spain seems to be experiencing a boom in technology related pastimes—computers, electronics, etc.

The street Calle Barquillo near the main post office has many electronics shops selling books and components. Examples are Componentes Barquillo, Barquillo 11, Shop 9 and Hipper-Music: Hipermercado de la Imagen y el Sonido (Picture and Sound Hypermarket). The latter has a huge range of electronics and amateur books. But the most colourful and interesting place to buy gear or even browse is in the Rastro area of Madrid. The Rastro is a huge market held outdoors every Sunday morning.

There you'll find Florentino Sanchez Argiles EA4AHR and his son Jose Luis Sanchez Sanz EA4BWQ at their components stall on the street called Ronda de Toledo. Every component you can remember from the electronics shop hey-day are there and more. Jose Luis speaks good English and is a mine of information on Madrid and Spain's amateur scene. A hundred metres up the hill towards the Puerta del Sol at 28 Arniches is the shop of Cristobal Laorden Martinez EA4BDA. Open seven days a week, Cristobal's shop has components but also receivers and transceivers, both new and second-hand. In between these two establishments on Sundays, during the Rastro, are thousands of stalls, a score or so selling magazines, including bargain priced

insurance is for liability of £95000. Private cost of antenna insurance is about £19 for the same £95000 cover or £11 for £45000 cover, so URE membership is good value. It is interesting to note that ordinary household radio and television antennas do not need to be insured.

Magazines

Spain has two monthly amateur magazines. One is the un-named URE journal included in the URE subscription. It runs to over 60 pages a month. Advertising proportion is below 20 per cent. A typical issue contains editorial, technical articles, regional URE news and columns on c.w., computers, DX, v.h.f./u.h.f./s.h.f. reports, awards and diplomas, new members and members' advertisements.

The other monthly magazine is *CQ Amateur Radio*, an offshoot of the US magazine of the same name. The Spanish edition billed as "La Revista del Radioaficionado"—the radio enthusiasts magazine—is mainly sourced in Barcelona, Spain's second largest city after Madrid. There are some translations of US editorial content. News stand cover price is £1.60 but this falls to £1.45 per issue on subscription. It runs to 84 pages. A typical issue has about 22 per cent advertising and contains editorial, reports of amateur affairs, technical and construction articles, gear reviews, columns on DX, satellites, v.h.f./u.h.f./s.h.f., propagation, awards and diplomas, new equipment and free subscriber advertisements.

There are no propagation predictions in the URE journal but *CQ Amateur Radio* regularly runs three-monthly predictions from the Caribbean and Central America, from South America and from the Iberian Peninsula and North Africa.

Books and Manuals

Spanish electronics shops seem well stocked with amateur publications, many from Boixareu Editores, the Barcelona specialist publisher of *CQ Amateur Radio*. Examples and sterling equivalent prices are: 1986 *ARRL Handbook* in Spanish £43; Clay Laster *W5ZPV Guia del Radioaficionado Principiante* (Guide for the Beginner Amateur Radio Enthusiast), 400 pages, £17; Ed. Jose Mompin Poblet *Manual del Radioaficionado Moderno* (Modern Amateur Radio Enthusiasts Manual), 2nd Edition, £19; P. Duranton *Bandas de 27 y 28.30MHz* (10 metre Bands), 412 pages, £7, and a series of amateur radio manuals at about £4: *Microcomputers and the Radio Amateur*, *What is Amateur Radio?*, *RTTY for Radio Amateurs*.

Specialist Modes

Activity in specialist modes is small. Satellite users are limited to perhaps 200 amateurs, amateur television to perhaps 30 and RTTY to about 150

50



TABLE 2: TRUE BEARINGS

From ►	Belfast 54°35' N	London 51°30' N	Birmingham 52°30' N	Glasgow 55°53' N
To ▼	5°55' W	0°10' W	1°50' W	4°15' W
Madrid: 40°25' N 3°43' W	173° 1580 km	194° 1260 km	187° 1350 km	178° 1720 km
Barcelona: 41°25' N 2°10' E	155° 1580 km	170° 1135 km	165° 1270 km	161° 1675 km
Valencia: 39°29' N 0°24' W	164° 1730 km	181° 1335 km	175° 1450 km	170° 1845 km
Seville: 37°24' N 5°59' W	180° 1910 km	199° 1630 km	193° 1710 km	184° 2060 km
Las Palmas: 28°08' N 15°27' W	199° 3040 km	212° 2890 km	208° 2930 km	201° 3210 km

people. While *CQ Amateur Radio* and the URE journal both run computer articles, the use of computers is not yet widespread, limited to about 300 amateurs presently. This is increasing all the time, however. About 50 amateurs use Esperanto, too, which must be the specialist mode par excellence.

Spain has one hundred 144MHz repeaters, 11 432MHz repeaters and six beacons. Of the repeaters, 81 are operated under the auspices of URE and the remainder by other associations.

Awards and Contests

The Spanish calendar includes 120 contests. While some are RSGB and

ARRL contests, most are Spanish and South American contests. The five main contests are S M el Rey (His Majesty the King) in April, Cervantes in June, Huelva Cuna de America in July, Iberoamericano in October and the Carnavales de Tenerife in November.

Spanish amateurs principally work towards Spanish and South and Central American awards. On Spain's 100 most wanted DX countries' list, UK calls appear four times: South Sandwich VP8 at position 15, South Georgia VP8 at 16, South Orkney VP8 at 64, and South Shetland VP8 at 91.

I have supplied rules for five Spanish awards to the editorial office of *PW*, a copy of which can be obtained with

Practical Wireless, February 1989

either an s.a.e. and 2 first-class stamps or 3 IRC's. Go to it! Basic QSO's in Spanish were outlined in *PW* September, October and November 1983, and beam headings for Spain from centrally located Birmingham are on Fig. 2; other centres' beam headings are appended also.

Lastly, remember if you're in Spain check out the gear in shops like that of Christobal at 28 Arniches, El Corte Ingles or the components on Calle Barquillo or at the Rastro stall of Florentino and Jose Luis on Sundays. You'll get a great welcome and make your trip that much more interesting. **PW**



Constructional

Kitchen Konstruktion

In number 10 of his occasional series, Richard Q Marris G2BZQ tells how to make a few useful home constructors' tools

If you dabble in home construction then no doubt you probably own and use a Junior hacksaw, or maybe its big brother, the standard hacksaw. These types of saw are great for cutting general d.i.y. materials, provided the cut is to be made along an accessible edge and the material's cross-section is not greater than half the length of the blade. Outside these parameters the hacksaw loses its usefulness due to its bow-type construction.

The saw needed to overcome these restrictions is called a padsaw and is ideally suited to cutting rectangular holes in large panels. This type of saw was very popular about thirty years ago, when chassis bashing was in favour. However, since that period this tool has largely been forgotten; which is a pity as it's a very useful item to have.

For those of you that have never clapped eyes on a padsaw, the following description may help you understand its qualities. A padsaw in its most basic form is merely a clamp type handle, capable of holding a hacksaw blade. Normally these handles will accept only standard size blades, rather than Junior blades. Padsaw handles are still available at about £5 from companies like Electromail. But if you don't fancy forking out for a ready made padsaw handle you could make your own.

To make a standard size padsaw handle, take one new hacksaw blade and fit a handle as shown in Fig. 1. The handle is made from two strips of wood, wider than the depth of the blade. With the two pieces of wood clamped together, drill and countersink a suitably sized hole, to take a small nut and bolt. Next degrease the

hacksaw blade with methylated spirit, and Superglue the two pieces of wood to the blade (Fig. 1). Then add the nut and bolt and tighten accordingly. After the glue has cured, round off any rough corners on the handle and smooth its surface with glasspaper. Finally give the handle a good coat of varnish.

To make a Junior padsaw, obtain a small wooden file handle, available from your local d.i.y. store. The file handle consists of a piece of turned and shaped wood, which has a small hole partially drilled up its centre. This hole is to accommodate the tang of a file and order to stop the wood splitting when the file is rammed home, a metal ferrule is fitted around the entrance of the hole.

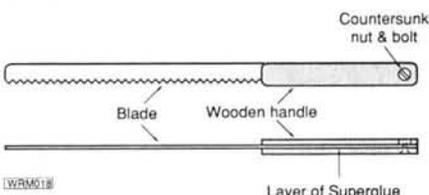


Fig. 1: Standard sized home made padsaw

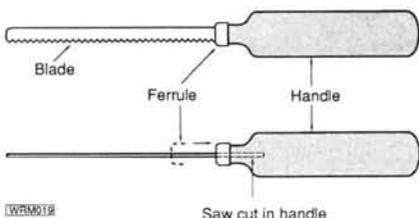


Fig. 2: Junior sized padsaw

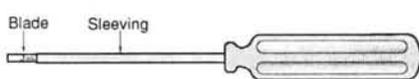


Fig. 3: Long insulated screwdriver

Take the file handle and using a screwdriver force off the metal ferrule. Then using a Junior hacksaw cut a slot partially down the centre of the handle. This slot is to accommodate a Junior hacksaw blade, as shown in Fig. 2. Next using pliers, remove the pins from both ends of a Junior hacksaw blade. Slide the prepared (degreased) hacksaw blade into the slotted handle and Superglue in place. Then force the metal ferrule back onto the file handle.

Long Insulated Screwdriver

Every now and then it's necessary to make crucial adjustments deep in the heart of a working piece of equipment. Long thin ($\frac{1}{8}$ in dia.) screwdrivers are available with 150mm to 200mm blades, but seldom are the blades insulated. If one attempts to use one of these screwdrivers the inevitable will happen, you'll short something out. As a golden rule, never, unless it is vital, try to adjust equipment in this way, when it's live. Remember SWITCH OFF before doing any unnecessary internal twiddling, as death is so permanent.

However, having made the warnings clear, there is a way around shorting things out with long screwdrivers. Take a length of suitable diameter heatshrink sleeving, twice as long as the screwdriver blade. Then using a hair drier shrink first one layer on and then the other over the top of the first. This way the blade is double insulated and more robust. If however, the sleeving becomes damaged in the course of time, remember to repair it before use, by adding a fresh top layer of sleeving. **PW**

RF Operated Relay

Simple circuits are often the best and most useful, as is this one from Paul Benton G8SVE. Don't be put off by this project's lack of technology, because the next time you build a QRO p.a. for your black box transceiver, you'll need this little circuit.

This simple design was produced out of necessity, after the author had built an external p.a. and a separate pre-amplifier in an effort to improve the performance of an ageing transceiver. The transceiver had no facilities for hard wiring an external p.t.t. line and the technical information regarding the equipment was rather scant. The author eventually came up with the design shown in Fig. 1 to overcome the need to modify the transceiver in question. There are many other uses for the r.f. operated relay, besides switching antenna circuits. You could for instance use it to mute another receiver while on transmit, to switch on and off cooling fans or even to run an "On-Air" light outside the shack.

The relay specified for the project won't handle the full legal power, but it should put up with at least 25W at 144MHz. The relay is quoted as having an a.c. contact rating of 5A at 250V.

Circuit Operation

Operation is relatively straightforward. The r.f. is picked up via a short length of wire (sensing antenna) and is then fed to rectifier doubler circuit C1/D1 and C2/D2. The resultant d.c. level is then fed to the base of Tr1, which along with Tr2 forms a Darlington pair high-gain amplifier. The d.c. level causes the Darlington pair to conduct thus energising RLA. The purpose of D3 is to protect Tr1 and Tr2 from the back e.m.f. generated in the

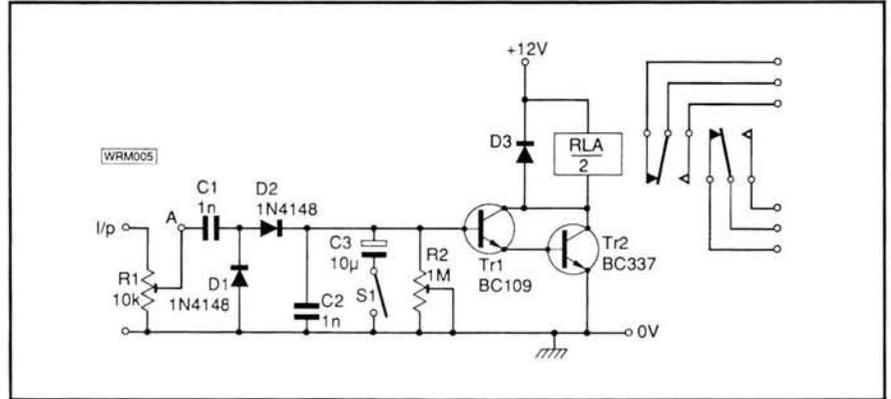


Fig. 1: Basic circuit of r.f. operated relay. D3 is a 1N4005

coil of RLA every time it is de-energised.

The combination of C3 and R2 form what is known as a "hang-time" circuit, which is required for c.w. or s.s.b. operation. These two transmission modes are not continuous in nature and will cause the relay to chatter. The "hang-time" network will slow down the decay of the d.c. level present across C3, thus holding RLA in during the short gaps in the transmission.

Construction

The construction of the project is very straightforward. First mount all the components on the p.c.b. and install Veropins where off-board connections are to be made. As mentioned earlier the relay contacts are rated to handle mains voltage.

If you intend to use the finished project to control mains-powered equipment, great care should be taken to use well insulated wire that is rated for 250V a.c. and to sleeve all bare off-board connection on the p.c.b.

Circuit Modifications

To increase the "hang time", the value of C3 should be increased. The switch S1 could be replaced with a wire link if the unit is to be used exclusively on s.s.b.

The prototype unit had no input attenuator (R1), so when it was tested with a child's QRP c.b. rig, the relay tended to false-trigger even on the stray r.f. picked up from the receiver's local oscillator. This means there's no lack of sensitivity, in fact in a shack with

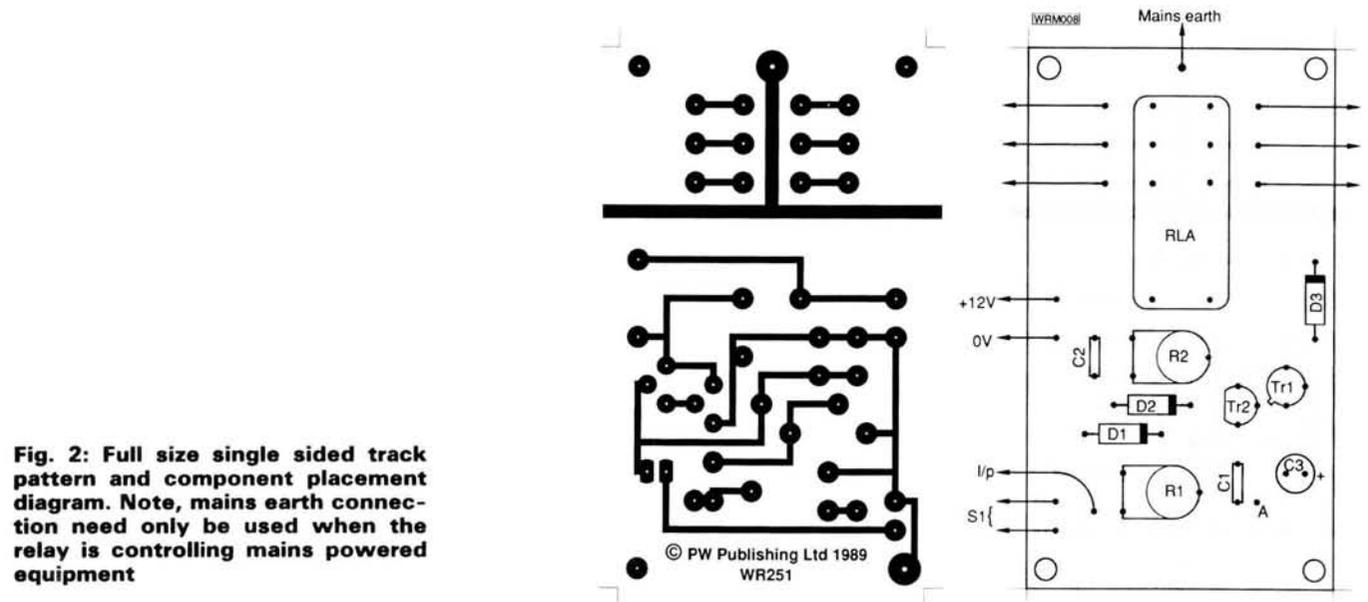


Fig. 2: Full size single sided track pattern and component placement diagram. Note, mains earth connection need only be used when the relay is controlling mains powered equipment

more than one TX the circuit may still false-trigger. To have a more positive control over the relay, a tuned circuit may be installed in place of R1 (Fig. 3). With the resonant circuit tuned to the same frequency as the required transmitter the relay will then operate only with that one rig, providing there are no other transmitters in the shack running on or near the same frequency band.

In areas with high field strength it may be necessary to install the relay in the same screened box as the ancillary equipment it is to operate. Then a closer form of coupling can be used as shown in Fig. 4., instead of the short length of insulated wire which forms the sensing antenna.

PW

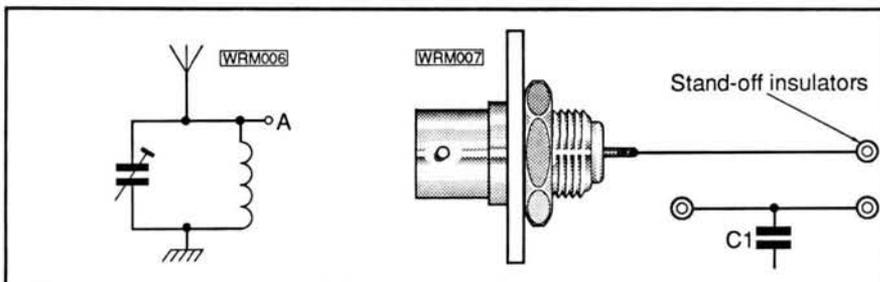


Fig. 3: Tuned circuit for making the r.f. relay frequency-selective

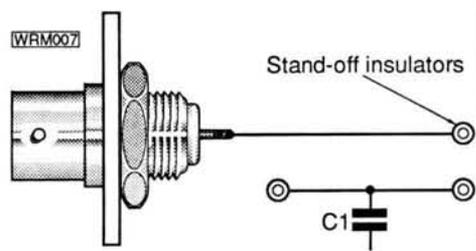


Fig. 4: Suggested close coupling technique shown inside ancillary equipment

**How Much?
&
How Difficult?**

£9

Intermediate

SHOPPING LIST

Resistors

0.15W 20% Carbon

Horizontal preset

10kΩ 1 R1

1MΩ 1 R2

Capacitors

Monolithic ceramic 63V

1nF 2 C1,2

Sub-miniature radial electrolytic

10μF 1 C3

Semiconductors

Diodes

1N4005 1 D3

1N4148 2 D1,2

Transistors

BC109 1 Tr1

BC337 1 Tr2

Miscellaneous

RLA OM1 Cirkit (46-70060); p.c.b.; connecting wire; S1 s.p.s.t. miniature toggle; Veropins.

SWAP SPOT

Have f.m. CB, 2 mikes and p.s.u., plus Steepletone SAB-9 with l.w., m.w., f.m., and airband. Would exchange for any shortwave receiver with b.f.o., valved or solid state or w.h.y? T. Galt, 51 Kilmuir Crescent, Arden, Glasgow G46 8BU. E946

Have Yaesu FT-757GX, FP-757HD and FC-757AT, unmodified and little used, on receive only. Would exchange for quality medium format camera system, or picture mounting hardbed press and picture mount cutter. Mr Barnes. Tel: Halstead 0787 473112. E947

Have 48K Spectrum+ with RS232 interface and Microdrive, plus lots of spare cartridges. Complete with leads, p.s.u., manuals and reference books all in good condition. Would exchange for working condition Commodore 64 computer with disk drive. Richard G6AKG. Tel: 0202 678558. During office hours. E948

Have Realistic PRO-2004 scanner. Would exchange for a Yaesu FRG-7700 receiver. Ray. Tel: 0443 755876. E893

Have Praktica MTL5B camera with auto flash, 50mm, 35 and 135mm lenses plus shoulder strap and holdall in excellent condition. Would exchange for hand-held scanner, e.g. Tandy Pro-32 200 channel or good 144MHz hand-held transceiver, w.h.y? Dave G1CCL, 192 Ambleside Road, Lancaster LA1 3ND. E895

Have Nissen Panasky short wave DX receiver with bandspread, covers m.w., 5.9-6.2MHz, 9.45-9.8MHz, 11.65-12MHz, 15.05-15.5MHz with logging scale. Would exchange for Zenith 12 35mm camera or telescope with 100x magnification or Super 8mm sound films. G8BSK, 290 Priory Road, Southampton SO2 1LS. E950

Have photographic colour analyser, professional valved type, made by Lectra Laboratories model number PTM-10. Would exchange for scanner 25MHz up with f.m. Tel: Walsall 642509. E962

Have Realistic DX-300 communications receiver 0-30MHz. Would exchange for Matsui MR-4099 type portable receiver. M. Whiting, 122 Weatherhill Road, Lindley, Huddersfield. Tel: 0422 79023. E965

Have 63 *Practical Wireless* magazines 1974 to October 1988, all in excellent condition but some issues missing. Would exchange for portable receiver covering 108 to 174MHz. Tel: Paignton 550035, after 11 a.m. E985

Practical Wireless, February 1989

Got a camera, want a receiver? Got a v.h.f. rig, want some h.f. gear to go with your new G-zero? In fact, have you got anything to trade radio-wise? If so, why not advertise it FREE here. Send details, including what equipment you're looking for, to "SWAP SPOT", *Practical Wireless*, Enefco House, The Quay, Poole, Dorset BH15 1PP, for inclusion in the first available issues of the magazine. A FEW SIMPLE RULES: Your ad. should follow the format of those appearing below, it must be typed or written in block letters; it must be not more than 40 words long including name and address/telephone number. Swaps only—no items for sale—and one of the items MUST be radio related. Adverts for ILLEGAL CB equipment will not be accepted. The appropriate licence must be held by anyone installing or operating a radio transmitter.

Have Realistic DX-440 digital readout h.f. receiver with a.m. u.s.b. and l.s.b. modes, covers 150kHz to 30MHz continuous plus 88 to 108MHz f.m. worth £150. Would exchange for v.h.f.-u.h.f. scanner, must cover 144MHz and 430MHz amateur bands. Ken. Tel: 091-548 7041. E993

Have Emdicta model 2400E/12 recorder; Cossor 1035 Scope; Marconiphone 248 cabinet; Eddystone 358X cabinet and 10W amplifier 12V d.c. input. Would exchange for any military wireless equipment, government surplus wireless equipment handbooks or Eddystone 'S' meter for 888A receiver. Tel: 0926 400876. E994

Have A.W.A. CR6B valved dual-conversion receiver, made in Australia, in mint condition. Would exchange for English or European made receiver. 39 Central Avenue, Maylands, West Australia 6051. F002

Have 10GHz QRO Klystron, 75mW flange output with micrometer tuning. Would exchange for good CdS light meter. Mann. Tel: Cambridge 860150. F015

Have FT-690 MkII complete with NiCads case and manuals, also 50W linear amplifier. Would exchange for 430MHz multimode base or mobile or FT-726. John. Tel: 061-202 2715. F023

Have Yashica FR and FX-II SLR 35mm camera. Would exchange for dual-band hand-held transceiver or one for each band, 144MHz and 430MHz. J. D. Bolton G4XPP, 10 Bowness Road, Coniston Park Estate, Timperley, Cheshire WA15 7YA. F032

Have Standard C58 multimode portable transceiver plus manual and accessories. Would exchange for amateur radio gear (no computers). J. D. Bolton G4XPP, 10 Bowness Road, Coniston Park Estate, Timperley, Cheshire WA15 7YA. F032a

Antenna Clinic

Session 2

Q "I want to construct vertical antennas for the 14, 21 and 28MHz (20, 15 and 10m) bands, based on the 'Ring Base' antenna for 144MHz (2m) published in *Practical Wireless* October 1982 (reprinted in the *PW* publication *Wires & Waves*). Can you supply the dimensions and the value of the loading inductance for each antenna? Also, what would be the optimum height above ground for these antennas?"

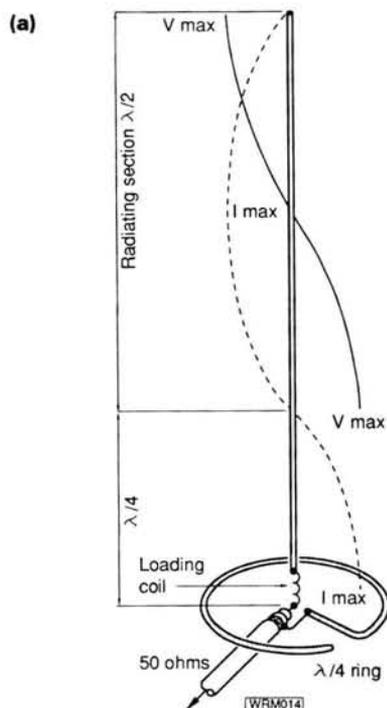
A The 2m Ring Base antenna was designed to operate as a virtual "free space" antenna at a height of several wavelengths above ground. Its overall length is approximately 1.27m (50in), the diameter of the quarter-wave ($\lambda/4$) ring at the base being about 140mm (5.5in). The general configuration is shown in drawing (a). On a frequency ratio basis, the approximate dimensions for each of the h.f. bands mentioned would be:

Band	Length	Ring diameter
14MHz (20m)	13.15m (43ft)	1.4m (55in)
21MHz (15m)	8.76m (28.7ft)	980mm (38.5in)
28MHz (10m)	6.35m (20.8ft)	700mm (27.5in)

The minimum height of the **bottom of the antenna** above ground to prevent detuning the ring at the base would have to be at least a quarter-wavelength at the frequency of operation. In view of the total length of each antenna, the construction would need to be fairly substantial, with large diameter tube for the elements and a strong mounting base. For the 14MHz band, the bottom of the antenna would have to be about 5m (16.4ft) above ground. This, plus the length of the antenna itself (13.15m) would bring the overall height above ground to 18.15m, or about 60ft!

Even for the 21MHz band, after allowing for the minimum height to the bottom of the antenna, the overall height would be 12.46m (41ft).

The amount of series inductance between the bottom of the vertical element and the base ring would have to be determined empirically, because of the additional but unknown capacitance and self-inductance introduced by the much longer and larger diameter material used for the main element. To establish this would entail building a prototype antenna for each band, making the requisite adjustments and

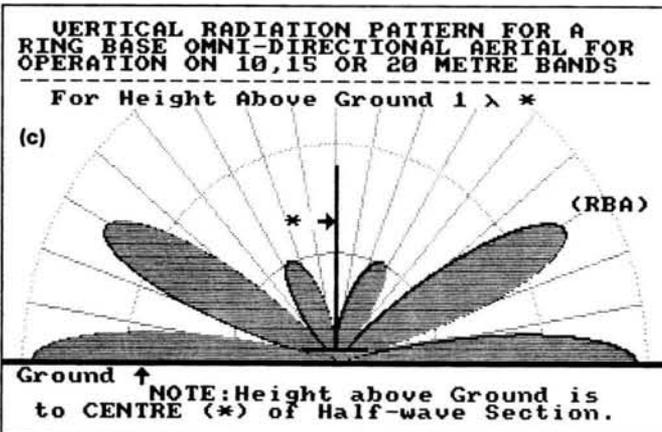
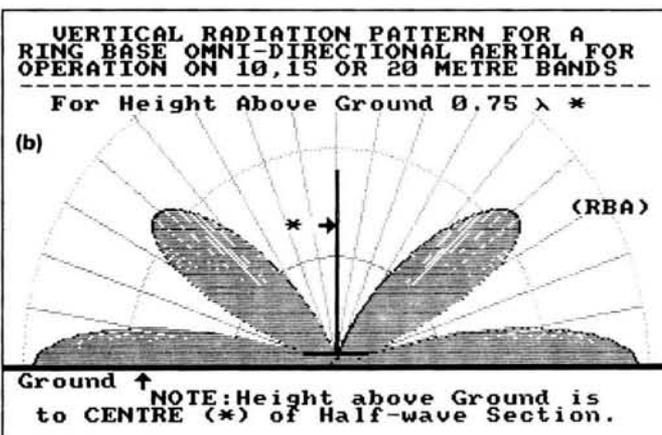


In the course of a year, antenna specialist F. C. Judd G2BCX receives many queries from radio enthusiasts, both about his own designs and about antennas in general. These come not only from various parts of the British Isles, but also from as far afield as Australia, New Zealand, Indonesia, Sri Lanka and several European countries.

Often, several people will ask a very similar question, highlighting a point that may be widely misunderstood. This series aims to explain some of these.

then measurements to ensure an acceptable performance. There would be no point in doing this for the following reason.

The vertical radiation pattern is determined by the height from ground to the **centre of the half-wave section**, which must also take into account the initial minimum height of the bottom of the antenna. For either band this would be a minimum of three-quarters of a wavelength ($3\lambda/4$). The resultant vertical radiation pattern (computer generated) would be as shown in drawing (b). This shows two lobes at a very low angle and two of more or less the same magnitude and width at an elevation of 40° . Since the r.f. power to the antenna is shared between the lobes, about half would be wasted at the higher angles. Increasing the height of the antenna, which could prove mechanically difficult, would do nothing to improve the vertical radiation as the second pattern (drawing (c)) illustrates. So, in this case, it is not just a matter of "scaling up" the size of the antenna. The design simply does not lend itself to h.f. band operation.





STANDARD.

FOR THE BEST CHOICE
IN DUAL-BANDERS

£599

£275

Reduced price £359



C5200



C500

C150



The latest addition to the Standard range is the C150, a feature packed supercompact 2m transceiver. Built with the usual high quality of construction that we have come to expect from Standard, this tiny radio has all of the usual features of a modern microprocessor controlled transceiver — plus several new ones.

- ★ Frequency Range 144-146MHz (with extended receive capability)
- ★ Up to 5W RF output
- ★ 3 position RF power output switch — Hi, Mid & Lo
- ★ 20 memories (in 2 banks of 10)
- ★ Power requirement 5.5-16V dc.
- ★ Superb sensitivity — less than 0.16V at 12dB SINAD
- ★ 6 different Dual Watch modes — yes, 6 different monitoring methods!
- ★ 14 different scanning modes
- ★ Paging function — individual and simultaneous group call available
- ★ DTMF and CTCSS available as optional extras
- ★ Separate Tx and Rx frequencies can be set for semi-duplex operation
- ★ Squelch-Off button to save knob twiddling
- ★ Battery Save and Automatic Power Off facilities
- ★ Rotary or Pushbutton frequency selection
- ★ Built-in S-meter
- ★ Splash proof case
- ★ Soft touch buttons and knobs
- ★ Keyboard Lock (Rotary Control is left active)
- ★ PTT Lock to prevent accidental transmissions
- ★ Sockets for external microphone, speaker and power supply
- ★ A comprehensive range of accessories is available
- ★ Size — 124mm High × 55mm Wide × 31mm Deep

This superb new radio **should** be available before Christmas and we will be pleased to tell you more about it when you visit or telephone our shop.

Introductory Price

£230

Coming soon from Standard, the AX 700E.
A wideband scanner — with built-in panoramic adaptor

PLEASE REMEMBER, WE ARE THE SOLE IMPORTER OF STANDARD EQUIPMENT IN THE UK AND WE ARE ABLE TO OFFER A FULL BACKUP SERVICE AND SPARES FROM STOCK.
SAE brings you leaflets on all rigs

400 EDGWARE ROAD,
LONDON W2
01-723 5521 Tlx 298765



Normally 24hr despatch but please allow 7 days for delivery.

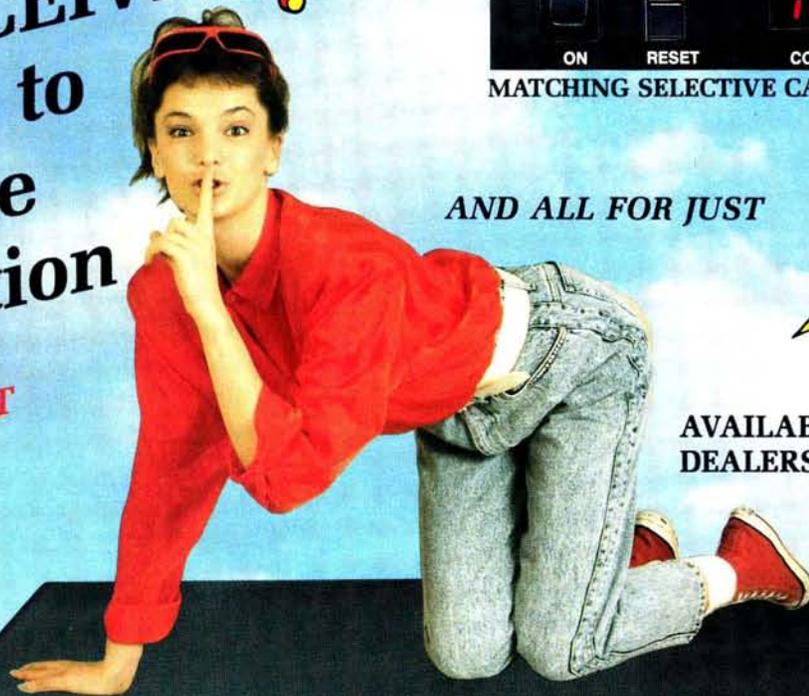
PLEASE NOTE WE ALSO STOCK
ROTATORS — SWR METERS — MORSE
KEYERS — ANTENNAS — POWER
SUPPLIES — ADDONIS MICS — COAX
SWITCHES — PLUGS — SOCKETS ETC.

OPENING TIMES:
9.30am-5.30pm Mon-Fri.
10am-4.30pm Sat.
Normally 24hr despatch but please allow 7 days for delivery.

Shhhhhhhhhhh

Keep this
to yourself!
the **NEW**
TRX404
TRANSCEIVER
is going to
upset the
competition

...JUST LOOK AT
IT'S FEATURES



FEATURES

- ★ **A UNIQUE NOISE SQUELCH SYSTEM** Ensuring you hear only FM transmissions through the Squelch and not interference.
- ★ **A SUPERB RECEIVER** Using double crystal filters that drastically reduce co-channel interference (Bleedover).
- ★ **A PROVISION FOR SELECTIVE CALLING** Using our new SR316D Sel Call unit that simply plugs into a socket provided on the TRX404.
- ★ **A SWITCHEABLE 'ROGER' BLEEP**
- ★ **A 4 WATT TRANSMITTER THAT DELIVERS 'PUNCH'.**

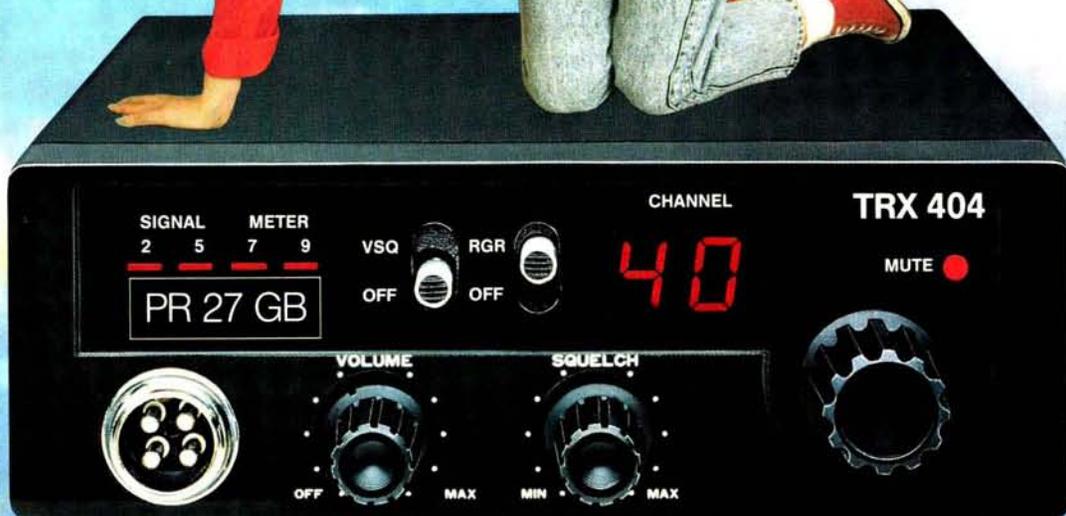


MATCHING SELECTIVE CALL UNIT - £59.95

AND ALL FOR JUST

£69.95

AVAILABLE FROM AUTHORISED
DEALERS THROUGHOUT THE UK



THE TRX404 27MHz TRANSCEIVER IS AVAILABLE IN TWO MODELS
 MODEL TRX404UK. ON THE STANDARD UK CHANNELS
 MODEL TRX404 FULLY APPROVED C.E.P.T. RADIO
 MODEL SR316D MATCHING SEL CALL UNIT FOR BOTH MODELS

DISTRIBUTED IN THE UK BY:—

NEVADA

TEAM UP WITH THE BEST

89 LONDON ROAD NORTH END PORTSMOUTH PO2 9AE

TEL: (0705) 662145 FAX: 0705 690626

On The Air

On The HF Bands

Reports to Paul Essery GW3KFE
287 Healy-Coleg, Vaynor, Newtown, Powys SY16 1AR

The bands have doubtless seemed better than they should have on account of the DX pile-ups and the contests; but my own yardstick is the signal strength of some of the Antipodean "regulars" over the long path in the mornings—and by and large these have been pretty steady

Question!

A nice letter from **G0KDZ** (Thirsk) to kick off with. Mike poses the question: if one can work the world with 100 watts, a CB antenna up at 7m, what is the point of a 18m tower surmounted by a four-element beam, and a linear down below? Clearly we have here a candidate for the G-QRP Club! Seriously, one can indeed work the world with very little when the conditions are right; but the 28MHz band (10m) will be virtually dead for several years at the bottom of the sunspot cycle and on the 21MHz (15m) and 14MHz (20m) bands any attempt at cracking a pile-up is made so much easier if one has a Big Signal. Do any readers have words of wisdom to add to this?

Mentions

John Fitzgerald writes to mention the WAB Awards which are available to the s.w.l.s as well as licensed amateurs. The regular WAB net frequencies are (nominal) 1.93–1.95MHz, 3.76MHz, 7.06MHz; and the DX enthusiasts congregate on 14.28MHz, 21.36MHz and 28.46MHz. Details on everything WAB from **G4KSQ** at 22 Burdell Road, Sandhills Estate, Headington, Oxford OX3 8ED.

G0DKN (Salisbury) offers a note of his activities in October in Malta. Andrew took along a FT-290R driving a Howes 2-20 transverter, putting ten watts into a dipole at some 20 metres above ground, 9H3JJ was the call. Among others AL7FQ, C30DSA, LU5DL, N5AU, ON4RIP, P4OP, RO5OC, VK3AG and ZL2JL were raised. On the licence question, **G0DKN** telephoned a couple of days before to enquire about a ticket—he was told to bring along a photocopy of the front page of his licence and a photocopy of the Validation document. On arrival in Malta the licence was issued within ten minutes!

Finally in this section we must mention **G0EWR** (Stourport-on-Severn) who has a QSL for c.w. contact with W4NTW, Echo Radio Club, for a c.w. QSO on 16 June 1987, on 21.020MHz. Will the rightful owner please claim his QSL—it certainly couldn't have been for **G0EWR** for various reasons. The address is: D. Wale **G0EWR**, 47 Ribbesford Drive, Stourport-on-Severn, Worcs DY13 8TQ.

Top Band

Where have all the reporters gone? Our only mentions this time are from **G3BDQ** (Guestling) and **G2HKU** (Sheppey); the former used s.s.b. to raise JX1UG, UP8A, HBOCZS, UO4OXV, LX1BV and other Europeans, plus c.w. to UG6GAW and EA6NB.

G2HKU used his s.s.b. for contacts with UP8A and ON7BW, while c.w. accounted for OZ3FI and OK1DRU.

Practical Wireless, February 1989

The 3.5MHz Band

Yes, there is some gold to be found amid the vapourings here! Try c.w.! However, all this being said, alas the only reporter on this band was **G0HGA** (Stevenage), and even using her full power Angie didn't manage to get outside of Europe save for UA9FB. Although, on the other hand, she did make it to just about every part of Europe, in the evenings.

The 7MHz Band

This seems to have been the main area of interest for **G2HKU** this time; Ted offers c.w. with UZ0QWT, RFOFWW, U0AL, UL7VAB, R18BT, UA3AVV, W1KM, K2OZ, VU2ASH, N4UB and SV4AAQ.

The 7MHz band (40m) activity at **G4XDJ** (Billingham) included contacts with ON7VA, G3LPN, U1AU, G4ITL, W1MK, G0GRU, SM4GL and SM6LJU.

G0JFM (Brixham) managed to find time for s.s.b. with I2UPG and SV1DO on this band.

Quite an enormous list comes in from **G0HGA**. Most of them were Europeans while using QRP, but on the 100 watts of c.w., KB2RM/4, UZ0AB, J3/K8CV, N9BQ/M, W4BQF, TA1Q, N2ER, K1ZZI, W3NZ, 5N7OKRA, W2FH, N5IP and UA9SH were all popped in the bag.

Up North now, to **GM3JDR** (Wick), Don stuck to c.w. on the band, which resulted in 9Q5DX, RV0YF, U0AL, JX1UG, JA5DQH, JE7MQB, JR1TNE, JA3RRN, JA6BSM, JA4GQK, JA8DLQ, JE1VTL, JH1GRG, JF1NZW, JH1QOJ, JA5RH, CM2QN, CO2SO, TA2AO, UA0WAO, YC5PD, NS7Z, WO7K, KH6IJ, KL7KJ, AL7B, AL7IF, AG4T/KL7, NTOZ, VU2ASH, 3W8CW, HC3AV/5, 8P6AU, YC3HRM and XE3PLV.

Finally for this band, **G3BDQ** who stuck mainly to s.s.b.; that way he raised 21 assorted JAs, UZ9CXX, UA0SEM, UJ8JJI, 6W8KW, VE2RP, TA2BK, VK3NC; c.w. knocked off SN70POZ (Poland), UH9HWB, A92BE, C6ANX and UI9ACP.

The WARC Bands

G2HKU tried 10MHz and made c.w. contacts with UA6LGM and DL1DQ.

A 24MHz addict s.w.l. is **Ian Hatton** (Derby) who uses a G5RV and a Racal RA17. Using this combo, Ian picked up ON4ABB, ND1T, YU2WM, CU2AF, 4X6RN, KV4AD, ISOEP, W9WVPV, EA9TP, CT2HB, J37AJ, W5CNE, K4VHV, W4QO, EA4DW, T77T, 5B4OK, I0AMU, Y25WJ, VU2NR, W0CM, TK5BF, VE3VX, K6STI, YT1V, PY3NZ plus loads more Stateside stations on s.s.b. around 24.890–24.990MHz; some of the latter were working an (inaudible in Derby) P29ZL.

GM3JDR found c.w. on 10MHz did the trick with JP3AZA and VK5FE, while on 24MHz he managed Ws, VEs, EA6BD and TU4CO.

The 14MHz Band

On this band we start with **G2HKU** who found DL4EB/SV9, HK1FCG, W2MUM, LU5EID, HK1ATG and P43SF.

On 14MHz (20m), **G4XDJ** mentions VK5GZ, VK3GFO and VK3PX.

Turning to **G0HGA**, clearly Angie doesn't go a lot on the band, but she did get around to putting a fifty watt carrier up the vertical, which managed UO5AR and ZZ2WV (QSL via PP2WV): in addition there were lots of Europeans in the contest.

G3BDQ tried some QRP—three watts to a doublet—and raised CT3CU on s.s.b., then AL7FG, DK2SC/4S7, VE8RCS and V47Z.

The 21MHz Band

Now here's a band for you; more active than 28MHz, less noise than 14MHz and plenty of DX. What more could one ask?

First, we have a report from **GM4SVM** (Stirling) who offers c.w. contacts with 5N28ELT, VU2SFY, PY2PAR, CO6SF, ZC4RF and CX8DR, who came back to a CQ when the band was dead due to auroral activity. Then s.s.b. yielded KP2BH, P4/KQ2M, ZS6OT, JY7CI and 4X1OZ. Gordon has just finished a monoband two-element beam to replace the rotary dipole and wonders if as a result he will miss much DX off the back. I doubt it, somehow!

G0CLP (Wymeswold) used to be G5ECD. He is operational, between studies, with an Icom 730 and a three-element beam, mainly on 21MHz (15m). In the contest on October 16, Chris had some 450 QSOs, and a multiplier of 67, with all JA call areas, all W prefixes including some twenty stations on the West Coast and all Canadian prefixes; also VK8AV, VK6LW, UL7CW, UM8MAD, UJ8JA, 5N0B/G3IGQ, VS6UO, NY6M/KH2, ZC4NC and several PY and LU stations. On October 28, P40TL was hooked along with UZ9OVM/UJ7 and WB4FLB/V47. In the s.s.b. contest on October 30, HD9OT, ZP5OY and YS0YS were raised. Finally, late on November 2 and into next morning, a session produced ZL3BJ, PY5BI/ZP9, ZL1AW, all dredged up from what appeared to be a dead band.

Now to **G0HGA** and the QRP; her c.w. managed YU1BEF, EA6ZY, UA3VBU, UR2QA, UA1DZ, UV1AS, UA9FGJ, K2UPD, N2KW, VE5UF, K2SIG, AA6DX, K3ZO, KA1DWW, WB00, K2MGR, NM2Y, VE7CC and shoals of Europeans.

That 50:50 ratio of c.w. and phone seems to have been used all month by **G4XDJ**; however, it may be on 21MHz he made it to K11K, UA6LHB, VE8RCS and HBOCZS.

Now **GM3JDR**. First the c.w.: HL0K, 3D2XX, 5UV386, P40ZZ, W6KG/5B4 (Lloyd and Iris Colvin on tour again), A4XEF, FY4EP, plus lots of JA and W; on s.s.b. were VP8APK, V44KI, JA, PY and Ws.

As for **G2HKU**, he obviously didn't fancy the band much this time, with just the one c.w. contact with VE1CAF in the list.

The short s.s.b. list from **G3BDQ** includes 9N1RN, UZ9OVM/UJ7K, 9V1WP, NW2000 (USA), PJOJ, HI3JO, 8P9X, HD9OT, PJ1B, FJ5AB, ZF2ML/A8 and TA2KB.

ARROW ELECTRONICS LTD

HEAD OFFICE 5 The Street, Hatfield Peverel

(Nr Chelmsford) Essex
Tel: 0245 381626
0245 381673
0836 739577
FAX: Call

Hours: 9-5 Mon-Sat. Closed Thursday

GLASGOW OFFICE
Unit 17, Six Harmony Row, Govan,
Glasgow G15 3AD
Tel: 041 445 3460
8.30-5.30 Mon-Fri. Late night Thurs
8pm

THE BEST DEAL IN AMATEUR RADIO

ALL MAJOR BRANDS AT DISCOUNT PRICES
AVAILABLE NATIONWIDE — CALL ANY NUMBER FOR FAST EFFICIENT SERVICE
(Arrow are AUTHORISED dealers for Kenwood, Icom, Yaesu and all we sell)

NORTH WALES
John Lewis,
Tel: Anglesey 0248
714657

WIGAN
Jim Cook
Tel: 0942 214968

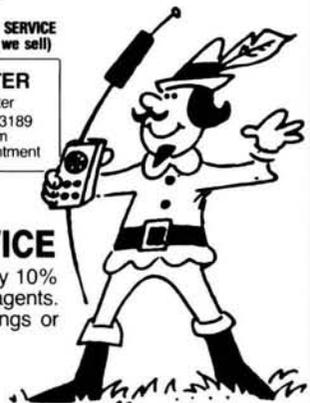
LEICESTER
Dave Foster
Tel: 0533 603189
latest 9pm
Call by appointment



TEN-TEC
Products now available
from stock — SAE for
brochure

NEW! 'COMPUTARIG' SERVICE

Arrow will sell your unwanted equipment for only 10% commission, via our nationwide network of agents. Please phone for access to our computer listings or send SAE.



ACCESS — VISA CREDIT SALES (HP) — PROMPT MAIL ORDER

ANTENNA TUNER

LOSING DX? BOOST reception and reduce interference with an **ANTENNA TUNER**, 100KHz-30MHz in 6 overlapping ranges, for outside or INDOOR ANTENNAS, end-fed LONG WIRES or dipoles, **IDEAL** for FRG7700 etc or 10W tx, **only £31.30**, hear **WEAK DX**, also just connect voltmeter to make yourself a **FREE WAVEMETER**, field strength meter etc.

V.L.F.? EXPLORE 10-150KHz, Receiver £28.20.

L.W. DX? 100-600KHz Converter to 3.5-4.0MHz, built-in antenna tuner, **£27.20**, receive weather facsimile etc.

Each fun-to-build kit (ready-made to order) includes all parts, case, pre-wound coils, pcbs are fibre glass, instructions, by-return postage etc. and list of other kits.

CAMBRIDGE KITS

45 (PP) Old School Lane, Milton, Cambridge.

VALVES

*High Quality
**Very High Quality
Prices correct as when going to press but may fluctuate: 15% VAT incl.

A1065	1.40	EF89	0.80	EF89	1.60	EY81	1.10	PFL200*	2.80	UCC84	0.85
A293	7.00	EC52	0.65	EF91	1.60	EY86/87	0.75	PL36	1.60	UCC85	0.70
A290	12.75	EC91	4.80	EF92	2.15	EY88	0.85	PL81	1.30	UCC82	1.50
AR6	1.15	EC92	1.85	EF95	1.90	EZ80	0.80	PL82	0.70	UCC81	0.75
AR3	1.15	EC81	1.25	EF96	0.80	EZ81	0.80	PL83	0.90	UCC82	1.60
AR35	1.15	EC82	0.95	EF96	0.80	EZ81	0.80	PL84	0.90	UF41	1.85
ATP4	0.90	EC83	1.10	EF183	0.75	GM4	8.30	PL504	1.25	UF80	1.80
B12W	5.50	EC84	0.80	EF184	0.75	GN4	6.30	PL506	2.00	UF85	1.45
CY31	2.40	EC85	0.75	EF182	0.75	GY501	1.50	PL509	5.65	UL84	1.50
DAF70	1.75	EC88	1.10	EF1200	1.85	GZ32	2.80	PL519	1.85	UM80	1.80
DAF96	0.90	EC189	1.20	EH90	0.85	GZ33	4.20	PL802SE	3.45	UM80*	2.30
DET22	32.80	EC804	0.65	EL32	0.85	GZ34	2.45	PY80	0.70	UM84	0.95
DF2	0.85	ECF80	1.25	EL34	1.35	GZ34*	6.30	PY81/800	0.85	UY82	0.70
DF96	1.15	ECF82	1.15	EL34*	6.75	GZ37	3.95	PY82	0.75	UY85	0.85
DH76	1.15	ECF82	1.80	EL82	0.70	KT77**	14.00	PY88	0.60	VR105/30	2.45
DL32	1.45	ECH42	1.05	EL84	1.35	KT88**	25.00	PY800A	2.10	VR150/30	2.45
DY86/87	0.65	ECH81	1.25	EL86	1.45	ML4	1.75	QDV03/10*	5.95	XE1M	1.70
DY802	0.70	ECH80	0.65	EL90	1.75	ML6	3.20	QDV03/20A	7.50	X86	4.95
ER2CC	2.80	ECL82	0.75	EL91	6.50	ML6	3.20	QDV06/20A	27.50	Z749	0.75
E180CC	11.50	ECL85	0.75	EL95	1.90	MX120/01	29.50	QDV06/40A	28.50	Z759	19.90
E1148	0.75	ECL86	1.10	EL504	1.10	N18	5.90	QDV06/40A*	54.10	Z800U	3.45
EA76	1.80	EF9	3.50	EL519	7.70	OB2	1.80	QV03/12	5.75	Z801U	3.75
EB34	1.15	EF22	2.15	EL821	0.85	PCL82	0.95	SP81	2.50	Z803U	21.15
EB91	0.60	EF37A	1.10	EL822	3.95	PCL84	0.85	TT21	45.00	Z900T	4.30
EBC33	2.20	EF39	1.10	EL805E	4.50	PCL86	0.80	TT22	45.00	1A3	3.80
EBC30	0.90	EF80	0.65	EM80	1.35	PCL805/85	0.95	UABC80	0.75	1L4	0.65
EBC31	0.90	EF83	3.90	EM80	1.35	PCL805/10	4.30	UBF80	0.70	1R5	1.80
EBF80	0.95	EF85	0.90	EM87	6.90	PFL200	1.10	UBF89	0.70	15A	1.00
		EF86	1.45	EY51	1.45						

VALVES AND TRANSISTORS Telephone enquiries for valves, transistors, etc. Retail 143 3534 trade and export 143 0899
POSTAGE: E1-£3 85p, E3-£5 85p, E5-£10 E1, E10-E15 £1.20, E15-E20 £1.75, Over £20 £2.30, Over 2kg at cost. Delivery by return

COLOMOR (ELECTRONICS) LTD 170 Goldhawk Rd, London W12 8HJ
Tel: 01-743 0899 Fax 01-749 3934. Open Monday to Friday 9 a.m.-5.30 p.m.

ICOM

Kent Showroom



Why not come along and visit the ICOM Showroom in Herne Bay, where Andy Rudd G6MRI will be happy to answer any queries that you may have.

In addition to the full range of new and secondhand ICOM products are many other well known brands such as Tono, MET, Diamond, Tonna, Jaybeam and many more.

Also available is a wide range of base, mobile and handheld scanners including AOR, Black Jaguar and the full Uniden range.

VISA

Icom (UK) Ltd
Unit 8/9 Sea Street Industrial Estate, Herne Bay, Kent CT6 8LD. Telephone: (0227) 369464.
Open: 9-5.30, Lunch 1-2pm. Mondays to Saturdays.



The 28MHz Band

Having little result on 14 and 21MHz, Mike at GOKDZ tried 28MHz (10m); on s.s.b. he made it to 9K2DR, YCOOMO, TJ8UQ, HC5CL, FM5DN, TE2Y, D44BC, C53FV, 5H1HK, 8P9Y, 8P9FD, ZXOF, ZF2ML/A, a near-miss with 9Y4IBN, XM3NBE, 9Y4VU, BY1BH, JY7SR, JY7EA and VP2ET. On c.w. the contacts included VQ9QM, XE2XD, VU2DPG, PJ2AM, FY5YE, KH6SS/5N0—and, of course, smaller fry such as W, VK, ZL and JA in both modes.

Turning to G3BDQ, John reckoned it to have been one of the best months ever for DX, although lower at the time of his letter. Contacts using s.s.b. on this band included J73LC, PJ2FR, J3/W8MQJ, J6LAH, A25/ZS6P, FH5EF, KB6VIR/5N3, 9Q5NW, JY9LC, H5AK (Bophuthatswana), OA4BQH and TE5T; and of course the usual run of VK, ZL, ZS, W, JA and other log-fillers.

Turning to GM4ELV (Glasgow), Dale uses QRP but has a good take-off. He mentions J87CD, ZD8MAC, CE3BFZ, PYS, ZP5Y, CE6EZ, LUs, EL8E, UJs, FT5ZB, Z21JE, Ws, HK6BER, VK, EA9AX, OY9JD, ZL, VEs, TI2YEM, ZSs, VP8BRY, HL88IKL, KP4FBA, TU4CQ, OD5QX, RI8OA, HL88BPI, HLOAQF, JAs, 6W6JX, CN8FC, 5N4/4X4FF, CU3AA, 7X2LZ, EK8IZN (QSL via UA9OJ), 6W1PM, C53FV, 5N3/KB6VIR, VO1QF, PJ2FR, P40V, HD0OT, NP4CC, JW5E, FM5DN, 6Y5NP, JY7HH, 9Q5NW, VE3PRU, YI0BIF, 9N1RN, PT2ZDR, SZ2COT, SX2VPH (both Greek varieties) and a load of the smaller fry. Dale notes that the JY7s were a celebration of the birthday of King Hussein, JY1. Work seven of them and you can receive a splendid certificate; for details, write to the Royal Jordanian Amateur Radio Society, PO Box 2353, Amman, Jordan; if applying for the certificate, enclose 10 IRCs.

GM3JDR notes his c.w. contacts with VS6UP, UAOLAY, 5UV386, AX8HA, JT1AO, VU2IIT, LU9CV, CX7BBB, RT7U, CR2CWT, VK3DQJ, UZ0UWI, VK7RK, VK2DID, VS6UN; the s.s.b. managed 7P8EG, ZL1CD, ZL2BPO, ZL1ATV, UZ0UWE and ZS6KW.

Next we come to G4XDJ and it was fifty-five phone and c.w., including W2RNH, W3ARK, KA8CVH, WA4WIN, K2SIG, G0IXE, AE4X, VE3JFH, NR5B, PY7GI, K11K, W1PAN and KM4EH.

Next we come to G0HGA, who has been on the band with QRP at 5–7 watts and c.w.; this resulted in JA0DWY, JA7CTU, JA1SGX, PY7AFL, W4OO, K2QJ, UV0BB, JR2BPV, JA9BGO, JE5CXD, JL3KEH, AE4X, K2KIB, W9DH, N4AR, 4Z4DX, JA4ISL, 4X6JS, UA0JB, W0WP, W9VE, KC2X, N8FGH, N7HUS, K2POF,

UAOLAY, UA9KCN, UA0BAM, UL7JW, N2KW, K1HZ, WB8RTW, WA2VYA, ZC4ZR, EA7AAW, N1FES, AA4SB and K1BU. Then, by going to about 50 watts, Angela was able to raise VK4TT after not quite connecting at the lower power level. In addition to this lot, of course, there were lots of the usual and inevitable smaller fry.

G0GJB was interested to read the reference to the Ten Metre FM Group in this piece and wants the address to write to, so for him and any others who may be interested here it is: try G4XRU, at 33 Hayling Rise, Worthing, W. Sussex BN13 3AL.

G0JFM offers his collection for the month, with VE2OC, A4XJV, OH1AT/9 in Lapland, whose antenna fell down during the QSO, and OA8K in the Amazonian jungle.

Forthcoming Events

As always, my thanks to the invaluable W1WY Contest Calendar, to RSGB's *DX News Sheet*, and to *The DX Bulletin*, as well as the passing comments in your letters and my own ears.

Mostly this section is a look into the future; but we must say this time what a wonderful job the HA group have made of their Vietnam expedition. 3W8CW and 3W8DX have delighted the ear and the eye with the sheer style of their operating. Their advertised aim to roll up some 100 000 contacts seems well on the way to fruition. At one stage they were on 28.535 listening two up, while a pirate was active on 28.535 transceive! On the negative side of this one, I understand they were not hopeful any longer of any XW operation this time, but that they would make it a prime target for next year.

If you are looking for SU, look for SU1EE; Charles Signer finally got the call after a year of trying and is very active. We hear he is there till May when he moves to the Sudan.

That 3D2XX Rotuma operation, although a mite overshadowed by the Vietnam job, still managed some 32 000 contacts; the QSL address is Box 1, Los Altos, CA 94023, and NOT the usual NCDXF address.

Still with the Big Guns, we see that the P40V expedition score in the CQ WW SSB contest multi-class knocked up a raw (i.e. before removal of dupes) score of about 58 million points, which seems to knock

the 1981 previous world record for six. Over 5000 contacts, 158 countries, more than 38 Zones on each of 28/21/14MHz, on 7MHz there were 125 countries in 32 Zones, 95 in 28 Zones on 80, and 45 countries in 17 Zones on Top Band.

Looking at RTTY, I note that Y11BGD is now using the gear left by JR6AIB.

On the negative side, the planned Wallis FWO operation was cancelled for want of some transport, so Vili stayed on as 3D2VV which caused some confusion when the Rotuma expedition was operating in somewhat similar style!

Albania may be never with us, but it is, in spirit, always with us: the latest manifestation of Slim is called Ramiz, ZA88RA, giving his location as 60XNR1, United Nations, Tirana, for QSL purposes. Nothing if not an optimist is Slim, whether from Tirana or anywhere else!

The current "possible" on the DXCC trial is now 320, with the acceptance of Malj Vysotskij Island, and QSLs may be submitted for DXCC credit from 1 March 1989.

A possible new one is being mooted now; Ua-Huka Island, in the Marquesas. It is difficult to be sure without good charts, but this one lies closest to Fatu Hiva in the Marquesas and Tepoto in the Disappointment group, and if the waters between are clear, then it seems handsomely to meet the Countries Criteria laid down by ARRL.

When you get this, you should soon be able to hop into the shack and find Mellish Reef and Willis Is activity, by way of a group comprising VE3CPU, NM2L, KB2HE, ZF2KN and VE3IEO; they are setting off on January 3, thanks to an assist in the way of transport from Jim Smith VK9NS.

Looking a little further ahead, word has it that Marion Island ZS8MI, will be activated from April 1989, by ZS6PT for a 14 month stint. QSLs are via ZS5E for Europe and Africa, while for the Yanks the route is to WA3HUP.

On the Awards front, I hear from G4XDJ that the Scandinavian award, mentioned in previous issues has now, thanks to Brian's pleadings, acquired a QRP section. Details on this one from Rick Meilstrup, OZ5RM, DK-7192185, Baynestien 6, DK2850, Naerum, Denmark.

So—there it is for another time. I need more reports from users of the bands, particularly for 1.8 and 3.5MHz. Come on you dab hands—show us how to do it!

**The next three deadlines are:
Jan 25, Feb 27 and Mar 29**

VHF Up

As this is the first issue to appear in 1989, may I wish all readers a Very Happy New Year. This time last year I see I was reporting on a fine spell of tropospheric propagation at the beginning of November. However, for once history did not repeat itself and this month's postbag was of more normal proportions for an average, non-eventful month.

Awards News

Congratulations to Italian Reader **Silvio Rua IW1AZJ** (DF79J) who was awarded

Practical Wireless, February 1989

the "125" sticker for this 144MHz QTH Squares Century Club certificate number 80 on Nov 17. Of the 26 cards submitted, three were for Sporadic-E QSOs, five for tropo contacts, the rest for m.s. and all but one were on s.s.b. mode. His total squares worked at Nov 4 was 143 and he hoped to have reached 150 after the Geminids in December.

Tropo contacts from Turin are difficult, hence Silvio's reliance on m.s. for the more distant squares. He now runs 100W using a Jaybeam 8-ele quad antenna for tropo and Es and an 11-ele Yagi for m.s. He can use c.w. on m.s. using an IBM "clone"

computer with his own software. PA3DZL/P (BN57h), on an old North Sea platform, was worked this way on May 15 last year.

Some unusual confirmations were from HG1YI/MM in CX (JM27) square off the coast of Algiers on 2 Aug 1988 and IOJXX/O in FB (JN51). The latter was a very rare one since there is only a tiny piece of land in the extreme north-east of the square. The place is mostly under military control, but the World Wildlife Foundation manages the Oasis of Macchiarotonda from where the expedition operated in April last year.

The 1988 Tables

The rather early copy date for the March issue (December 22) dictates that the final placings for the 1988 annual tables will be published in the April edition this year. This means you will have up to January 25 to get your final scores to me.

Beacon Notes

I see from issue no. 88-16 of Hal Lund's ZS6WB ZS VHF News that ZS5SIX (KG50) is now operating on 50.321MHz having been relocated near Pietermaritzburg. It runs 10W to a halo antenna. ZS6PW (KG44) is on 50.010MHz from about 1200 to 1900UTC beaming north.

A new beacon began operating from Iceland on 50.0575MHz on Oct 29 running 50W to a vertical antenna. The callsign is TF3VHF and the locator is HP94CC. It has been heard in Holland but no reports of its reception in any letters from British Isles correspondents. Such reports should be sent to G4CVI or TF3JB.

Amstrad Computer Programs

The paragraphs in the December issue about amateur radio programs for the Amstrad PCW8256/8512 computers brought several inquiries. I have since added further programs to my library. These include: YAGIS based on DL6WU's doubly optimised designs for v.h.f. Yagi antennas; FSPL, a simple free space path loss calculator and SPB, a satellite power budget program.

For meteor scatter operators I have a couple of useful programs. MSD1 produces a table showing the reflection efficiencies in eight directions at hourly intervals. MSD2 is a dedicated program for you and your sked partner and calculates the antenna azimuth and elevation plus distance as well as displaying the efficiencies in percentage and histogram form. In each version 17 popular showers are programmed in and any others can be accommodated by entering their right ascension and declination figures.

Previously I offered to supply listings but this is inefficient. I am now only prepared to copy onto your ready formatted disks, either CF-2 or CF-2DD if you have a Drive B available. Drop me a line first enclosing an s.a.e. and I will send a list of all the current programs and other information. Please do not send any disks without prior agreement.

My local public library has a good selection of books referring to the Amstrad range. One of them is called *The Amstrad Companion* written by David Lawrence and Mark England and published by Sunshine Books. The ISBN number is 0-946408-95-5. It is devoted to CP/M, Basic, GSX and Logo and I find it much more informative than the Amstrad manuals.

Mallard BASIC is quite fast. For example the design for a 25-ele u.h.f. Yagi takes just eleven seconds while a complete pageful of satellite data appears in 45 seconds. I have no idea if these programs would run on other than the Amstrad PCW8000 series computers.

Scandinavian VHF Meeting

I was talking with a Danish station on the 14MHz v.h.f. net recently and he mentioned the annual meeting of v.h.f. enthusiasts. The Scandinavian countries take it in turns to run these events and this year's will be in Jutland on the second weekend in June. They attract dedicated v.h.f. folk

Annual v.h.f./u.h.f. table January to December 1988

Station	50MHz		70MHz		144MHz		430MHz		1296MHz		Total Points
	Counties	Countries									
G1KDF	48	17	—	—	92	22	66	12	37	7	301
G6HKM	47	15	—	—	78	28	54	19	31	15	287
G4XEN	47	14	36	5	72	34	51	15	—	—	274
G1SWH	59	20	—	—	95	20	55	9	—	—	258
G8LHT	38	8	33	5	67	32	48	17	6	2	236
G1LSB	37	12	—	—	71	25	55	19	—	—	219
G4SEU	35	13	67	9	48	11	29	4	—	—	216
G0IMG	49	15	36	6	49	12	24	5	—	—	196
GM0EWX	57	15	—	—	58	24	7	3	—	—	164
G4DEZ	33	16	—	—	30	16	27	6	34	10	162
G6MXL	20	9	19	4	42	19	19	9	9	3	153
GW6VZW	50	16	—	—	70	17	—	—	—	—	153
G1IMM	35	11	—	—	58	12	31	7	—	—	152
G0EHV	—	—	50	7	68	23	—	—	—	—	148
G4VOZ	27	14	58	8	—	—	29	8	—	—	144
ON1CAK	—	—	—	—	72	34	23	15	—	—	144
G1EZF	—	—	30	5	76	33	—	—	—	—	144
GM0HBK	48	13	—	—	54	22	—	—	—	—	137
G4YCD	12	9	—	—	84	30	—	—	—	—	135
GJ6TMM	30	15	—	—	44	21	10	11	—	—	131
ON1CDQ	—	—	—	—	66	34	16	15	—	—	131
G8XTJ	34	5	—	—	58	14	—	—	—	—	111
G4ARI	—	—	33	4	60	13	—	—	—	—	110
G8PYP	21	9	2	1	50	16	6	2	—	—	107
G4ZEC	—	—	—	—	78	29	—	—	—	—	107
GW4FRX	—	—	—	—	71	30	—	—	—	—	101
G7ANV	—	—	—	—	75	26	—	—	—	—	101
G140WA	19	17	—	—	48	16	—	—	—	—	100
G3FPK	—	—	—	—	78	22	—	—	—	—	100
G6MGL	19	10	—	—	49	10	—	—	4	2	94
GW4HBK	22	18	43	6	—	—	1	1	—	—	91
G1SMD	21	17	—	—	25	18	—	—	—	—	81
G4AGQ	—	—	15	2	38	8	12	4	—	—	79
G1DOX	16	2	19	2	22	5	5	2	2	1	76
G2DHV	5	1	22	2	30	6	7	2	—	—	75
G1CEI	—	—	—	—	59	12	—	—	—	—	71
G4WHZ	6	4	—	—	33	19	—	—	6	2	70
G4WNO	—	—	60	7	—	—	—	—	—	—	67
G3EKP	12	3	16	4	7	4	5	1	—	—	52
GU4HUY	—	—	—	—	35	16	—	—	—	—	51
GM0JOL	—	—	—	—	30	10	—	—	—	—	40
G4ZVS	—	—	—	—	34	5	—	—	—	—	39
G0HGA	—	—	—	—	30	6	—	—	—	—	36
G0HDZ	—	—	—	—	30	5	—	—	—	—	35
GM1ZVJ	4	3	—	—	14	7	—	—	—	—	28
G8PNN	—	—	21	3	—	—	—	—	—	—	24

from all over Europe and offer a good mix of technical and social content. I will publish more details when I get them. It is a pity they occur at the peak of the Es season though, and this could discourage some from going.

Worked All Britain

John Fitzgerald G8XTJ (BKS) has sent the December Press Release covering the WAB awards. The first 50MHz Decade Award for s.s.b. went to G4ZUR and the first District Award Class 3, for working 200 districts on 144MHz f.m., was won by GW8PTS. There are WAB nets on 144.43MHz on Fridays at 2030 and on Sundays at 1000 or 1030 local time. On 144.44MHz the net meets on Mondays, Wednesdays and Fridays from 2000 or 2030 and all are welcome to join in. Full details of the WAB group can be obtained from G4K5Q.

Contest News

As usual at this time of the year, the RSGB seems not to want to let anyone know any details of v.h.f. and u.h.f. contests. On a more positive note, the Derby and District ARC has forwarded details of its 144MHz event scheduled for March 12, 1300-1700UTC. Any mode provided you observe the band plan. Usual RS(T) exchanges with serial numbers starting at 001. State your administrative county, even if it no longer exists, e.g. Greater London and Greater Manchester.

Scoring is two points per contact except that G3ERD is worth ten. There is a county multiplier and countries outside the UK are regarded as extra counties. There are three

sections; Full legal power, Low power—30W maximum output—and listener. Fixed and -/P categories and entries should be sent by March 29 to the DADARS at 119 Green Lane, Derby DE1 1RZ. The rules mentioned -/A operation but there is no such licence category now, of course.

The 50MHz Band

Danish stations seem to expect they will get a 50MHz allocation within two years. Similarly the Swiss amateurs might have an allocation in the next year or so.

After all the excitement reported last month, it has now gone rather quiet on the band from the UK. Bob Nixon G1KDF (LNH) operated in the Trophy Contest on Oct 23 for a few hours and had 15 contacts of which seven were with new counties.

Mike Devereux G3SED (HPH) sent a resumé of his activity up to Nov 2. At 1250 on Nov 2 he reports that G3GJQ was signing G3GJQ/5N0 from JJ16 in Nigeria, the previous 5N28 being a special event suffix. Roy was running 7W to a 3-ele Cushcraft Yagi at 24m a.g.l. At 1944 he heard LA3EQ via Ar, then worked GM4COK and GM4DGT.

Ela Martyr G6HKM (ESX) has worked very little on the band, her only addition for the table being G1WWU (NOR) on Nov 14. Since his historic "first" G/5N QSO on Oct 22, Bill Biltcliffe G6NB (OFE) has only worked a few GWs and Northern G stations. Little activity either from Steve Damon G8PYP (DOR) who was going to install a gamma match on his 3-ele Yagi. John Pilags G8HHI (SRY) has managed to update his station at long last. He is now *Practical Wireless, February 1989*

active on the band using a Kenwood TS-680 and 5-ele Yagi.

The sole new one for G8XTJ was G0BLB (AVN), the only other noteworthy contact for John being with GJ4ICD. Welcome to **D.J. Mullan G16EIR** (LDR) who wrote mainly about the Amstrad programs but also mentioned forthcoming activity using a Yaesu FT-101ZD/FTV-901R transverter set-up with a 4-ele Yagi.

Keith Boleat GJ6TMM worked ZS3AT (JG87) at 1732UTC on Sept 9 and claims it as a GJ/ZS3 "first" on the band. He contacted Tom again on Sept 14 and ZS6XJ (KG33) on the 16th. Nov 4 brought GW1PDN (GNW) in IO81 for a new county, country and square.

Colin Robertson G0HKB (HLD) on the Isle of Skye had not written for some while so sent details of his activity from last June. His most recent addition was a fairly local station GB2WQ on Oct 26.

Paul Baker GW6VZW (GWT) reckons his claim to fame was hearing ZS3AT repeat his callsign. Unfortunately Tom faded out before a QSO could be completed. In the Trophy Contest best DX was GW4MGR/P (CWD), other new counties being BFD, LEC, NHM and YSN.

The 70MHz Band

It is hardly worth a separate heading this month as there was virtually no mention of 70MHz activity in your correspondence, even though 17 readers have table entries. Only **Gordon Emmerson G8PNN** (NLD) reported anything and he worked G4PMK (YSW) on Oct 23 for a new county.

The latest issue of *QSB, The Newsletter for Four Metres* carries a front page item recording a new tropo distance record. This was achieved during the Trophy Contest on Sept 18 between G4RFR (IO90AS) and GM3WQJ (IO77WO), a QRB of 773km. Other news is of regular s.s.b. activity from G14RYP (ARM) who listens on 70.200MHz most evenings around 2200 local time. John runs 12W to a 4-ele Yagi. G8ROU is reported to be constructing a beacon TX to be sited at Lerwick (SLD) and more details are promised later.

QSB is published quarterly at present by Roger Banks G4WND and had over 80 subscribers according to the October 1988 issue. Inquiries should be directed to him at "Rivendall", Kiln Way, Polesworth, Tamworth, Staffs B78 1JF. His telephone number is Tamworth (0827) 894464.

The 144MHz Band

Johan Van De Velde ON1CAK has written after some months, to update his table scores and those of his brother **Geert ON1CDQ**. Both are keen British Isles county hunters but Johan still needs CBA and CVE in England; ARM, FMH, LDR and TYR in Ulster; BDS, CTR, LTH, OKE, SCD and SLD in Scotland and SRK in the Channel Islands. He contacted GW4VEQ/M (IO83) on Oct 16 and EI3GE (IO63) on the 31st.

Angela Sitton GOHGA (HFD) still finds time to operate on the band, particularly on c.w. mode. During the contest on Nov 5/6 she worked an HB9 for a new country, many F stations and other DX. She concluded that conditions were good but that activity from the UK was down on the 1987 event.

Gerry Schoof G1SWH (MCH) has found his last "G" county for the year having worked G14XKI (TYR) in IO64ML. Many readers have asked if there are any stations QRV from Tyrone nowadays, so that is a call to listen for. **George Haylock**

G2DHV (LDN) operated in the November c.w. contest and has increased his ladder score as a result. He is the only reader who uses all four bands in this table.

Pat Billingham G4AGQ (SRY) has been rather work weary of late so did not feel like making much of an effort in the Marconi Memorial Contest on Nov 5/6. He made fewer than 50 QSOs, best DX being about 700km including the usual HB9s. He concluded that conditions were not all that bad as he scored more points than he got in 1986 for twice as many contacts. During a slight lift on Nov 13 Pat worked DL6KAI (DK), ON4KLY (BK) and PA3DEK (CK) on c.w. and all affected by deep, slow QSB.

Ian Cornes G4OUT (SFD) has taken over Jack Hum's G5UM job as RSGB VHF/UHF Awards Manager but found time to take part in the c.w. contest. He thought conditions were fairly good and concluded 94 QSOs in nine countries which has boosted his ladder total considerably.

Roger Colwell G4ZEC (BKS) participated in the Marconi c.w. contest, but was disappointed by the lack of support from British stations. He completed 126 QSOs of which fewer than half were with G stations and he wonders where all the GMs were. He did not think the conditions were all that good.

We discussed this contest at some length later and Roger suggests that having the RSGB event as well during the closing hours probably discourages many from taking part in the 24 hours event. It would be far better if both events started at the same time, then those who operated for the 24 hours could just carry on with their serial numbers. The disadvantage would be that of having a contest on a Saturday afternoon when many people have other things to do. Any comments from c.w. addicts?

The only exotic callsign in G6HKM's log this time is LAODT/MM but unfortunately for Ela, Damian was in a square already worked. Her shack is in the garden but she now has a Kenwood TR-9130 in the house connected to an indoor ground plane antenna. This enables her to keep an eye on the s.s.b. end of the band during the day.

G6NB has not been at his new QTH long enough to put up all new antennas but seems to be doing well enough at present, in spite of generally poor conditions. In addition to local Gs, Bill has worked ON4XC, HB9BZA/P, F6HPP/P, PI4VHL, GJ4ICD, GJ6TMM and GW3KJW.

Annual c.w. ladder

Station	Band (MHz)				Points
	50	70	144	430	
G4ZEC	—	—	727	—	727
G4OUT	—	—	276	—	276
GOHGA	—	—	218	—	218
G4AGQ	—	37	167	12	216
PA3FAQ	—	—	199	—	199
G4WHZ	21	—	157	—	178
GOHLT	13	—	161	—	174
G4VOZ	29	93	—	18	140
GOHEE	—	—	111	—	111
G4ARI	—	29	80	—	109
G2DHV	10	37	45	12	104
G0DJA	11	—	69	—	80
G4ZVS	—	—	80	—	80
G3FPK	—	—	70	—	70
GU4HUY	—	—	59	—	59
GW4HBK	21	33	—	—	54
G0GKN	—	—	52	—	52
G1SMD	21	—	15	—	36
G6DIF	2	—	30	—	32
G1DOX	3	5	—	—	8

Number of different stations worked since January 1

David Law G6OYL (YSS) responded to the request for more reports on the Sept 9/10 opening to EA8, of which more later. He moved to a new QTH on Sept 23 and was nearly ready to go when he wrote in mid-November. He anticipated being on for the Geminids shower provided he could put up his mast.

G8PYP reports conditions as being generally quiet but with a few good days. Steve worked F6CTI (IN97) on Oct 31 and on Nov 4 GOAEA (IOS) for a new square IN69 at last, followed by F6IOG/P (IN97). The next day brought HB9SNR/P (JN36) and another new square JO30 thanks to DB8KJ. On the 14th he contacted EI3BEB (IO62) and GMOBQM/P (IO85), yet another new square.

The period Nov 5/6 was quite rewarding for GJ6TMM. On the 5th Keith worked five HB9s in DG, DH and EH squares. The next day brought five new squares; DG8MET (FH), DL4MDQ (FI), OE2KMM (GH) also a new country, OE5OLL (GI) and OE1RKU (II). Other QSOs were with OE5VRL/P (HI), six Ds and two HB9s in previously worked squares.

Now north of the border to **Mervyn Rodgers GM0GD** (CTR) who worked GB2WQ on Oct 25. In a small tropo opening on Nov 14 he contacted GOAEA at 1910 with strong signals at both ends. Other south coast and some EI stations were audible but he could not stay on to have a try.

GMOHKB operated in an Ar event between 1522 and 1817 on Nov 2. Colin used c.w. to work OZ1BUR (EQ), DJ9YE (EN), DL9LBH (EO), SM6EAN (FR) and UQ2GMD (LR) which was a new country. OY9JD (WV) was another new country on s.s.b. GB3LER was Auroral at 1524 on Nov 7 but nothing else was heard till 1714 when he contacted LA5SAA (CT) on the key.

John Nelson GW4FRX (PWS) has taken down the bayed 17-ele Tonna Yagis that have served him so well with the DX. They were still in pristine condition. He has replaced them with four 18-ele Cushcraft Yagis and has also installed an elevation rotator. He is impressed with the design and construction of the new antennas except for the method of feeding the driven element, which he has altered.

GW6VZW mentioned some tropo contacts with D and F stations on Oct 16. On Nov 12 Paul worked ON2AAJ (BL) and ON4UVW (BK) which latter was a special event station at Ypres commemorating the 70th anniversary of the end of hostilities in the First World War. The same day brought QSOs with stations in DHM and ATM but he was still looking for CVE for 1988.

Reg Woolley GW8VHI (GNW) was home from Germany for a while in November. On the 14th, using 8W output and a 14-ele Yagi, he worked FC1FMU (ZI), F6APE and F1FHI (ZH), GJ6TMM, GJ7AOG/P and GU3EJL (ALD).

The 430MHz Band

ON1CAK's report went up to mid-October. On the 16th Johan worked DG8MET, DJ2IB (JN57) and GJ6TMM and the following day GW3KJW (GDD) in IO72. G6HKM reports a lot of activity in the Cumulative contest on Nov 7 and Ela had 73 QSOs including G3JOC (NOR) for a new county. She also worked three Fs, two Ds and seven PAs. G1DXI (HBS) was contacted on the 10th.

GJ6TMM worked HB9AMH/P (DH) on Nov 5. On the 6th Keith found OE2KMM

Practical Wireless, February 1989

and OE2CAL (GH) for a new country and square on the band, with OE5VRL/5 (HI) another new square. GM0HBK runs 100W and a 24-ele Parabeam and on Oct 10 Colin made a couple of s.s.b. QSOs via Ar with G8XVJ and G4CBW (YN). He worked GB2WQ on tropo on the 23rd but GM0GDL could not make the QSO with Tیره.

The Microwave Bands

G1KDF reports excellent conditions on Nov 15 for the third leg of the 1.3GHz Cumulatives with good reports exchanged with stations in the south-east. But Bob found activity disappointingly low and only made 18 contacts.

G6HKM made eleven QSOs in the Oct 30 leg of the 1.3GHz Cumulatives and G4APA (CBA) was a new county. In the Nov 15 session Ela made 26 contacts, G8BNE (YSW) being a new table county. On Oct 16, G8PNN worked his 63rd square on 1.3GHz thanks to FC1DBE/P (AJ). And that is all the microwave news this time.

The EA8 Opening—Postscript

Several more readers have responded to the request in the December issue for further reports on the extraordinary propagation to the Canary Islands on Sept 9/10 last year. I feel these should be published so that the propagation experts have as much data as possible to analyse.

Colin Oakley G0AEA (IN69UW) works down to EA8 ... with some regularity ... located as he is in the Scilly Isles. He uses a Kenwood TS-9130, 80W amplifier, RX pre-amp and 10-ele Yagi 8m a.g.l. his QTH being 47m a.s.l. He worked six EA8s on the 9th and four on the 10th the calls being EA8s ACW, AGD, AOM, ARJ, AYY and BTA, plus EB8AIZ. He summarises the phenomenon as follows.

Numerous G, GI, GM and EI stations were heard working the EA8s, most of whom were S9+20dB. Several were conducting QSOs on 144.300MHz. Such was the QRM at G0AEA that Colin QSYed to the repeater frequencies and worked some EA8s, and EA7s in southern Spain, through a relay in north-west Spain. He is quite sure that if there had been anyone on from the Cape Verde Islands (D44) he could have worked them.

John Cornall G6IJM (I083LS) runs 100W from a Kenwood TS-711E to a 17-ele Yagi by Tonna. His Blackpool QTH is only 3m a.s.l. and signals to EA8 have to traverse right over Snowdonia. He worked EA8BML at 1353 on the 9th and EA8ACW at 1436. Others were heard weakly but 'BML was copied on and off all that day and also on the afternoon of the 10th. John worked EA1QJ (IN53) at 1450 on the 9th.

G6OYL (YSS) came on the band late on the 9th and worked EA8BTA as well as EA1ED, EA1TA and EA2AGZ (ZB) who thought it was Es propagation. The next morning David worked EA1QJ, EA8BML at 0744 receiving an S9+60dB report and EA8AYY at 0835. Between 1042 and 1046 there was a pile-up on 144.300MHz with EA8s ACW, AYY and BPZ all having QSOs. Regrettably a special event station caused deliberate QRM in spite of being told about the DX.

Tony Jones GW4VEQ (GDD) had never written to any radio magazine before but was so excited by the event that he just had to put his experiences down on paper. He was at his parents' home when alerted

by GW4HKX that the band was full of EA8s. He dashed across Anglesey to home only to find his electricity supply was off. The electricity board had chosen that very period to move a feed pole after he had waited three months for them to do it!

So he went out mobile with 10W and a halo antenna and between 1822 and 2158 worked EA8s ACW, ALZ, AYY, BEX, BML and BTA, plus several EA1s who were also very strong. At 1215 the next day, again using the mobile station, Tony worked EA8BML on f.m. and in the middle afternoon EA8AGD and EA8BOC on s.s.b.

He reckons the contact with 'BML on S22 was the best QSO he has ever had on the band and it lasted over two hours with GWs ODDQ, OGLX, 6ARL and 6DOK joining in. They also worked through the local GB3AR repeater and Mañuel's local relay on Fuerteventura Island. The QSO was conducted in Spanish and English and he even tried to teach him some Welsh.

In the December issue I mentioned the possibility that LA8OJ had worked into EA8. To date I have had no reply to a letter to Egil on the matter, nor have I heard him on the 14MHz v.h.f. net. However, in the EA8BML/GW4VEQ/M QSO Mañuel told Tony that his best DX was GMOKAE as already reported.

What I find so astonishing is that readers have reported extremely strong signals from the EA8s across such a wide front, typically from Cork to the G/GW border region; that is 300km. One reason why I have devoted so much space to this event over the last three issues is so that researchers can deduce if the duct moved around, rather like a car windscreen wiper, such that at one time the westerly stations were favoured, at others the easterly.

The European UHF Scene

GW8VHI operates mostly from Germany using his CEPT call DA4RG. Reg has been out with various groups and was a member of a team that operated from Liechtenstein in the October IARU u.h.f. contest last year. He said the trip was quite successful but he only worked on 1.3 and 10GHz. He contacted HB9, D and OE on 1.3GHz and HB9AMH/P on 10GHz, a QRB of 183km. On m.s. they only worked one station though.

They took the chair lift up to 1500m and hiked the rest of the way to 2369m. Later they discovered that helicopters can be hired quite cheaply so another trip is contemplated for this year using QRO equipment transported by this means.

Reg suggests that, contrary to what many believe, there is not such a great amount of u.h.f. and microwave activity in middle Europe. The reason they work more stations is that they are in the middle of things with stations in all directions and not stuck on the edge of the action like we are in the UK. His experience has been that, apart from contests, the bands from 430MHz up are dead. So it would seem this is a pretty universal phenomenon and not one unique to the British Isles.

432MHz Moonbounce

Last Oct 28 GW8VHI/DA4RG visited the station of PA3CSG when conditions were so good that a random CQ call on 432MHz s.s.b. was answered by OE3OBC. Geert's antenna array consists of sixteen 26-ele Yagis and he is always looking for skeds. He can work single Yagi stations running 700W, so two or four Yagi stations using the legal UK limit

QTH Locator Squares Table

Station	Band (MHz)			Total
	1296	430	144	
G3IMV	42	122	406	570
G4KUX	—	120	372	492
G8GXP	45	151	331	527
G4DHF	—	—	307	307
G4SWX	—	—	293	293
G4RGK	48	115	274	437
G4XEN	—	109	270	379
G1EZF	32	93	263	388
G4PCS	—	3	258	261
G4RRA	—	62	254	316
GJ4ICD	59	119	253	431
G0DAZ	—	114	249	363
G4DEZ	48	37	248	333
G3UVR	79	129	239	447
G4IGO	—	—	238	238
G3FPK	—	—	233	233
G4SSO	—	93	229	322
G4MEJ	—	—	213	213
G8LFB	—	—	209	209
ON1CAK	—	33	204	237
GW4FRX	—	—	203	203
G4TIF	—	110	200	310
G1EGC	23	80	198	302
G4YCD	—	—	197	197
G3XDY	86	138	191	415
G6HKM	44	105	191	340
G3COJ	44	103	186	333
G4DOL	—	—	186	186
G6DER	78	110	183	371
ON1CDO	—	32	182	214
G1JUS	—	—	181	181
G3JXN	87	134	179	400
G0EVT	—	49	177	226
E15FK	—	56	172	228
G1KDF	37	98	168	303
G3NAQ	—	80	160	240
G1GEY	—	68	158	226
G6DZH	—	87	154	241
G1LSB	—	133	150	283
GJ6TMM	—	46	150	196
G4MUT	28	90	149	267
G8HHI	38	110	148	296
G8LHT	4	80	146	230
G0EHV	—	75	146	221
G8ATK	45	91	143	279
G8MKD	—	49	142	191
G6MGL	59	89	141	289
G7ANV	—	—	131	131
G6STI	24	69	130	223
G8PNN	63	98	128	289
GM6VZW	—	6	123	129
G4TGK	—	—	118	118
G8XTJ	—	—	110	110
G4AGQ	1	41	104	146
GM0HBK	—	—	104	104
GI4OWA	—	—	102	102
G1IMM	—	17	98	115
G6AJE	5	57	95	157
G1WPF	—	22	93	115
G1SMD	—	—	93	93
G6MXL	15	42	91	148
G0FEH	—	24	88	112
G4WHZ	7	—	76	83
GM0GDL	—	20	73	93
GU4HUY	—	—	73	73
G0HEE	—	—	73	73
G8PYP	—	6	64	70
G1CRH	—	—	62	62
G0HDZ	—	—	61	61
G1NVB	—	—	58	58
G4ZTR	29	29	37	95
G7AHQ	—	—	34	34
G2DHV	2	7	33	42
G1VTR	—	23	32	55
GM0JOL	—	—	29	29
GM1ZVJ	—	—	21	21

Starting date 1 January 1975.
No satellite or repeater QSOs.
"Band of the month" 144MHz

should be able to make QSOs. Reg was at Geert's QTH on the Oct 22/23 weekend when they operated in the first session of the ARRL EME contest making 37 contacts.

DXpedition Feedback

Peter Croucher G4YPC (SRY) has sent a detailed report on the Lizard operation last September and which I mentioned briefly in the December issue. The locator was IN79JX and conditions were excellent on all bands from Sept 17 to 20, but began to decline on the 21st to revert to flat on the 22nd. Thereafter very strong winds made any further radio operation impossible.

Their equipment was all under canvas and comprised: On 144MHz a Yaesu FT-221R with MuTek board, single 4CX250B 200W amplifier and two 17-ele Tonna Yagis at 12m a.g.l. On 432 MHz, a Yaesu FT-707 and Microwave Modules transverter with masthead pre-amp. 8W output to two 21-ele Tonna Yagis at 12m with LDF4-50 feeder. On 1.3GHz, a Kenwood TR-9000, MM transverter with 2W to four 23-ele Tonna Yagis at 12m again fed through LDF4-50 cable.

In summary their results on 144MHz

were 85 squares and 18 countries worked, with EA, HB9, I2, LX, OE, OK, SP and Y stations contacted. On 432MHz, 29 squares and ten countries including EA, LX and Y, and on 1.3GHz four countries and 13 squares from 22 QSOs. The QSOs were 12 Gs, one GI, five Fs and four PAs.

Gem of the Month

G4AGQ passed on this gem heard on the GB3SN repeater. First G1. "I went up north last week. Lots of lady breakers on two metres up there." Second G1. "I expect women in the north are more intelligent than those in the south." Pat comments that what they failed to realise is that most of the lady operators in the south are on c.w!

Final Miscellany

GW6VZW has QSL information for the following stations: EA8BML, SM6AEK, SV1DO, 9H1CG, 9H1E, 9H1EL and

9H1FL. Anyone requiring addresses can telephone Paul on Cwmbran (066 33) 60921. I recall that some Maltese stations are not members of their national society so that cards sent to them through the bureau never reach them. Hence direct QSLing is the only answer.

Commenting on the 144.300MHz calling frequency, G8PYP writes, "Have you ever noticed how there are 'flumes' of activity with several stations calling at once, then long periods of silence? A little like waiting an hour for a bus then three coming along together." Steve concluded, "I am sure it's related to TV programme times!"

I have often listened to this at G3FPK and I am quite convinced that certain stations do hear others calling CQ then deliberately start their CQ just as the first one goes over to listen for replies. These folk would never demean themselves by answering anybody else's call; you are expected to go to them. Something to do with a "Macho Image" perhaps?

The next three deadlines are: Jan 25, Feb 27 and Mar 29

RTTY

I'll start this month with some DX information that I received from **John Barber**, actually it should have been in last month's column but I forgot it! What John kindly sent me was a couple of direct QSL addresses for Russian DX RTTY stations which are as follows:

ULOP/UZ9CWA Dekabristov 12-12
PERM, 614022 USSR
UW3TT/UJ1J PO Box 93, Gorky-centr,
603000 USSR.

If you manage to pick up any little snippets of information like this, please drop me a line with the details.

FAX Activity

Christopher Moss has written giving his experiences of monitoring amateur FAX transmissions. There still seems to be very little activity as regards h.f. FAX in the UK, whereas on the continent there is quite a lot of interest. In his letter Christopher reports that Sunday mornings on 14MHz are the best times to monitor, especially if there is a contest running. The most recent was the DARC contest, last October, where Christopher logged some 12 FAX stations during the morning. Of these stations seven were German and the rest were a mix of Western European stations, sadly there were no UK stations.

I'm sure many are put off by the thought that FAX must be expensive, but this is not necessarily the case. Take Christopher's h.f. listening station which comprises a Kenwood R-1000 receiver fed by a 12m indoor antenna. The computer is a Spectrum 48K and the RTTY and FAX software is by J & P Electronics. Assuming you already have a receiver you will need a Spectrum computer, software and a drum-speed generator to start receiving pictures. To give you an idea of cost, the J & P FAX program costs about £9 and the matching drum-speed generator about £24. As you can see this is an ideal way to get started on FAX reception. Hopefully, you should find some examples of amateur FAX received using the J & P software in this column.

If you run a BBC B, B+ or Master computer then FAX reception can be achieved quite cheaply by using the FAX decoder produced by David Bird (G6EJD). This decoder which costs £49.95 for the screen-only version and £59.95 for the screen and printer version is capable of surprisingly good results.

Another way of getting on the air with FAX is to look out for a secondhand FAX machine. One which has been well documented is the Rank Telecopier 400. Although this machine is not directly compatible with current amateur standards there have been plenty of mods published in *DATAKOM* the quarterly magazine from BARTG. If you manage to find one on the secondhand market it should be quite cheap as most of them were originally given away to members by BARTG.

One other significant point is that once you have the system running, you are not restricted to receiving amateur FAX, as the decoders can be used to receive a wide range of weather charts and some press pictures.

As a final aside I have heard that an economical FAX transceive program for the Spectrum is being developed, so watch this space as the manufacturers will be letting me know as soon as it's ready.

GB2RS on FAX!

Staying with FAX for the moment I have recently heard that Dave Smith, who is a member of the RSGB Membership Liaison Committee, is looking for someone to participate in a venture to send the GB2RS news bulletin by FAX. In order to do this you will need a conventional FAX machine that is capable of taking a document and producing standard 120 r.p.m. 576 or 288 IOC FAX. You will also need to be able to produce a healthy signal on 3.5MHz and be available on Sunday mornings! I'm sure there are plenty of amateurs who could contribute to this experiment so if you would like to have a go contact Dave⁽¹⁾ directly, using the address at the end of this column.

*Reports to Mike Richards G4WNC
200 Christchurch Road, Ringwood, Hants BH24 3AS.*

Personal Mailbox Systems

Siskin Electronics⁽²⁾ have just sent me the latest update for their TINY-2 Terminal Node Controller (TNC) so I thought it would be a good idea to explain just what a Personal Mailbox System (p.m.s.) can do. Taking the TINY-2 as an example the addition of this feature is simplicity itself as all you have to do is replace this existing ROM with a new one containing the appropriate software.

The next question you are going to ask is, "OK so what does it actually do?" Well, I'm sure most of you who already have packet facilities make quite extensive use of the multitude of established mailboxes for general information or for sending messages to friends. At present, in order to find out if there are any messages waiting you have to log on to the mailbox, whereupon you will be told if there is any mail waiting. By using the p.m.s. system you will no longer have to log on to the mailbox for your mail as it will automatically be sent directly to you and be stored in your TNC! This is obviously quite a change and may even help to relieve some of the congestion on the mailbox frequencies.

Before you can make full use of the system you will need to inform the local mailbox operator that you have installed p.m.s. so he can set up the mailbox to auto-forward your messages. In addition the p.m.s. can be used by any other station to send a personal message to you which is quite handy.

Moving back to the p.m.s. implementation on the TINY-2 there are a number of additional commands that come with the p.m.s. ROM. Most of the commands follow the standards set by the WORLI and WA7MBL mailbox systems so operators should have little problem in finding their way round them, there is even a simple help file if you're not sure! Probably the most used command is SEND which starts the procedure for sending a message. Once this command has been issued you then enter the callsign of the station you are sending the message to in the normal

Practical Wireless, February 1989

TRANSVERTERS

TL50-28-25 6M/28MHz IF	316.25
TL50-144-25 6M/144MHz IF	299.00
TL70-28-25 4M/28MHz IF	316.25
TL70-144-25 4M/144MHz IF	299.00
TL144-28-25 2M/28MHz	345.00

2M LINEAR AMPLIFIERS

L144-3-25	*New Linear 3w input 25w output	74.75
LP144-3-50	Linear/Preamp 3w input 50w output	138.00
LP144-10-50	Linear/Preamp 10w input 50w output	138.00
LPM144-3-100	Linear/Preamp/Meter 2w i/p 100w o/p	235.00
LPM144-10-100	Linear/Preamp/Meter 10w i/p 100w o/p	205.00
LPM144-10-180	Linear/Preamp/Meter 10w i/p 180w o/p	355.00
LPM144-25-180	Linear/Preamp/Meter 25w i/p 180w o/p	305.00

B.N.O.S.
ELECTRONICS

Mill Lane, Stebbing, Dunmow, Essex, CM6 3SL.
Tel: 0371-86681 Fax: 0371-86273 Tlx: 817763 BNOS G E & O E

**PLEASE MENTION
PRACTICAL WIRELESS
WHEN REPLYING TO
ADVERTISEMENTS**



TONNA F9FT THE VHF/UHF ANTENNA SPECIALIST

50MHz		435MHz	
20505 5 element	£41.69(a)	20909N 9 element	£28.62(a)
144MHz		20919N 19 element	£34.35(a)
20804N 4 element	£27.60(a)	20438 19 element crossed	£39.66(a)
20808N 4 element crossed	£34.96(a)	20921N 21 element 432MHz	£44.57(a)
20809N 9 element fixed	£30.87(a)	20922N 21 element ATV	£44.57(a)
20089N 9 element portable	£33.12(a)	1296MHz	
20818N 9 element crossed	£57.86(a)	20623 23 element	£30.36(b)
20813N 13 element portable	£46.00(a)	20696 4 x 23 element - power splitter - stacking frame	£160.00(a)
20817N 17 element	£61.54(a)	20655 55 element	£46.20(a)
144/435MHz		20666 4 x 55 element - power splitter - stacking frame	£230.00(a)
20899N 9 & 19 element Oscar	£57.86(a)		

All prices include VAT. Please add carriage (a) £5.00. (b) £2.20.
ACCESS or VISA cardholders telephone your order - immediate despatch.
Callers welcome but by telephone appointment only please.
SEND 50p FOR OUR CATALOGUE WHICH CONTAINS FULL SPECIFICATION OF ALL OUR ANTENNAS, POWER SPLITTERS, STACKING FRAMES, COAXIAL CABLES ETC.

SOLE UK DISTRIBUTOR
RANDAM ELECTRONICS (P)

12 Conduit Road, Abingdon,
Oxon, OX14 1DB.
Tel: (0235) 23080 (24 hours)

AR-2002?

IC-R7000?

FRG-9600?

SEND FOR DETAILS ABOUT A BRILLIANT NEW PRODUCT WHICH GREATLY INCREASES THE UTILITY & FUNCTIONS OF THESE RECEIVERS

AIRCATTLE PRODUCTS
P.O. BOX 78
BOURNEMOUTH
BH1 4SP
(0202) 666233

PLEASE STATE WHICH RX YOU HAVE

THE Circuit WINTER '88-89 CATALOGUE IS OUT NOW!



and features many new products:

- Books - 12 Latest Titles
- Navico 2m Transceiver
- Miniature Mains Rocker Switches
- 8 Channel Logic Analyser
- Collet Knobs and Caps
- 2.4GHz Frequency Meter
- 10.7MHz Ceramic Filters
- Broadcast Band FM Tunersets
- RF Dip Meter
- IEC Mains Connectors
- Scanning Receivers - New Models
- 100MHz 3 Ch Oscilloscope
- RF and AF Signal Generators
- Pyropen - Cordless Gas Iron
- High Temp Elec Capacitors
- Miniature Analogue Multimeter

Plus discount vouchers, easy to enter competition and feature project. Available from your newsagent or directly from Circuit.

Circuit

PRICE **£1.30**



Circuit Distribution Ltd.

Park Lane, Broxbourne, Herts EN10 7NQ
Telephone (0992) 444111 Telex: 22478

way. As third party traffic is not allowed under current licensing regulations, there is an additional command called 3RDPARTY which, when set to off, informs anyone attempting to send third party traffic that it is not allowed. I thought this was a very useful extra command.

Once a message has been stored in your TNC the status i.e.d. will flash slowly giving you a clear indication that mail is waiting for you.

An extra plus-point of this particular upgrade is that a c.w. ident has been included which can be set to give a c.w. station identification. The timing of these idents can be set in the same way as with beacons, i.e. either at regular intervals or at a preset time after activity on the channel.

Overall I think that the p.m.s. is a very worthwhile upgrade and I particularly liked the fact that the messages are actually stored in the TNC. This feature has the added advantage that you only have to leave your rig and TNC powered up rather than your whole station which I'm sure will appeal to many packet users.

For further details of this particular upgrade contact Siskin Electronics.

BARTG

They have changed their name! BARTG now means British Amateur Radio Teledata Group. The subtle difference is the word teledata as opposed to the old teleprinter. The change has come about as BARTG wants to make it more widely known that it is not just a group for teleprinter and RTTY enthusiasts, but covers all modes of data communication over radio. Other changes made at their recent AGM include new Chairman and President, namely Ken Young G3ZOG and Alan Hobbs G8GOJ respectively. I would also thank Ted Double for all his hard work over the years as he has now decided to retire from the posts of President and Awards manager.

VHF/UHF RTTY Contests

After the poor response autumn v.h.f. RTTY contest I think it's about time that these contests had a re-think. One idea that has been suggested is that the contests are made multi-mode, i.e. RTTY, AMTOR and Packet. I think this would promote a much greater interest, as I'm



Fig. 1

sure there are many more amateurs set up for v.h.f. Packet than v.h.f. RTTY. One example of this type of contest is already in the contest calendar, albeit on h.f., so let's see a few more.

Have you a view on this subject? If so please write and let me know.

BARTG Spring HF Contest Results

This very popular h.f. contest attracted a healthy entry this year. Looking through the results I see that the highest placed single operator G station was G4PKP who managed a very creditable fifth place overall with 538 692 points. The winner TG9VT, managed to score 1 030 160 which gave this station a very significant lead over the second place with 831 600. Moving on to the multi-operator section the winner was WA7EGA with 1 143 296 points and the highest placed G station was G3UUP in eighth place with 464 520 points. The final section, for short-wave listeners, was won by ONL383 with 544 036 points and Ted Double kept the UK in the results by scoring 257 136 points giving him third place. He was closely followed by G6LAU with 215 080 points.

Wavecom W-4010

I have just received a press release from Dewsbury Electronics regarding this versatile data communications decoder. The W-4010 is a very sophisticated piece of equipment which can resolve a vast range of commercial and amateur data modes. Although not cheap it does seem to be quite well priced when compared with its competitors, i.e. the Pocomtor and Info Tech ranges. The following is a brief summary of some of the reception modes covered:

ITA No. 2 (RTTY): 30 to 250 baud including bit inversion and Arab, Greek and Cyrillic alphabets.

ASCII: 30 to 300 baud including 7, 8 or 9 data bits.

ARQ/FEC (AMTOR): Includes Swedish ARQ.

Morse: Automatic tracking in two ranges 2 to 150 w.p.m. and 150 to 300 w.p.m.

AX-25 (Packet): 300, 600 and 1200 baud.

Two Channel TDM: Including TX/RX role reversal.

Four Channel TDM: To CCIR 342.

The Wavecom W-4010 includes all the necessary filtering, meaning that a complete, professional-quality monitoring system can be assembled simply with the addition of a receiver and a video monitor.

The Wavecom can be obtained from Dewsbury Electronics⁽³⁾ price £895 plus £7 for registered post.

(1) Dave Smith G4DAX, Red Roof, Goathland, Whitby, North Yorks YO22 5AN. Tel: 0947 86333.

(2) Siskin Electronics, Southampton Road, Hythe, Southampton SO4 5HU.

(3) Dewsbury Electronics, 176 Lower High Street, Stourbridge, West Midlands DY8 1TG.

**The next three deadlines are:
Jan 25, Feb 27
and Mar 29**

Amateur Satellites

MIR Operations

Right on schedule, in fact slightly before the planned first week-end, up came Musa Manarov U2MIR, to provide the first USSR space-to-earth manned amateur radio communications.

All went according to schedule, apart from the first pleasant change, in that the MIR spacecraft commander Vladimir Titov also showed great interest in becoming involved in the space communications experiment. As a result, being senior, he took the callsign U1MIR, leaving the first operations and the callsign U2MIR to fellow cosmonaut Musa Manarov.

The grounded USSR amateurs performed their tuition of amateur procedure within the allotted week and the very first amateur 145MHz band f.m. QSO with MIR was made by Leo Labutin, as UA3CR/W4 for the AMSAT Space Symposium in Atlanta. For this purpose, Leo had to obtain an American Licence, which he did

in rapid time. He was loaned a book on the subject matter, sat up most of the night studying it, and was given a test by two "W" amateurs on the following morning. He passed his extra class licence examination with flying colours and used the station of W4BIW to talk to Musa as MIR passed over the USA at the week-end. The first contact was made on 145.525MHz simplex (S21). The ground station consisted of a small, commercially made 145MHz band f.m. transceiver plus a 30 watt amplifier, feeding a small loop antenna. The reports were 5 and 9 both ways! On the same evening, U2MIR contacts were also made by Andy Macallister WA5ZIB and Doug Loughmiller KO5I.

Andrej Oravec OK3AU, nee OK3CDI, a very keen and long time satellite enthusiast, worked U2MIR at 2046UTC on November 18, when the spacecraft was over the Mediterranean Sea, using 145.550MHz simplex. On Sunday November 20 at 1733UTC, when MIR was over

the Black Sea, he had a 145.500MHz simplex QSO with Vlad U1MIR. The hat trick was almost made when on both the Saturday and Sunday, to everyone's surprise (including that of Andrej) Valery Polyakov, the medical doctor cosmonaut aboard MIR, came on as U3MIR! "They were all good signals, and we spoke in the Russian language" said Andrej.

UB5ICR reports working U2MIR with his transmission on 145.500 and the cosmonaut on 145.550MHz, the first known duplex QSO, whilst OH5LK reports a similar QSO, with signals at 5 and 9 both ways on Tuesday November 23, after IOLYL and OE3PU were worked.

Similar contacts were made in other parts of the world when the activity time permitted, as on Sunday November 20 at 0625UTC, 0025 American Central time, and 0925 MIR time, he was worked by Mike WDOGML. "He was a really strong and clear signal, pinning my S-meter," said Mike. "He spoke excellent English, al-

Practical Wireless, February 1989

though with a noticeable Russian accent. He sounded very tired, but was obviously enjoying his new hobby."

Hans ZS6AKV informs us that several contacts have been made whilst MIR was overflying South Africa, with QSOs being effected with ZS6BTG and some forty other ZS5 and 6 stations.

The reason that QSOs were not made in range of western Europe over the first two weeks of operation was the co-incidence of the times they were above the European horizon and the cosmonauts' sleeping hours. Passes were between 2200 and 0600UTC, and the space-men have a tight programme, with their required hours of rest set according to Moscow time, e.g. around midnight to about 9am MSK. As MSK is three hours later than UTC, this means that activity cannot normally be expected between 2100 and 0600UTC, so we had to wait for the third week of operation, when, as the group of passes occur over Europe daily, their free time coincided with their times of overfly. This explains why Musa appeared to be tired to Mike WDOGML, as he was obviously just awake in his early morning.

The first operation audible from the UK transpired on Tuesday November 23, when at 1940 he was heard, on S22 by **Mike Cooke G4DYC/M** mobile in Norfolk, calling stations and announcing "I am U2MIR". **John Harvey G6SVJ** heard him at 1946 calling IOLYL (three times) and OE3PU (twice) apparently without success. **Alf Ward, G3PZX** of Norwich was also listening on 145.550MHz at the same time and having not caught up with the news, thought that Musa was an Italian station coming in on a sudden Sporadic-E opening. This was a very short-lived and low-angle pass for the UK and may not have been heard by stations to the north-west of Britain. No activity was evidenced on the next pass from 2110 to 2120UTC, as the crew were probably fast asleep by this time.

The evening of Sunday November 27 produced two good active passes for the UK from 1818 to 1826 and 1952 to 2001, when U2MIR came up on 145.550MHz calling CQ from "Soviet spaceship MIR". Two Norfolk stations, G0BFL and your scribe were both acknowledged and stations in ON, DL and SM2 were also worked. **Serge UB5UN**, advises that a new frequency of 145.400MHz may be used in the future, this presumably being when the new 10 watt transceiver is taken aboard.

Some indication of what is being heard on MIR can be heard by listening on 143.625MHz, as the open microphone often permits audibility of the upcoming two metre signal, a rather surprising outcome when one considers the close proximity of the frequencies and the antennas. (Such is the closeness of the actual transceivers that on one occasion Musa picked up the wrong microphone to go back to a station calling him on 145MHz!). By this method your author was able to hear brief parts of upcoming calls being made between 2018 and 2028UTC on Monday November 28 as MIR went nearly overhead on a west to east crossing up to an elevation of 57 degrees. The level of mutual QRM overheard by this inadvertent relay was quite amazing!

With this problem recognised, a few hints and tips on how best to ensure a QSO with MIR would seem to be in order. It first has to be recognised that the level of activity observed from the orbital height on what may appear to be empty channels

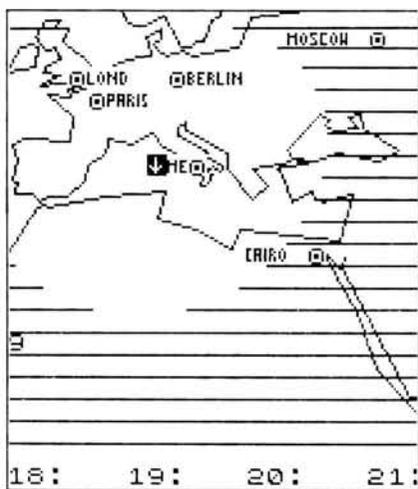


Fig. 1

to any one observer on earth is quite incredible. Your scribe has listened (with specific permission from the aircraft pilot) when flying over Europe at 30 000 feet, when a radio "line of sight" of up to 395km distance is given, e.g. an area capture of a vast area of activity is covered. Even at this relatively low altitude, the simplex channels are seen to be packed out with stations. MIR covers a much greater footprint, which can be seen in Fig. 1, where the unshaded area shows the line-of-sight path when the MIR station is over the Mediterranean Sea. All of EI, GI, GW, GD, G, most of GM, all of west and east Europe, southern Scandinavia and north Africa are "visible" and accounts for the huge number of stations, most of whom will be calling MIR on any one channel.

The problem in a spacecraft was evidenced by the tapes sent to your scribe made by Owen Garriot W5LFL. When flying over Europe, only a few calls were audible from the thousands calling at any one time, due to continuous blocking QRM without abatement. The only effective QSOs were made from the USA, Australia and Asia, where the amateur density per unit area on the 144MHz band was considerably less. In other words, the more that called, the less that were worked.

The answer is to make your calls on an adjacent channel quickly and of brief duration, i.e. only a 1 x 2 call with recognisable phonetics. As the Cyrillic Russian alphabet is quite different from the Roman, it would help identification to also give your phonetics as they do in the USSR, by common names, like "Anna" for A, "Boris" for B and so on. Do not give a long call—just a four second call and then listen, and then await the next invitation. The QRM produced if simplex channel working were to be attempted in western Europe would be phenomenal and impossible to cope with by newly licensed amateurs.

Some advantage might be effected by pointing a high gain beam to a point at which the spacecraft is expected to be at a part of the pass, as on f.m. the strongest wins by virtue of the capture effect.

Remember though that they move rapidly and may not be at that point when listening on that frequency and that you have to move it to reply again if called. A simple crossed dipole and 1 watt will give a sufficient signal throughout the pass, but is in equal competition with many similar signals.

Remember too that unlike the short duration missions of the Shuttle, MIR will be up and active for many years with a continuing amateur radio station, so you will have plenty of chances to come.

In your local area, you can have a net and form your calls as a serial, e.g. a set order of each station one after the other. This tactic was used by the Californian amateurs for the W5LFL mission and each and every W6 was heard and taped. Beams and high power are not really necessary and may be in fact counter-productive, 10 watts to a simple vertical or crossed dipole will give a 5 & 9 plus 20dB signal at the spacecraft if you are alone on a frequency.

Above all, do NOT call MIR when he is attempting to communicate with a station already indicated. The crew will make all attempts to complete the existing QSO and all QRM will elongate established contacts, reducing your chance of a contact.

It is almost impossible to give accurate pass times for MIR, as in the first week of operations alone the listed orbit period changed three times. Whilst we can give the very approximate periods some six weeks ahead and the band of times when they will be making passes over us, it is best to obtain updated times based on the known most recent, current Keplerian element data direct from the various satellite nets earlier given in these columns.

Your QSLs or reports for U1, U2 or U3MIR should go to Boris Stepanov UW3AX, Moscow 107207, P.O. Box 679, USSR, who will ensure a return. The first batch of QSLs will be sent up to MIR by the Progress supply missions for the cosmonauts to have and to provide decor for the station.

RS-10/11

At this time, RS-11 is being kept continuously active, with the Mode "A" transponder on all the time. **Leonid Maksakov RA3AT**, chief operator of the RS command station RS3A says that this will continue into 1989, with RS-11 being kept as a reserve back up. The "K" and "T" modes are not normally now in use, due to the high level of activity now evidenced on 21MHz at this period of high solar flux levels and correspondingly good propagation conditions.

Leo invites anyone with questions or the need of information on the RS satellite programme to write to him at Moscow, 117526, P.R. Vernadskogo 97,289, Maksakov L.I., USSR.

G8ATE, who has been very active on RS-11 since July writes to tell us of the stations he has worked so far, giving him 35 countries to date. His list includes EB6SU, K1WWT, KA1LMX, KE9GK, LA6QBA/P, LZ1KWF, N1ETT, NJ1H, NY2I, OE3JPA, OE6AHD, OX3DB, SP6HEI, SP8BTJ, UB4MDN, UC2OAV, VE1AMA, VE1BZV, VE1CIK, W1NU, WA10MI, YU2CSI, plus lots of DL, F, G, EA, I, ON, OZ and PA stations.

FO-12

The Japanese Fuji satellite is currently back on again, having had a month of rest in order to attempt to recondition the battery. In order to keep a close eye on the power levels, a new telemetry program has been loaded that will permit parameter observance every two seconds in place of the one minute transmission given previously.

Planned operations made in advance cannot be assured, so it is best to continue to look and hope for indications of activity. The JARL are soliciting funding for JAS-1-B, and at the 1988 Ham Fair collected over 400 000 Yen in the three days.

OSCAR-10

This old faithful is still going strong and is now out of the poor battery charge state once again. It is performing well, better than its new counterpart according to most Phase III users, but very few stations seem to be on the satellite. **Ron Pearson G3CAG** is a regular user of all the satellites

and states the following: "Whilst I can hear the noise floor on OSCAR-13, and receive excellent beacon signals; I cannot get my own signals into it. Using exactly the same power and system, on OSCAR-10, all is well."

Des Carne, AMSAT-UK 1683 writes: "I find it difficult to work Mode 'B' on OSCAR-13. I am using the same equip-

ment as I did on OSCAR-10, an FT-726R with a 50 watt p.a. for uplink, and an Icom 251E with a MuTek masthead pre-amplifier for the downlink. A single Cushcraft 410 10-element horizontal is used for the 435MHz uplink and 144-10T crossed Yagi for the 145MHz downlink. I found that on its better days I could work USA, Hawaii, South America, etc., even when the satellite was at my far west horizon. With OSCAR-13 to my west, I am unable to hear it until it is 5 degrees above my horizon."

The 145.809MHz A-O-10 beacon is on again, but is evidenced as a steady carrier without modulation. It is requested by AMSAT that if any signs of frequency modulation occur on this beacon, due to poor power regulation affecting the transponder oscillators, then all uplinking attempts should cease. If all is well, and it is in the permitted transponder deployment time, then minimum power uplinks for general QSOs are in order. At this time, OSCAR-10 should not be used between mean anomaly 30 and 90. As this eclipse period will slowly change, potential OSCAR-10 users are asked to keep updated on this non-use transponder MA period via the AMSAT nets.

Satellite Name	OSCAR 9	OSCAR 10	OSCAR 11	OSCAR 12
International Designation	81-100B	83-058B	84-021B	86-061B
Catalogue Object Number	12888	14129	14781	16909
Element Set Number	341	360	358	115
Epoch Year	1988	1988	1988	1988
Epoch Day/decimal day	302.29024608	298.55866518	302.73499601	279.26846706
Inclination	97.5995	27.0465	98.0396	50.0147
Right Asc. of Ascending Node	339.3609	298.2929	2.0404	1.9211
Eccentricity	0.0000515	0.6037040	0.0013307	0.0011139
Argument of Perigee	212.9441	347.2463	334.5778	58.6669
Mean Anomaly	147.1750	2.4750	25.4751	301.5254
Mean Motion (orbits per day)	15.36928141	2.05880371	14.62533140	12.44395542
Decay or Drag Factor	2.0670E-04	-5.8E-07	1.247E-05	-2.5E-07
Revolution or Orbit Number	39315	4036	24870	9766
Nodal Period in minutes	93.753840	699.1863	98.518097	115.653096
Longitude increment deg.west	23.435307	175.3521	24.630316	29.239314
Beacon Frequency(s) in MHz	21.002/ 145.825/ 435.025/ 2401.0 MHz	145.810 MHz 145.987 MHz	145.826/ 435.025/ 2401.5 MHz	435.797/ 435.913 MHz
Reference Equator Crossing	03 Nov 1988	03 Nov 1988	03 Nov 1988	04 Nov 1988
Orbit Number	39403	4056	24947	10137
Time UTC (HHMM.MM)	0027.66 Utc	0632.33 Utc	0017.21 Utc	0133.90 Utc
Longitude Degrees West	64.12	204.08	39.61	156.68

Satellite Name	OSCAR 13	R S 10/11	SALJUT 7	MIR
International Designation	88-051B	87-054A	82-033A	86-017A
Catalogue Object Number	19216	18129	13138	16609
Element Set Number	19	558	294	463
Epoch Year	1988	1988	1988	1988
Epoch Day/decimal day	273.72660805	305.97826864	307.73614561	293.73977731
Inclination	57.5382	82.9286	51.6134	51.6159
Right Asc. of Ascending Node	237.5900	46.7164	339.8504	147.7137
Eccentricity	0.6578369	0.0011150	0.0000970	0.0024353
Argument of Perigee	191.3601	330.8762	4.0169	210.4815
Mean Anomaly	139.7626	29.1800	355.9834	149.4161
Mean Motion (orbits per day)	2.09697959	13.71912730	15.34552252	15.74544942
Decay or Drag Factor	3.0E-07	-2.4E-07	1.3804E-04	7.9726E-04
Revolution or Orbit Number	225	6810	37334	15344
Nodal Period in minutes	686.6553	105.021898	93.777000	91.393033
Longitude increment deg.west	172.1935	26.381228	23.823922	23.272293
Beacon Frequency(s) in MHz	145.812/ 435.651 MHz	29.357/ 145.857/ 29.407/ 145.907 MHz	19.953 MHz	143.625=voice 166.125=data (AM)
Reference Equator Crossing	01 Nov 1988	04 Nov 1988	07 Nov 1988	04 Nov 1988
Orbit Number	293	6852	37400	15585
Time UTC (HHMM.MM)	0330.59 Utc	0059.62 Utc	0049.12 Utc	0044.10 Utc
Longitude Degrees West	219.78	13.95	99.70	345.48

Satellite Name	N0AA 9	N0AA 10	N0AA 11	METEOR 2-15
International Designation	84-123A	86-073A	88-089A	87-001A
Catalogue Object Number	15427	16969	19531	17290
Element Set Number	295	166	15	198
Epoch Year	1988	1988	1988	1988
Epoch Day/decimal day	302.46714348	302.51339271	302.36765666	304.49254307
Inclination	99.1175	98.6686	98.9099	82.4674
Right Asc. of Ascending Node	279.2490	331.1781	241.8696	338.0056
Eccentricity	0.0014671	0.0013081	0.0012134	0.0012478
Argument of Perigee	243.2496	199.4850	162.6391	179.0884
Mean Anomaly	116.7173	160.5829	197.5196	181.0295
Mean Motion (orbits per day)	14.11682999	14.22665250	14.10663295	13.83620119
Decay or Drag Factor	4.78E-06	4.22E-06	4.81E-06	1.77E-06
Revolution or Orbit Number	19975	11099	478	9185
Nodal Period in minutes	102.062217	101.275702	102.136299	104.133281
Longitude increment deg.west	25.513387	25.319030	25.533653	26.162612
Beacon Frequency(s) in MHz	137.620=AFT 137.770=DSB	137.500=AFT 136.770=DSB	136.995=AFT	137.850=AFT
Reference Equator Crossing	03 Nov 1988	04 Nov 1988	04 Nov 1988	04 Nov 1988
Orbit Number	20054	11192	572	9248
Time UTC (HHMM.MM)	0135.60 Utc	0117.92 Utc	0050.23 Utc	0109.67 Utc
Longitude Degrees West	141.50	85.38	167.57	86.57

Satellite Name	METEOR 2-16	METEOR 2-17	METEOR 3-2	COSMOS 1766
International Designation	87-068A	88-005A	88-064A	86-055A
Catalogue Object Number	18312	18820	19336	15331
Element Set Number	172	63	59	409
Epoch Year	1988	1988	1988	1988
Epoch Day/decimal day	305.72054093	304.87210780	305.07040891	308.29467757
Inclination	82.5575	82.5404	82.5523	82.5262
Right Asc. of Ascending Node	40.5447	102.7808	337.7495	246.5230
Eccentricity	0.0014259	0.0016282	0.0016854	0.0025346
Argument of Perigee	115.9897	191.1945	38.5642	112.6818
Mean Anomaly	244.2744	168.8865	321.6641	247.7128
Mean Motion (orbits per day)	13.83367789	13.84048772	13.16845036	14.73965943
Decay or Drag Factor	-2.06E-06	1.0E-06	3.91E-06	1.334E-05
Revolution or Orbit Number	6092	3796	1275	12200
Nodal Period in minutes	104.152391	104.101160	109.409911	97.755414
Longitude increment deg.west	26.166699	26.154025	27.481071	24.568395
Beacon Frequency(s) in MHz	137.400=AFT	137.300=AFT	137.850=AFT	137.330=AFT
Reference Equator Crossing	04 Nov 1988	04 Nov 1988	04 Nov 1988	07 Nov 1988
Orbit Number	6138	3854	1327	12255
Time UTC (HHMM.MM)	0108.60 Utc	0133.71 Utc	0030.69 Utc	0040.87 Utc
Longitude Degrees West	22.74	327.50	76.19	173.58

OSCAR-13

Increasing activity is evidenced on the new satellite, with a growing number of stations now active on Mode 'L'. A list of stations heard around the world has been noted by DF5DP, DL6KG, JR1WZI, KORZ, PJ9PC, W4FJ and W6ABN and has been made into a listing by William McCaa KORZ, which was sent on to us by **Ted Mathewson W4FJ**. It shows that there are 77 stations active from the USA, 42 from West Germany, 32 in Japan, 11 from Italy, ranging down to 7 from England, 4 each from Argentina, Canada, Austria and Australia, 3 each from Alaska and the Netherlands, 2 each from Wales, Switzerland and Brazil, and single representatives from other countries as ON6UG, UA1ZCL, F9FT and EA8ZU.

Station equipment varies considerably, with uplink powers ranging from 7 to 300 watts, uplink antennas ranging from single short Yagis to stacks of 4 x 55-elements, many variations of helix antennas and loop Yagis, and dishes from 1.3 to 6 metres diameter. For the downlink, most use bays of Yagis, ranging from JA2ODV's 8 x 15-elements and WA4OFS's 8 x 19-element K2RIW's down to a single Yagi or helix. VE7BBG uses the same 6m dish with a GaAs-f.e.t. built in pre-amplifier. For Mode 'S', a more demanding mode, we reproduce where known the list in full, the station, name, uplink and downlink, and the signal over noise of the beacon heard.

DK2ZF Rolf	—	10
DF5DP Bert	20dBd Yagi	10
G2BFO David	—	—
GW3XYW Stu	3m dish	—
IN3HER Raimund	1.5m dish	10
JA1UHY Hise	10kW e.r.p.	20
JR1WZI Ken	4kW e.r.p.	10
JA4BLC Row	65kW e.r.p.	40-ele loop
JR4AEP —	—	—
JR4BRS Toshe	10kW e.r.p.	4m dish
K0KE Eric	40W 8xK2RIW	4m dish
KORZ Bill	750W 4x15 NBS Yagis	1.2m dish
ON6UG Freddy	—	1.2m dish
VE4MA Barry	1kW 8x19 K2RIW Yagis	4m dish
WA3ETD John	—	1.2m dish
WB5LUA Al	800W 10T helix	1.2m dish
WB0QIY Doug	—	1.2m dish

The noise figures of the pre-amplifiers, not all of which are GaAs-f.e.t.s, are an important consideration. JR1WZI has a figure of 3.0, VE4MA 1.0, JA1UHY and KOKE have 0.9, whilst KORZ and WB5LUA have theirs down to 0.8 dB!

Bill McCaa KORZ believes that an unexpected problem is evidenced in the mode "S" transponder, as a hardware problem between the OSCAR-13 IHU and the transponder itself, preventing the ground command station from selecting the beacon only or passband only operation mode. This has resulted in the mode "S" receiver demanding far more power than expected, some 35dBW for c.w. and 45dBW for s.s.b. Bill thinks that a microswitch is at fault, giving an attenuation of some -20dB, which has to be "jumped over" with high power.

Mode "J"

No list of known users has been produced for Mode "J" as part of the "JL" uplink, as confusion between Mode "L" uplink is likely. At a guess, it can be said that at least six hundred stations seem to be active around the world using the 144.425-144.475MHz uplink.

The controversy over the use or otherwise of the low end of the 144MHz band as an uplink continues and a large number of useful and informative inputs on the problem have resulted.

Des Carne writes: "I believe, as do my colleagues here in Cornwall also, that Mode 'J' should be available for use, as it is in the all-mode section of the two metre band. Not only is it difficult for the eastern bloc stations to get Mode 'L' equipment, but for us also. I have scoured the country for a 1271, 1 ring lcom monthly for a 1275, and find a 736R costs £2500! Even a reasonable transverter costs £400, which, with the linear and antenna costs added would come to a bill of some £4000." He wonders how we can talk to the eastern stations, and says, "The Mode 'L' club stations are not heard in the 'J' section downlink of the 435MHz band and we need a simple access satellite that all can use, young and new call signs alike, with 145MHz up and 435MHz down."

John Fitzgerald G8XTJ writes from Great Missenden in Bucks, and points out that we need to hear from the regular

144MHz s.s.b. users rather than the f.m. and satellite users, as the 144.425-144.475MHz uplink falls into the c.w. and s.s.b. section of the IARU band-plan. He states that it is simply not true to say that this is an unused portion of the band. "The band is so crowded in highly populated parts of the country, which extend way beyond London and the South East, that the sector is very heavily used. There are regular Worked All Britain nets on 144.430 and 144.450MHz and on at least one occasion a large net of over 20 stations spread widely over the country has been forced to QSY because of OSCAR QRM." John continues: "I have yet to hear a satellite user ask if the frequency is in use on either u.s.b. or l.s.b. The mode of operation employed mostly seems to involve netting onto a signal heard on the downlink with a lot of v.f.o. swishing and whistling." He concludes, "In view of the clearly expressed views that mode 'JL' should not be used in this country, your attitude seems irresponsible to me."

Norman Fitch G3FPK, who as evidenced by his excellent and well informed column in this magazine fully knows the 144MHz band and its contents well, also informs us of the presence of the WAB nets. He adds that further consideration needs to be given to the fact that this part of the band is used for meteor scatter, a mode that requires a quiet and reliable frequency for schedules to be effected. The main meteor showers are as follows:

Quadrantids, January 3-4	Lyrids, April 22
Eta Aquarids, May 3-5	Halleidys, May 8
Omicron Cetids, May 14	Arietids, June 11
Zeta Perseids, June 13	Beta Taurids, June 26
Perseids, August 12	Piscids, September 9
Draconids, October 8-9	Orionids, October 21
Sigma Taurids, November 3	Cassiopeids, November 9
Leonids, November 17	Geminids, December 12-13
Ursids, December 22	

Not only must these dates be carefully observed, but other random MS times and

dates when planned schedules need to be effected.

Ron Broadbent G3AAJ, having heard the extremes of both sides of the story, ranging from "... the band is continuously in use over the whole country ..." to "... that part of the band is never used ..." decided to find the facts for himself. He undertook a tour of the country right up to Scotland and listened over the disputed section from many points en route. He stated his findings, that "... there are indeed black holes outside London with no activity evidenced, but, I did find signs of some activity in a few spots ...".

The answer in practical terms appears simple. The band is licensed for use for all UK amateurs for all modes, including satellites. The upper 200kHz is IARU agreed for satellite exclusive, but in practice the agreement is not seen to be implemented. We can, and must share our limited mixed-mode two metre frequencies, having a very restricted band total compared to the 4MHz available in other regions, despite a much greater station usage. If we all carefully listen on our intended uplink frequency on all modes, l.s.b., u.s.b. and f.m. before transmitting, and call to ask if the frequency is in use, no problems should arise.

Keplerian Elements

Apologies again for the omission of these last month, but the space was needed for the coming MIR operation information. Birger Lindholm has again provided them for us this month. It is pointed out that MIR will undoubtedly have changed, and although the times produced will give the general times when passes occur over you, the actual positional times will probably be well out by the time you receive this set. Please update from direct sources of supply such as the various AMSAT nets.

**The next three deadlines are:
Jan 25, Feb 27 and Mar 29**

Propagation

I have always been interested in the beginnings of all aspects of radio communication, but I never thought that when I built and used a solar radio telescope I would meet the people who actually identified the radio waves that were coming from the "active" sun. By June 1973, my telescope had completed 5 years' work and I was frequently called upon to give talks to a variety of technical organisations about the instrument and its results.

In October 1973 I met Nell Corry G2YL when talking about solar activity to the Guildford and District Radio Society. Nell was their President and she told me that, in 1935, Denis Heightman G6DH heard a "hissing" sound above the background noise of his 28MHz receiver and suggested that this was caused by a solar event.

After that, with the consent of Nell and Denis, I began to research their work from original material. At the request of Patrick Moore and Cmdr Henry Hatfield I reported my findings, by lecture, in March 1975 to a

national meeting of the British Astronomical Association. Unfortunately Nell died before my story was complete, but Denis attended the BAA meeting in London and saw my article entitled *The Hissing Phenomenon* published in the BAA Journal of June 1975. (See also, *The Sun's Influence*, PW November 1979, and reprinted in *Out Of Thin Air*.)

Briefly, contemporary radio enthusiasts found the short waves very exciting because the majority of them had learnt, from experience, that signals transmitted on these bands were vulnerable to a variety of natural disturbances. Many of those who studied propagation were members of the RSGB's Research and Experimental section and were always keen to investigate something new.

Often during 1935, Denis, a prominent member of the 28MHz group, heard the "hissing" whilst operating on the 28MHz band and consistently observed that this noise only occurred during daylight hours

and usually preceded some form of radio disturbance. In January 1936, Nell, another experienced radio operator became the author of the 28MHz report which was published monthly in the RSGB's *T & R Bulletin*. Nell produced these reports until December 1939 which included her own work on the band and the gen about 28MHz happenings that she received from operators around the world. The information gathered was recorded daily in a set of five diaries (1936-40 inc.) which Nell gave me before her death. From her diaries and *Bulletin* reports, I found that at least 24 radio amateurs had reported hearing the "hissing" and furthermore it was not confined to 28MHz, because her entries on 31 July 1938 and 25 June 1939 revealed that Miss Barbara Dunn G6YL and Denis Heightman, respectively, heard the "hissing" at 56MHz.

In the four years covered by her diaries, which are now in my archives, I learnt that aurora was reported on 53 days, fadeouts

on 140 days, echoing on signals on 26 days and "hissing" on 107 days. Although very few radio enthusiasts were able to observe during the early war years, the "hissing" was reported again in February, March and November 1940 and in June and July 1941. The important contribution that Denis made to our scientific knowledge was recognised by Dr. R. L. Smith-Rose when he was guest of honour, in 1956, at the fourth annual dinner of the London UHF Group. In his after-dinner speech, he mentioned that "radio astronomy is based on the 'hiss' phenomena, first observed by a British amateur, Denis Heightman, in 1935."

From 1973 onwards, I often thought of Nell and Denis especially when the fluctuating "hissing" from a solar event came from the loudspeakers of my 95 and 136MHz telescopes.

But now we must come forward a few years to the happenings in the last quarter of 1988.

Solar

"The mean sunspot number for October was 124.4, with every day above 100 except for the 12th, with a high of 220," wrote Neil Clarke GOCAS (Ferrybridge). He continued, "October 1988 saw the first daily solar flux figure in the 200s. It started the month at 179 s.f.u., climbed to peak at 202 on the 3rd then fell back to 149 s.f.u. on the 12th." Details of the daily fluctuations can be seen on Neil's computer print out, Fig. 1.

With his 2.5in refractor and 4in projection screen, Ron Livesey (Edinburgh) noted 3 active areas on the sun on October 16 and 22 and 6 and 5 respectively on days 29 and 30. At his observatory in Bristol, Ted Waring counted 12 sunspots on October 29 and 16 and 54 on November 5 and 18 respectively.

Henry Hatfield, using his spectrohelioscope, observed 20 filaments and 7 quiescent prominences on October 24, 10f and 2qps on the 29th and 18 and 20f on the 30th and 5 and 7qps on the 31st. He saw various sized flares manifesting on November 2, 3, 4, 6, 13 and 14 and recorded bursts of solar radio noise, at 136MHz, on October 24, November 2, 4, 5, 13, 15, 18 and 19 and noise storm conditions on November 3, 6, 7, 8 and 9. Among the many interesting entries in his log was the one for the 8th which read, "Bursting heard at 1007. Violent continuous bursting started at 1230 and continued till 1530; then continuous noise until sunset at about 1550."

Magnetic

"October was unsettled with stormy days on the 6th and 18th but was very stormy on the 10th with an Ap index of 103," reports Neil Clarke.

Karl Lewis (Saltash) and Doug Smille (Wishaw) recorded magnetic storms on the 10th and 18th.

Aurora

The auroral influence on terrestrial radio signals was detected on October 18 and reported to Ron Livesey, the auroral coordinator for the **British Astronomical Association**, by Gordon Hunter (Hamilton) and Doug Smille.

Ron also received reports of visual aurora overnight from the 15th to 20th inclusive from observers in Alness and Kirkwell, Scotland and Oulu, Finland. These were described as "glows", "rays", "rayed arc" and "quiet arc."

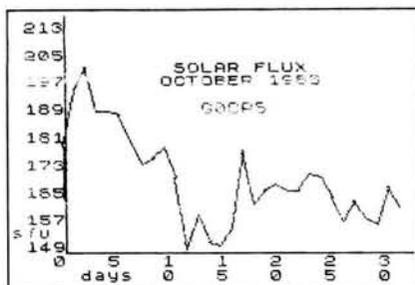


Fig. 1

The 50MHz Band

During October, very smeary and hazy television pictures, most likely from the Far East, have been received in the UK on Chs. E2/R1 (48.25MHz/49.75MHz), via the "F2" region of the ionosphere by Bob Brooks (Great Sutton), Simon Hamer (New Radnor) and Edwina and Tony Mancini, (Belper). Similar pictures were periodically seen by Lt. Col. Rana Roy (Meerut, India) between September 23 and November 10.

The 28MHz Band

"I've had a good time on 28MHz and 24MHz c.w. working into the States," wrote Neil Clarke on November 15. John Levesley GOHJL (Bransgore) found the band wide open from 0600 to 2000 on October 29 when he worked stations ranging from the USA to Japan including VK9YG in the Cocos/Keeling Isles and heard signals from Asia, South America, Europe and the Middle East. He logged many stations from these areas again on the 19th and 30th with the addition of

South Africa and Canada. John found the path active towards Japan again on October 28 and November 3, 5, 6 and 12.

Propagation Beacons

First of all my thanks to Mark Appleby (Scarborough), Chris van den Berg (The Hague), John Coulter (Winchester), Vaclav Dosoudil OK2PXJ (Kvasice), Henry Hatfield, Don Hodgkinson GOEZL (Harrow), Ken Lander G3LCX (Harlow), John Levesley, Greg Lovelock G3III (Shipston-on-Stour), Ted Owen (Maldon), Fred Pallant G3RNM (Storrington), Ted Waring and Ern Warwick (Plymouth), for their 28MHz beacon logs from which I compiled the list, Fig. 2.

You will see that the Adelaide Island beacon, VP8ADE (28.285MHz), was among those frequently heard during the period and Laurence Howell GM4DMA, who put it on the air in 1980 with the help of G3DME and G3ZMF, kindly sent a QSL card, Fig. 3, which he used when he was there. The photograph was taken near the site of VP8ADE which is on the rocky promontory sticking out into Marguerite Bay. The beacon has a power output of 8W and its present antenna, an east-west dipole on a rocky ridge around 31m a.s.l., overlooks the British Antarctic Survey Base of Rotherera.

Ken Lander heard "WJ7X/BCN SEATTLE" (28.250MHz) and "VE6YF/B EDM IOWT PSE QSL" (28.188MHz) for the first time on October 25 and 27 respectively.

Vaclav Dosoudil told me that the new beacon, OKOEG, which began operation on October 17, is operated by Radioclub of Hradec Kralove and sponsored by OK-Propagation Study Group. It has an output

Beacon	October 88											November 88															
	26	27	28	29	30	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
AX2RSY	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X
QFOAAR	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X
DL01GI	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X
EA2HB																			X								
E66RCM	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X
LY4M	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X
KR4VPI	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X
KC4DPC	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X
KD4EC	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X
KF4MS	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X
KI4PJ																			X								
LASTEN	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X
LUIUG	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X
OH2TEN	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X
OKOEG								X	X							X	X	X	X	X	X	X	X	X	X	X	X
PY2AMI	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X
VE1MUF	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X
VE2HOT	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X
VE3TEN	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X
VE6YF	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X
VK5VI	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X
VK6RWA	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X
VK6RTW	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X
VP8ADE	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X
VP9BA	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X
VA4DJS	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X
VB4JHS	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X
VB4VPI																											
WC8E	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X
W3VD																											
WJ7X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X
W7JPJ	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X
WBFKL	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X
W9UXO	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X
Z0BHF	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X
ZL2MHF	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X
ZS1LA	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X
ZS5VHF	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X
ZS6PW	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X
Z21ANR	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X
ZB4CY	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X

Fig. 2

S.E.M.

UNIT P, UNION MILLS, ISLE OF MAN
Telephone: (0624) 851277

Some comments on our QRM Eliminator in the last few days. "It works like magic". "Locals thought I was exaggerating until they heard it". "I'm phoning from Florida to say it's reduced my power line noise to zero. I can talk to my English friends again".

S.E.M. QRM ELIMINATOR. Unique design gets rid of any local interference. Connect in your aerial lead and removes QRM before it gets to your receiver (you can transmit through it). Any sort of interference, it can be next to your rx (your computer) or several miles away, e.g. power lines. £69.50 ex stock. As the P.W. review says "Does it work? Yes it does."

S.E.M. TRANZMATCH MKIII. The only Aerial Matcher with UNBALANCED and TRUE BALANCED OUTPUTS. 1 kW 1.8-30 MHz. £135. Built-in EZTUNE (see below). £39.50. Built-in Dummy Load. £9.90. Ex stock.

EZTUNE. Allows you to TUNE UP on receive instead of transmit. FANTASTIC CONVENIENCE. Boxed unit, £45.00. P.C.B. and fitting instructions to fit in any ATU. £39.50.

FREQUENCY CONVERTERS. V.H.F. to H.F. gives you 118 to 146 MHz on your H.F. receiver. Tune Rx. 2-30MHz. £59.50 ex stock.

H.F. to V.H.F. gives you 100 kHz to 60 MHz on your V.H.F. scanner. £49.50 ex stock. Plug in aerial lead of any receiver. Tuning from 100MHz up.

2 or 6-METRE TRANZMATCH. 1kW. will match anything. G2DYM or G5RV? £35.00 ex stock.

DUMMY LOAD. 100 W. THROUGH/LOAD switch. £24.00 ex stock.

VERY WIDE BAND PRE-AMPLIFIERS. 3-500 MHz. Excellent performance. 1.5 dB Noise figure. £32.00 or straight through when OFF. £37.00 ex stock.

R.F. NOISE BRIDGE. 1-170 MHz. Very useful for aerial work. £45.00 ex stock.

IAMBIC MORSE KEYS. 8-50 w.p.m. auto squeeze keyer. Ex stock. Ours is the easiest to use. £45.00. First class twin paddle key. £20.00 ex stock.

TWO-METRE LINEAR/PRE-AMP. Sentinel 40: 14x power gain, e.g. 3 W - 40 W (ideal FT290 and Handhelds), £85.00. Sentinel 60: 6x power, e.g. 10 W in, 60 W out, £95.00. Sentinel 100: 10 W in, 100 W out, £135.00. All ex stock.

H.F. ABSORPTION WAVEMETER. 1.5-30 MHz. £39.50 ex stock.

MULTIFILTER. The most versatile audio filter. BANDPASS Hi Pass, Lo Pass and two notches. Frequency and Bandwidth adjustable 2.5 kHz-20 Hz. £75.00 ex stock.

HIGH PASS FILTER/BRAID BREAKER. Cures T.V.I.. £7.50 ex stock.

CO-AX SWITCH. Three-way + earth position. D.C.-150 MHz, 1kW, £25.00 ex stock.

12 MONTHS COMPLETE GUARANTEE INCLUDING TRANSISTORS

Prices include VAT and delivery. C.W.O. or phone your CREDITCARD NO. Ring or write for further data or catalogue. Orders or information requests can be put on our Ansaphone at cheap rate times. Remember we are as near as your 'phone or post box.

MAKE YOUR INTERESTS PAY!

More than 8 million students throughout the world have found it worth their while! An ICS home-study course can help you get a better job, make more money and have more fun out of life! ICS has over 90 years experience in home-study courses and is the largest correspondence school in the world. You learn at your own pace, when and where you want under the guidance of expert personal tutors. Find out how we can help YOU. Post or phone today for your FREE INFORMATION PACK on the course of your choice. (Tick one box only!)

Electronics	<input type="checkbox"/>	Radio, Audio and TV Servicing	<input type="checkbox"/>
Basic Electronic Engineering (City & Guilds)	<input type="checkbox"/>	Radio Amateur Licence Exam (City & Guilds)	<input type="checkbox"/>
Electrical Engineering	<input type="checkbox"/>	Car Mechanics	<input type="checkbox"/>
Electrical Contracting/Installation	<input type="checkbox"/>	Computer Programming	<input type="checkbox"/>
GCE over 40 'O' and 'A' level subjects			<input type="checkbox"/>

ICS

Name _____ P. Code _____
Address _____
International Correspondence Schools Dept EES C10, 312/314 High St., Sutton,
Surrey SM1 1PR. Tel: 01-643 9568 or 041-221 2926 (24hrs).

QRP KITS AT QRP PRICES!

A 3-BAND RECEIVER KIT FOR £63!

- ★ Complete in every detail!
- ★ 80-40-20m Bands!
- ★ Direct Conversion!
- ★ Fully Detailed Manual!



Other Super Kits include:
DTR3 TRANSCEIVER, ATU's, AUDIO FILTER etc etc... all 'well styled' and complete!

For full details of the 'CARLTON' and the rest of our range, send a SAE to:

**LAKE ELECTRONICS, 7 MIDDLETON CLOSE,
NUTHALL, NOTTINGHAM NG16 1BX.**
Or ring Alan G4DVW on (0602) 382509 (callers by appointment only).

J. BIRKETT

RADIO COMPONENT SUPPLIERS



25 The Strait
Lincoln, Tel. 20767
(LN2 1JF)
Partners J.H. Birkett.
J.L. Birkett.

EX-MILITARY COMMUNICATION RECEIVER TYPE R210 frequency 2 to 16 MHz in 7 Switched Bands, AM, CW, SSB, aerial inputs 80 ohm balanced line, long wire or whip CW Filter, BFO, noise limiter complete with 240 volt AC power pack loudspeaker and a pair of lightweight headphones or £79.80 Carr. £8.
EX-MILITARY COMMUNICATION RECEIVER TYPE R210 unconverted or £50 Carr. £6.
SPECIAL EX-GPO COMMUNICATION RECEIVER 133kHz to 33MHz type 40A mains battery operation. Callers only or £195.
STRIPLINE TRANSISTORS BF362 or 5 for £1, BFR90 or 4 for £1.60.
3" AXIAL FANS 18 to 24 volt dc or £4.95, 4" 12 volt dc or £5.95.
AIR SPACED VARIABLE CAPACITORS 200-350P F. or £2.50, 125-125P F. or £1.95, 10+10+20P F. or £1.50, 170+380P F. or £2.50, c804 type SP F. or £1.95, 10 P.F. or £1.95, 25P F. or £2.50, 50P F. or £2.50, 150P F. or £2.95.
20 ASSORTED MINIATURE Leds or £1, 15 rectangular Leds or £1.
FILM TRIMMERS 10P F. or £2p, 40P F. or £2p each, 130P F. or £3p each.
TUBULAR TRIMMERS 0.5P F. to 3P F. or £3p, 15P F. or £3p.
PYE WESTMINSTER W15FM dash mount mid-band or £15 carr. £3. **PYE WESTMINSTER W15FM** boot mount mid-band or £7 carr. £3.
DYNAMAR 25 WATT DASH MOUNT 16 CHANNEL FM TRANSCEIVER MID-BAND £15 carr. £3.
STORNO FM BOOT MOUNT MID BAND TRANSCEIVER MID-BAND £8 carr. £3.
GCE AM DASH MOUNT HIGH BAND RECEIVER or £10 carr. £2.
STORNO FM BOOT MOUNT HIGH BAND TRANSCEIVER or £12 carr. £3.
PYE EUROPA FM 25 watt MID-BAND TRANSCEIVER or £25 carr. £2.
PYE EUROPE FM 5 watt VNE TRANSCEIVER or £37 carr. £2.
DYNAMIC MIKE INSERTS 250 Ohm or 60p 4 for £2.
CARBON MIKE INSERTS or 10 for £1.50.

WOOD AND DOUGLAS AND C.M. HOWES KITS AVAILABLE BY POST AND FOR CALLERS.
ACCESS AND BARCLAY CARDS ACCEPTED. P.P. 60p UNDER £5.00, OVER FREE UNLESS STATED OTHERWISE.

SPECIAL NOTICE TO READERS

Although the proprietors and staff of *PRACTICAL WIRELESS* take reasonable precautions to protect the interests of readers by ensuring as far as practicable that advertisements in *PRACTICAL WIRELESS* are bona fide, the magazine and its Publishers cannot give any undertakings in respect of claims made by advertisers, whether these advertisements are printed as part of the magazine, or are in the form of inserts.

While the Publishers will give whatever assistance they can to readers having complaints, under no circumstances will the magazine accept liability for non-receipt of goods ordered, or for late delivery, or for faults in manufacture. Legal remedies are available in respect of some of these circumstances, and readers who have complaints should address them to the advertiser or should consult a local Tradings Standards Office, or a Citizen's Advice Bureau, or their own solicitor.

S.E.M.

UNIT P, UNION MILLS, ISLE OF MAN
Telephone: (0624) 851277



S.E.M. QRM ELIMINATOR

Do you suffer from local interference? The answer is probably yes. If you moved your receiver into the country you would be amazed how quiet your reception would be. The noises you hear on the H.F. bands are produced by local electrical equipment.

This completely new idea, developed by S.E.M. can provide the complete removal of any of these problems. You don't even have to know what or where the source is. It can be your own computer next to your receiver or r.f. welding equipment in a factory several miles away.

The QRM Eliminator connects in your aerial lead (you can transmit through it) it requires an auxiliary aerial (this can be ANY other aerial e.g. a 2 metre one, or a few metres of wire, because wide band amplifiers are used to boost the level of the QRM). Your unwelcome signal will arrive at the two aenals slightly out of phase and by adjusting the phase of the signal from the auxiliary aerial with the Eliminator controls, you can completely remove it BEFORE IT ARRIVES AT YOUR RECEIVER. Forget all the inadequacies of noise blankers, this is a new, different, concept. Sceptical? As W4CXH in Florida says "The mains noise is S 7 and you are coming through 5 and 4." Practical Wireless review says "Does it work? Yes it does". Other comments "A remarkable achievement", "It works like magic", "It even eliminates rain static" and comments about being able to operate again after years of enforced inactivity because of some local problem not previously curable or even traced, are many.

Size: 6" x 2" x 3" deep. Sockets SO239s. Supply 12 V (10-14) 30 mA. Frequency range 500KHz - 60 MHz continuous. May be transmitted through.

Price: £69.50 including VAT and delivery.

of 10W to a dipole antenna, uses the f.s.k. mode and operates from JO70WE on 28.282MHz. "All reception reports are welcomed permanently and will be verified by special QSL card. They should be mailed to CRC Bureau, Box 69, 11327 Praha 1," said Vaclav. Among the many beacon signals he heard during October, the Cyprus beacon, 5B4CY, was the strongest at S9+.

Ern Warwick logged CT3B, DKOMW, LU4AA, OH2B and 4X6TU on 14.1MHz around 0845 on October 13 and IK6BAK on 24.915MHz at 1147 on the 14th. Ted Owen logged this Italian beacon at 0905 on November 6 and 8, DKOWCY/ BEACON on 10.14MHz at 1330 on the 7th and, along with Don Hodgkinson and Fred Pallant, added ZL2MFH to our 28MHz list. Don and John Coulter heard AL7GQ on October 27 and 28 respectively and KE2DI (28.286MHz) on November 20 and 21.

Mark Appleby copied signals from the 24 and 10MHz, Italian and German beacons, on most days between October 28 and November 21 and Greg Lovelock heard IK6BAK on October 31 and November 3.

Don Hodgkinson first heard KI4PJ on 28.221MHz at 1328 on November 13 and again on 28.226MHz on the 19th, OKOEG on the 4th, PA3BBI (28.275), near Amsterdam on the 1st and WJ7X/BCN (28.253MHz) Seattle, on October 25. Ken Lander also lists KI4PJ.

Tropospheric

In October, I had the pleasure of meeting two of our readers from Rye and showing them around the radio exhibition at The Chalk Pits Museum, Amberley, Sussex. **Norman Henbrey BRS28198** and **Tony Whatman**, left and right in Fig. 4, are neighbours with differing interests in the world of radio communication. Norman has been active for 40 years and enjoys listening on all amateur bands from 1.7 to 432MHz using all modes. His receivers include FRG-7700, FR-DX400, KW77 and converters for v.h.f., u.h.f. and RTTY. He recently added a Datong Active antenna to his present system which includes an 8-over-8 slot for 144MHz, Fig. 5, a 48-element for 432MHz and a TA31 dipole, 18AVT wide-band vertical and a long wire for the h.f. bands. Norman is a member of the Hastings Electronics and Radio Club and has won listening awards from the RSGB and the ISWL. Radio next door in Tony's QTH is less extensive but none the



Fig. 3

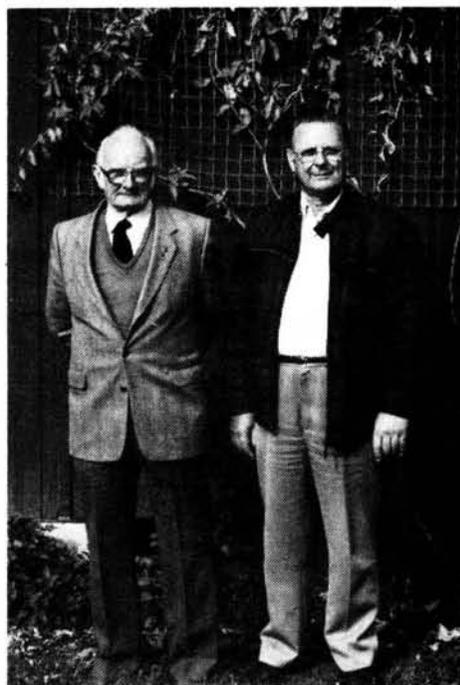


Fig. 4 ▶

Fig. 5

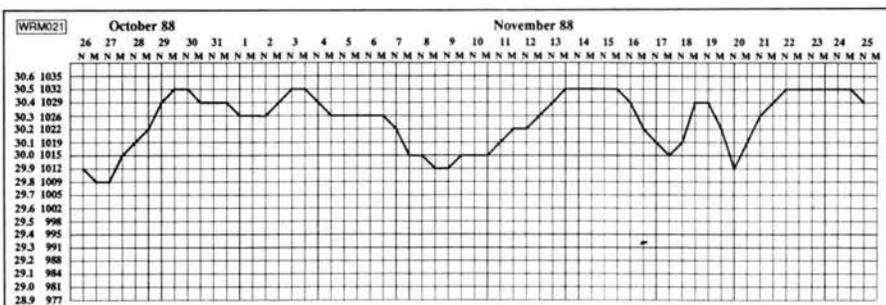


Fig. 6

less interesting because his speciality, which began in his service days, is aircraft and their general RT traffic. He is a member of the Robertsbridge Aviation Society and has a Realistic receiver.

The atmospheric pressure readings for the period October 26 to November 25, Fig. 6, were taken at noon and midnight from my barograph in Sussex.

934MHz

While on holiday in Deal, between October 19 and 27, **Les Jenkins GB-37** (Godalming) made contact with stations in Biggin Hill, Canvey Island, Dagenham, Dettling, Eastwood, Fobbing, Hadleigh, Leigh-

on-Sea, Minster, Rochford, Sandwich, Sittingbourne, Southend and Westerham. Les found conditions normal and used a Cybernet Delta One transceiver, Crestbyte receiver pre-amplifier and a Nevada quad loop antenna only 3m a.s.l.

John Levesley UK-627 received signals from GY-186 in Guernsey on October 25 and November 5, 6, 9 and 10 and worked him on the 4th, and JY-797 in Jersey on the 5th. The Channel Isles to John is around 170km.

**The next three deadlines are:
Jan 25, Feb 27 & Mar 29**

Broadcast Round-up

Peter Shore

Radio activity has been high in recent weeks — and I'm not talking about another Chernobyl. The BBC is convinced that we are moving towards a sunspot maximum, as it has started to use the 11 metre band for broadcasts to Europe and Africa, and indeed, several other stations are now doing likewise. Details later.

Radio is proving to be worthwhile on a news gathering front, with stations in the parts of the Soviet Union where unrest is spreading providing a reliable source of information. In some cases if you are to find out what is going on, you'll have to be a linguist with several obscure tongues to your credit, as services audible here are often in regional languages. However, some do have English and French broadcasts. Details in European news desk. Some Western broadcasters are taking

the opportunity of the continuing nationalist feeling to introduce new services directed to those parts of the Soviet Union. Radio Sweden introduced an Estonian newscast on December 5 at 1755 daily, on its medium wave channel of 1.179MHz.

Meanwhile, money troubles continue to plague the international broadcasting world, for whilst Radio Sweden now enjoys a new language service, its s.s.b. transmissions finish at the end of 1988. These transmissions, which have relayed Swedish Radio's Programme 1, have been in existence in trial form since 1977, from the Grimeton transmitter near Varberg. It is considered too expensive to make them permanent.

Kol Israel may be forced to leave the air soon, according to reports reaching us. More donations are required from the

Jewish Agency, or alternatively the Israeli Government, if broadcasts are to continue.

The Middle East has given some interesting listening lately with Radio Jordan testing its new transmitters, and Abu Dhabi giving good reception and two simultaneous short wave services, one possibly a revamped External programme.

Radio France International and Radio Beijing started their transmitter exchange during November, and RFI has entered into new agreements with Africa Number One for broadcasts from the Moyabi transmitter site. Meanwhile, a former DG of RFI has just signed an agreement to install three high power short wave transmitters in Cape Verde which will be leased to international broadcasters for programmes aimed at Latin America and Africa.

The Dutch government is considering an
Practical Wireless, February 1989

Asian relay station for Radio Netherlands, and there is the possibility of increasing the number of languages the station broadcasts. No decision has yet been made on the site of the new relay, but more information should be available within the next six months.

With short wave conditions theoretically on the up and up (although listening during the evening in late November as this is written has been most frustrating, with very poor reception on all paths), it is worthwhile keeping an ear to the regular propagation reports from Radio Australia, heard at 0425, 0827, 1225, 1627 and 2027, with weekly updates in the *Communicator* programme. Radio Netherlands communications magazine, *Media Network* also has a weekly update and forecast.

Europe

(all times UTC/GMT)

BBC World Service uses 5.875MHz, an old feeder frequency, for English by Radio, French and German from 1715 until 2200 giving good reception in Europe.

Radio Austria International's English to Europe can be heard at 0430 on 6.155MHz, 0830 and 1230 on 13.73 and 6.155MHz, at 1730 and 1830 on 6.155 and 5.945MHz and finally at 2230 on 9.87 and 6.155MHz.

The Voice of Greece has started two new language services recently. Swedish news can be heard daily at 1540 on 17.565, 15.63 and 11.645MHz, whilst Polish is broadcast at 1740, immediately after the 1725 Russian news, on 11.645 and 7.43MHz.

The Italian Radio Relay Service has been testing at weekends between 0600 and 1500 on 7.145, 7.16, 9.86 and 11.995MHz, and after 1530 on 3.945MHz. Eventually it is planned that this organisation will relay international broadcasters — for a fee, of course.

Radio Netherlands has altered two frequencies — at 1130, new 21.615MHz is used in parallel with 21.48MHz, and at 1430 new 17.605MHz is used, replacing 21.48MHz.

Radio Norway International's latest operating schedule for services which include on Sunday the English *Norway Today*, programme:

1000 on 25.73, 21.705, 15.235 & 15.18MHz

1300 on 21.705, 15.31, 9.59 & 6.035MHz

1400 on 21.70, 15.31, 15.25 & 15.19MHz

1600 on 21.705, 15.31 & 11.76MHz (and on Monday only on 1.314MHz)

1700 on 15.31, 15.22 & 9.655MHz

1900 on 15.225, 9.59 & 6.015MHz

2000 on 15.31MHz

2200 on 11.85 & 9.605MHz

Radio Exterior de Espana has two one-hour long transmissions in English to Europe at 1930 and 2130 on 11.79 and 9.765MHz.

Radio Sweden is using 17.815 between 1200 and 1600, a 5kHz move from 17.81MHz.

Soviet regional external services include Radio Yerevan from Armenia, which transmits in French Monday to Saturday at 2150 on 11.98, 9.48 and 9.47MHz, and on Sunday at 0850 on 15.51, 15.485 and 15.455MHz.

Radio Vilnius in Lithuania has English daily at 2230 on 6.10MHz and at 2300 (aimed at the USA) on 15.455, 15.18, 13.645, 9.765, 7.40, 7.165 and 6.10MHz.

Radio Kiev in the Ukraine, at present seemingly untroubled by nationalistic tendencies, is on the air to Europe at 1900 daily on 7.115, 6.165, 6.09 and 6.01MHz.

Offshore news from Europe — Radio 819 is now carrying Dutch programmes daily 0400–2300 on 819kHz, with Caroline carried 24 hours a day on 558kHz and on 819kHz between 2300 and 0400.

Middle East

Radio Jordan is using 9.56MHz between around 0500 and 2200, with broadcasts in English, apparently a relay for test purposes of the domestic English service. Reception varies, and reports are requested. Swiss Radio International uses 9.56MHz between 0745 and 1030 rendering Jordan inaudible. Reports are to be sent to PO Box 909, Amman, Jordan.

Arabic programmes from the country are heard 0330–1500 on 11.92, 11.81 and 9.54MHz, and from 1500–2330 on 11.81, 9.54 and 9.53MHz.

Iran is using 6.08MHz in parallel with 9.022 for the evening period which includes English at 1930.

Iraq is now using 15.01MHz during the morning for Arabic programming.

Tunisia is heard with good reception from around 1400 on 9.675MHz.

The United Arab Emirates station in Abu Dhabi carries English at 2200 on 9.595 (or 9.597) and 11.965MHz as well as announced 6.17MHz. UAE Abu Dhabi's Arabic programming is heard on 25.90, 21.515, 21.735 and 17.82MHz. Separate

services have been noted from just after 1400 until 1530.

In UAE Dubai, the 1600 English broadcast is carried on 17.865, 15.435, 11.73 and 9.64MHz.

Saudi Arabia's English service is on 9.705 and 9.72MHz at 2000–2100.

Asia and the Pacific

Radio Afghanistan is carried on 9.635, 6.02 and 4.76 MHz at 1900 with English, but presumably from 1730.

Radio Australia is testing to the Indian sub-continent on 15.14MHz between 1500 and 1800, and can be received in the UK.

Bangladesh is on the air at 1800 on 15.51 and 7.505MHz, and announced 13.650MHz.

Radio Bhutan may just be audible in Europe on new 5.04MHz between 1330 and 1600.

All India Radio uses 7.412MHz during the early evening, with a brief English newscast at 1730.

The Voice of Indonesia is on 15.15, 11.79 and 7.125MHz between 1800 and 2100, and carries English at 2000.

Radio New Zealand's current schedule is:

0230–0630 on 17.705 & 15.15MHz (0045 on Sundays only)

0900–1115 on 11.78 & 9.85MHz (heard in UK on both channels)

1730–2015 on 15.15 & 11.78MHz

2245–0045 on 17.705 & 15.15MHz

Voice of Turkey uses 15.20 with 9.445MHz (ex 9.46) 0500–1000 with Turkish programmes.

The Americas

HCJB in Quito, Ecuador with English to Europe is heard at 0700 on 9.61 and 6.205MHz with the Australian service on 9.745 and 6.13MHz, sometimes running in parallel.

A supposed clandestine station, R. Libertad, broadcasting in Serbo-Croat is broadcast on the transmitters of WHRI on 21.84 and 15.105MHz at 1600 daily, with good reception in the UK. It is not known who is behind this station at the present time.

KUSW is heard after 1600 on 15.65MHz with good reception, and WRNO in New Orleans is audible on 13.76MHz during the evening period.

Any reports for Broadcast Round-Up should be sent to the PW offices

OSL

QUARTZ CRYSTALS

QuartzLab MARKETING LTD

P.O. Box 19 Erith Kent DA8 1LH
Telephone: 0322 330830
(24hr Ansafone)
Telex: 8813271 GECOM-G
(Attention QUARTSLAB)
An SAE with all enquiries please
PRICES NOW INCLUDE VAT

STOCK CRYSTALS

CRYSTALS FOR 2 METRES
HC25 £2.70 FOR ONE CRYSTAL £2.50 EACH FOR 2 OR MORE

TX CRYSTALS 12MHz 30 & 40pF	RX CRYSTALS 44MHz Series Res 14-15MHz 30pF Scanner Crystals SR9 crystals £3.45	R0-R7, S8-S23, & S32
---------------------------------------	---	-------------------------

HC6 £2.80 FOR ONE CRYSTAL £2.60 EACH FOR 2 OR MORE

TX CRYSTALS 4MHz 30pF	RX CRYSTALS 44MHz Series res	R0-R7, S11, S20-23
---------------------------------	--	--------------------

4 METRE CRYSTALS FOR 70.26 IN HC6/U AT £2.80 each
TX 8.78250 RX 29.7800

70CM CRYSTALS £6.50/pr or £3.25 each
For Pye PF1 PF2 & PF70 series Wood & Douglas and FDK MULTI U11
SUB (433.2) SU20 RB0 RB1 RB2 RB3 RB4 RB5 RB6 RB8 RB10 RB11 RB13 RB14
RB15

Also for MULTI U11 ONLY SU16 SU18

CONVERTER CRYSTALS IN HC18/U AT £3.30 each.
22.000, 38.666, 42.000, 96.000, 101.000, 101.500, 105.666, 116.000

FREQUENCY STANDARDS £3.20 each.
HC3U 1000kHz 10.000MHz
HC18/U 1000kHz 7.00MHz 10.00MHz 10.70MHz 48.00MHz 100.00MHz
TONEBURST, I.F. & MPU CRYSTALS IN HC18 £2.60 each.
7.168MHz (For 1750 Hz Tone), 10.245 (for 10.7 I.F.)
3.2768 4.000 5.0688 10.245MHz 14.3180 15.00000

YAESU CRYSTALS FOR FT101's FT901 & etc £4.80 each.
Many available ex stock (A list is available on request please send S A E.)

Full list available on request, please send SAE
PRICES NOW INCLUDE VAT

MADE TO ORDER CRYSTALS

FUNDAMENTALS		OVERTONES	
FREQUENCY RANGE	PRICE	FREQUENCY RANGE	PRICE
1 TO 1.5MHz	£12.40	3rd OVT 21.00 TO 65.00MHz	£5.25
1.5 TO 2.0MHz	£5.90	5th OVT 60.00 TO 110.00MHz	£5.90
2.0 TO 6.0MHz	£5.50	5th OVT 110.00 TO 125.00MHz	£8.60
6 TO 21MHz	£5.25	7th OVT 125.00 TO 175.00MHz	£11.60
21 TO 25MHz	£7.50		

DELIVERY
2.0 to 175.0MHz 2 weeks approx. 1 TO 1.499MHz 3 to 4 weeks

Unless otherwise requested fundamentals will be supplied for 30 pF load capacities and overtones for series resonate operation.
HOLDERS - PLEASE SPECIFY WHEN ORDERING - else HC25/U supplied for XTLS above 3MHz.

HC6/U & HC33/U 175MHz
HC18/U & HC25/U 2-175MHz
HC17 Add £0.50 HC45 Add £3.75

DISCOUNTS: Price on application for 10 + units to same frequency spec. or bulk purchases of mixed frequencies.
COMMERCIAL CRYSTALS: available on fast delivery and at competitive prices.
EMERGENCY SERVICE FOR XTALS 1 to 175MHz: Add the surcharge for each XTAL. Days refer to working days: 4 days + £12. 6 days + £7. 8 days + £5. 13 days + £3.
CRYSTAL SOCKETS: HC25 £0.25 ea. HC6 £0.30 ea. **MINIMUM ORDER CHARGE** £1.50 unless ordered with crystals
TERMS: Cash with order post inc. to UK & Ireland. Cheques & PO's to OSL LTD.

PRICES NOW INCLUDE VAT

USE THIS

SMALL ADS

Whilst prices of goods shown in advertisements are correct at the time of closing for press, readers are advised to check with the advertiser both prices and availability of goods before ordering from non-current issues of the magazine.

The prepaid rate for classified advertisements is 42 pence per word (minimum 12 words), box number 60p extra. Semi-display setting £13.90 per single column centimetre (minimum 2.5 cms). Please add 15% VAT to total. All cheques, postal orders etc., to be made payable to Practical Wireless. Treasury notes should always be sent registered post. Advertisements, together with remittance should be sent to the Classified Advertisement Dept., Practical Wireless, Enefco House, The Quay, Poole, Dorset BH15 1PP. Telephone (0202) 678558.

SPACE

Receivers and Components

QUARTZ CRYSTALS and FILTERS

Large numbers of standard frequencies in stock for amateur, CB, professional and industrial applications. Stock crystals £5.00 each (inc. VAT and UK post). Any frequency or type made-to-order from £6.50. Phone or SAE for lists.

GOLLEGE ELECTRONICS
Merriott, Somerset, TA16 5NS.
Tel: (0460) 73718.

SCANNER OWNERS. For those of you who wish to hear more, we offer extensive frequency listings and many scanner modifications. For full details send a large S.A.E. to S.S.C. PO Box 71, Bournemouth, Dorset BH9 1DL.

RACAL RA 171. £175. Racal accessories, JRC NRD-525 general coverage receiver, new £837 inc. VAT. JST-135D 100W transceiver, new £1200 inc. VAT. All optional accessories. Telecom antennas & accessories. High quality mobile ext. speakers. Please contact E. NAVAIDS LTD. Tel: 01-391-0545. Fax: 01-391-5258.

LISTEN TO HF ON YOUR 2M RIG using our UC1332 synthesised up-converter. Covers 1-33MHz in sixteen bands. Prices from £39.50. **MALSOR KITS**, 21 Green Street, Milton Malsor, Northampton NN7 3AT. Phone evenings (0604) 858988.

Kits

KANGA PRODUCTS

Kits for The Amateur, Budding Amateur and the Listener
NEW KITS, NEW KITS, NEW KITS
C.W. MORSE PRACTICE OSCILLATOR £7.95
IAMBIC KEYSER KIT £12.95

OLD FAVOURITES

100 Watt DUMMY LOAD £8.45
CRYSTAL MARKER KIT £10.95
FREQUENCY COUNTER/DIAL £21.95
OWNER HF TRANSCIVER £27.50
TOP BAND KIT FOR THE FT707 & FT77 £29.95
SINGLE BAND RECEIVER £21.95
DUAL BAND RECEIVER (20M & 80M) £36.95
(some kits are supplied semi-complete) PLEASE ADD £1 FOR P&P
Send a large S.A.E. for free catalogue now
3 Limes Road, Folkestone, Kent CT19 4AU
Tel. 0303 76171

NEW VHF MICROTRANSMITTER KIT, tuneable 80-115MHz, 500 metre range, sensitive electret microphone, high quality P.B. SPECIAL OFFER complete kit ONLY £5 POST FREE. Access orders telephone 021 411 1821, cheques/P.O.s to: QUANTITEK ELECTRONICS LTD. (Dept P.W.), 45a Station Road, Northfield, Birmingham, B31 3TE.

MINIATURE VHF TRANSMITTER with microphone, size approx 1 1/2" x 1 1/2", £3.99. Telephone transmitter, VHF, uses no batteries! £4.75. Automatic telephone recording switch, £8.99. Prices include p&p. Access holders telephone 05438 71902 (24 hour). SAE catalogue. Cheque/P.O. to A.C. ELECTRONICS, Dept P.W., 99 Greenheath, Hednesford, Staffs.

Service Sheets

ACCESS

TECHNICAL INFO SERVICES (PW)

**MASTERCARD
EUROCARD**

76 Church St., Larkhall, Lanarkshire ML9 1HE
Callers during business hours to 2 John Street, Larkhall ML9 2ET
Phone 0698 884585 Mon-Fri 9-5, 0698 883334 any other time FOR FAST QUOTES
IMMEDIATE DESPATCH OF ALL Phone Orders by ACCESS, etc. or to Listed Customers
WORLD'S LARGEST COLLECTION OF SERVICE MANUALS from £3.50 to £50 Most unobtainable elsewhere
Every issued FULL SIZE SERVICE SHEET in stock. CTV's or Combinations £3.50/Singles £2.50; Plus LSAE
LSAE for any Quotation, plus FREE large Catalogue, STREE Review, Pricelists, etc.
Send now for

Full details of our Famous Complete Integrated Repair Systems for TVs, Videos & Domestic Equipment
These systems contain all the circuits & data needed to cover repairs and servicing for anyone in business or wishing to start up their own business. All the Diagrams, Repair, Service & Technical Data needed. At a fraction of the normal cost of buying such data.
Terms are also available.

For £3... Comprehensive Service Manuals & Sheets Catalogues PLUS 1988 Chassis Guide & £4 Vouchers
Spectrum Repair & Service Guide £5.00 Video Recorders, Service Guide 3rd Ed. £20.00
Domestic Equipment Repair & Servicing £16.95 Servicing Radio, HiFi, TV Equipment £9.95
Audio & HiFi Engineers Pocketbook £9.95 Practical Radio, Repair & Service Course £9.95

* **WORKSHOP SERVICE MANUALS** *
* Any Colour/Mono TV, Amateur Radio, Military Surplus, *
* Music System, Vintage Valve Wireless etc etc. *
* £5.00 plus LSAE *
* Any Video Recorder, £15.00 plus LSAE *
* FREE Catalogue *
* Unique Repair and Data Guides for LSAE *
* MAURITRON ELECTRONICS (PW) *
* 8 Cherry Tree Road, Chinnor, Oxon, OX9 4QY. *

Veteran & Vintage

THE VALVE DATAMAN

1914-1959 for circuits, service sheets, manuals, handbooks on all valve and early transistor equipment including audio, military (British & foreign), radio and T.V. Quotation by return via letter (S.A.E.) or phone. Brochure supplied with S.A.E. Credit card orders taken over the phone.

THE DATAMAN,
Tudor House, Cossham Street,
Magotsfield, Bristol BS17 3EN.
Phone: 0272 565472.

For Sale

80w MOSFET poweramps £6.95 tested! ITT components! THD 0.0008%. Directions... KIA, 8 Cunliffe Road, Ilkley LS29 9DZ.

RCS VARIABLE VOLTAGE D.C. BENCH POWER SUPPLY
1 to 24 volts up to 1/2 amp. 1 to 20 volts up to 1 amp. 1 to 16 volts up to 1 1/2 amps.
A.C. Fully stabilised. Twin panel meters for instant voltage and current readings.
Overload protection.

Fully variable Operates from 240V A.C. Compact Unit: size 9 x 5 1/2 x 3 ins.  £39 Inc. VAT Post £2

RADIO COMPONENT SPECIALISTS

ACCESS 337 WHITEHORSE ROAD, CROYDON SURREY, U.K. Tel: 01-684 1665 VISA
List, Large S.A.E. Delivery 7 days Callers Welcome Closed Wednesday

CAVITY WAVEMETERS one wavemeter to cover the VHF/UHF bands. 144MHz to 2500MHz. Also 10GHz Wavemeter kit. SAE brings information, P., SERGENT G40NF, 6 Gurney Close, Costessey, Norwich.

KENWOOD R2000 and VC10 converter as new £600 o.n.o. aerials headset. Telephone 0372 54819.

TRANSMITTER CIRCUIT DIAGRAMS: medium, short-wave, f.m., c.b., minimum 17. £4.25. D. DAVIES, 33, Gwaclodygarth, Merthyr Tydfil, CF47 8YU.

EDDYSTONE 750 communication receiver loudspeaker S meter 480kHz-32MHz £75. Tel. 0392 874079 (Exeter).

YOUR NAME AND CALLSIGN. Quality badges, permanently engraved, silver, gold, white with black lettering. Colours available. Two lines engraved £2.50 post free. Orders despatched return post. WYCRRAFT, (PW), Roschill, Jeffreyton, Kilgetty, Dyfed SA68 0RE. Tel. (0646) 651772 anytime.

ORDER FORM PLEASE WRITE IN BLOCK CAPITALS

Please insert the advertisement below in the next available issue of Practical Wireless for
insertions. I enclose Cheque/P.O. for £ CAT. heading

(Cheques and Postal Orders should be made payable to Practical Wireless)

NAME

ADDRESS

PRACTICAL WIRELESS
Classified Advertisement Department,
Enefco House, The Quay, Poole,
Dorset BH15 1PP. Telephone (0202) 678558
Rate 40p per word, minimum 12 words.
Box No. 60p extra.
PLEASE ADD 15% VAT TO TOTAL

Software

COMMODORE COMPUTERS (+4, C16, 64, 128). "MICROCOM" cw/rty tx/rx with superb morse tutor. "TURBO LOG" ultimate high speed station log. "MICROCOM INTERFACE" ready built. S.A.E. to: Moray Micro Computing, Enzie Slackhead, Buckie, Moray, AB5 2BR. Tel. 0542 7384.

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**

S.A.E. for details of all our products



J & P ELECTRONICS LTD.



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

Educational

COURSE FOR CITY & GUILDS, Radio Amateurs Examination. Pass this important examination and obtain your licence, with an RRC Home Study Course. For details of this and other courses (GCE, GCSE, Career and professional examinations, etc.) write or phone: THE RAPID RESULTS COLLEGE, Dept. JX26, Tuition House, London SW19 4DS. Tel. 01-947 7272 (9am-5pm) or use our 24hr Recordacall Service: 01-946 1102 quoting Dept. JC26.

Wanted

FOR CASH or perhaps exchange ex government radios, pre 1960 - must be valve type, anything considered, working or for parts/scrap. Can collect up to 100 miles - or pay postage. Contact TONY HOWARD, Milton Keynes MK3 6BY.

Miscellaneous

WAVEGUIDE, FLANGES & DISHES. All standard sizes & alloys (new material only) from stock. Special sizes to order. Call: EARTH STATION 01-228 7876. 22 Howie Street, London SW11 4AR.

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 battery (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 PW)
12 Longshore Way, Milton, Portsmouth PO4 8LS

QSY ON 70MHz with full spec crystals. Pye Westminster W15FM 70.450 & 70.475MHz crystals at £11.00 per pair inclusive. C.A.R.E. (NORTH WEST) LTD, 12 Leedsie Close, Liverpool, L32 9QT. Tel: 051-426 2546.

HEATHKIT U.K. Spares and Service Centre. CEDAR ELECTRONICS, Unit 12, Station Drive, Bredon, Tewkesbury, Glos. Tel. (0684) 73127.

Miscellaneous - Cont.

GWFF LOOP ANTENNAS COMPLETE WITH ATU FOR HF. HAM BAND TRANSMISSION (SWR One to One 40, 15 and 10 and One Point Five to One 80 and 20) AND SWL's, AND LONG AND MEDIUM WAVE BANDS FOR BCL's. Loops 21 inches square or triangle. No special skills required. Circuits, Parts Lists with sources of supply assembly data. HIGH FREQUENCY LOOP 80 to 10 Metres. £5. LONG AND MEDIUM WAVE LOOP for BCL's. £3. LONG WAVE MEDIUM WAVE AND SHORT WAVE LOOP 1500 to 10 Metres FOR THE BCL AND SWL. £8. SHORT WAVE ATU FOR LOOP OR LONG WIRE ANTENNA. £4. SHORT WAVE ATU BUILT IN PRE AMP FOR LOOP OR LONG WIRE. £7. Pre amp LW, MW and SWave. £2. MW LOOP with pre amp ATU. £3. PRE AMP FOR GWFF HF Loop or ATU. £4. SAE for details. All projects DIY. Photo Copy HRD Manual £4
F. G. Rylands, 39 Parkside Avenue, Millbrook, Southampton SO1 9AF
Tel. (0703) 775364

Clubs & Societies

TELEVISION YOUR INTEREST? You need the British Amateur Television Club, only £6 per year - super magazine. Send SAE to: 'Grenchurst', Pinewood Road, High Wycombe, Bucks.

Situations Vacant

MAGAZINE AD PRODUCTION

PW Publishing require a young enthusiastic person to help run the Advertisement Department. A cheerful, confident telephone manner, the ability to type with basic design and print sense being essential and an interest in Radio Communications would be advantageous. There will be some clerical work but the main duties will involve liaison with clients, typesetters, printers and the Editorial Department. This is the ideal position for someone looking for an introduction into Advertising and Magazine Production. Salary £7,000-£8,000 pa. according to experience.

Apply in writing to:
Roger Hall, Ad Manager,
PW Publishing Ltd., Enefco House,
The Quay, Poole, Dorset BH15 1PP.

INDEX TO ADVERTISERS

AH Supplies	43	Garex	10	Quartslab	73
AKD	8	Golledge Electronics	74		
Aircastle Products	65			Radio Component Specialists	74
A.R.E. Communications Ltd	3,13	Howes, CM Communications	22	Radio Shack Ltd	76
Arrow Electronics	58	Icom (UK) Ltd	4,5,58, Cover 3	Random Electronics	65
		ICS Intertext	71	RAS Nottingham	8
Birkett J	71	J & P Electronics Ltd	75	Raycom Communications Systems	25
BNOS	65	Kanga Products	74	RN Electronics	12
Bredhurst	61	Lee Electronics	55	RST Valve	12
		Lake Electronics	71	Rylands FG	75
		Langrex Supplies	12		
Cambridge Kits	58	Maplin	Cover 4	SEM	71
Cirkit	65	Mauritron	74	Short Wave Magazine	19
Colomor	58	Merlin Systems	8	Sony	38,39
Component Centre	13	M.H. Electronics Ltd	75	South Midlands Communications	
Cricklewood Electronics	61	Microwave Modules	2		Cover 2,6,7,43
		N.A.R.S.A.	31	Spectrum Communications	13
		Navico	21	Stephens James	10
Dataman	74	Nevada Communications	56		
Datong	10			Tandy	35
Dewsbury Electronics	11			Technical Info Services	74
Dressler Communications Ltd	22			Technical Software	43
				Ward Reg & Co Ltd	12
Elliot Electronics	8			Waters & Stanton	9

YOUR LOCAL DEALERS

CORNWALL

SEAWARD ELECTRONICS

Hobby Kits, Test Meters, Satellite TV and Amateur Radio Accessories.

Unit 5, Lynstone Industrial Estate, Bude, Cornwall.

Tel: 0288 55998

Send or phone for lists.

IRELAND

Radcom Electronics

Icom, Yaesu and most Amateur Radio Accessories ex stock.

NEW PREMISES:-

Unit 4, Albert Quay, Cork City.

Tel: 021-632725 and 088 553947

(Mon-Fri 9-5 and Sat 9-3.45)

LONDON

Henry's

27MHz/934MHz Rigs & accessories in stock.

Lists - S.A.E. (A4) - 26p

Full catalogue (TG/P) - large S.A.E. £1.00

404 Edgware Road, London W2 1ED

Tel: 01-724 0323

(Open 6 days a week)

ESSEX

Selectronic

The UK's leading suppliers of 934MHz personal radio equipment

203 High Street, Canvey Island, Essex

Tel: 0268 691481

(Open Mon-Sat 9-5.30)

Amateur radio equipment also in stock

HERNE BAY

ICOM

ICOM (UK) LIMITED

The Official Icom Importer

Unit 8, Sea Street Herne Bay, Kent CT6 8LD

Tel: 0227 369464

Fax: 0227 360 155

Open Mon-Sat 9-5.30, (Lunch 1-2.00 pm)

SOUTHAMPTON

South Midlands Communications

Official Yaesu Importer

S.M. House, School Close, Chandlers Ford Industrial Estate, Eastleigh Hants SO5 3BY.

Tel: 0703 255111

PORTSMOUTH

Nevada Communications

Importers of the Nevada range of 934MHz equipment

189, London Road, North End, Portsmouth, Hants, PO2 9AE

Tel: 0705 662145

DEVON

Reg. Ward & Co. Ltd.

The South-West's largest amateur radio stockist. Approved dealer for Kenwood, Yaesu and Icom

1 Western Parade, West Street, Axminster, Devon, EX13 5NY

Tel: 0297 34918

(Closed 1.00-2.00 and all day Monday)

BUCKINGHAMSHIRE

Photo-Acoustics Ltd.

Approved Kenwood, Yaesu and Icom dealer (part exchange always welcome)

58 High Street, Newport Pagnell, Buckinghamshire MK16 8AQ

Tel: 0908 610625

(Tues-Fri 9.30-5.30, Sat 9.30-4.30) Closed Mondays

SOUTH WALES

ELECTRO DISPOSALS

2000 sq ft of surplus equipment and components

UNIT 31, LONLAS WORKSHOPS SKEWEN, NEATH.

Tel: 0792 818451

TO FILL THIS SPACE CALL:

0202 678558

YORKSHIRE

YAESU ICOM

Alan Hooker Electronics

42, Netherhall Road, Doncaster.

Tel: 0302 25690

Open Mon-Fri 10-5pm

Closed Thursdays

MERSEYSIDE

MGR SERVICES

Wirral based communications

ICOM - YAESU - M. MODULES - HOWES - CIRKIT - WOOD & DOUGLAS - PART-EX - AERIALS - PMR - MARINE - MET ANTENNAS - ALINCO - HEATHERLITE - SPECTRUM COMMS

48, Shrewsbury Road, Oxtun, Birkenhead, L43 2HZ.

Tel: 051 653 3437

(Callers by appointment 9 am-9 pm. Mon-Sat)

SOUTH WALES

MAIL ORDER RETAIL

A.C.S. SYSTEMS

PACKET RADIO: ST-PC-AMIGA COMPUTERS

AMATEUR SOFTWARE FOR MOST COMPUTERS

SATELLITE TELEVISION SYSTEMS

ICS DEALER FOR DATA COMMUNICATIONS

19, CILHAU TERRACE, MOUNTAIN ASH, MID GLAMORGAN

SOUTH WALES. CF45 3ND. TEL 0443 47090

SAE CALLERS BY APPOINTMENT 9am-5pm Mon-Sat

LIST

PLEASE MENTION PRACTICAL WIRELESS WHEN REPLYING TO ADVERTISEMENTS

WEST SUSSEX

MAIL ORDER RETAIL

BREDHURST ELECTRONICS LTD.

High St., Handcross, West Sussex

Tel: (0444) 400786

Situated at the Southern end of M23 Easy access to M25 and South London.

Open Mon-Fri 9am-5pm except Wed 9am-12.30pm Sat 10am-4pm

YAESU ICOM

RECEIVERS - TRANSCEIVERS - SCANNERS

ICOM IC-3210E



- Full crossband duplex.
- 20 double-spaced memory channels.
- Built-in duplexer.
- 4 priority watch functions.
- 25 watts outputs.
- Programmed, memory and selected band memory scan.
- Variable LCD backlight intensity.
- Tone squelch and pocket beep functions (optional).

KENWOOD R5000



THE HF RECEIVER

£875

Including FREE next day delivery.



PRO - 34

The NEW 200 Channel Handheld Scanner. All the frequencies of the old PRO32 + 806 - 960 MHz.

£249.95



RADIO SHACK LTD

188 BROADHURST GARDENS, LONDON NW6 3AY

(Just around the corner from West Hampstead Station on the Jubilee Line)

Giro Account No. 588 7151 Fax: 01-328 5066 Telephone: 01-624 7174





ICOM

Count on us!

IC-725 Budget HF



- General Coverage Receiver
- 105dB Dynamic Range
- 100W Output
- DDS System
- 26 Memories
- Scanning
- CI-V Computer Control
- Semi Break-in

The new ICOM IC-725 budget H.F. has been produced due to the demand for a simple, high specification transceiver. Despite the limited features, compared to more expensive equipment this set retains a superior level of technical performance necessary to operate on the H.F. bands today.

Additional features include Noise Blanking, Pre-amp, Attenuator, AGC and RIT. The DDS System (Direct Digital Synthesizer) ensures fast Tx/Rx switching times, ideal for Data Communications. An A.T.U. controller is built

into the IC-725 for use with the AH-3 H.F. Automatic Antenna Tuner for mobile or base station operation.

Accessory options available are the PS-55 20A P.S.U., AH-3 Auto Antenna Tuner, UI-7 AM Tx. FM Tx/Rx Unit, FL-100 500Hz CW Filter, FL-101 250Hz CW Narrow Filter and SP-7 External Loudspeaker.

For more information on the IC-725 budget H.F. and other ICOM amateur equipment contact your nearest authorised ICOM dealer or phone us direct.

Icom (UK) Ltd.

Dept PW, Sea Street, Herne Bay, Kent CT6 8LD. Tel: 0227 363859. 24 Hour.

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.



THE NEW MAPLIN CATALOGUE IT'S OUT OF THIS WORLD SEND FOR YOUR COPY TODAY

ORDER OF YOUR COPY OF THE NEW MAPLIN CATALOGUE ON SALE NOW

Pick up a copy from any W.H. Smith for just £1.95 or post this coupon now to receive your copy by post for just £1.95 + 50p p & p. If you live outside the U.K. send £3.40 or 15 International Reply Coupons. I enclose £2.45.

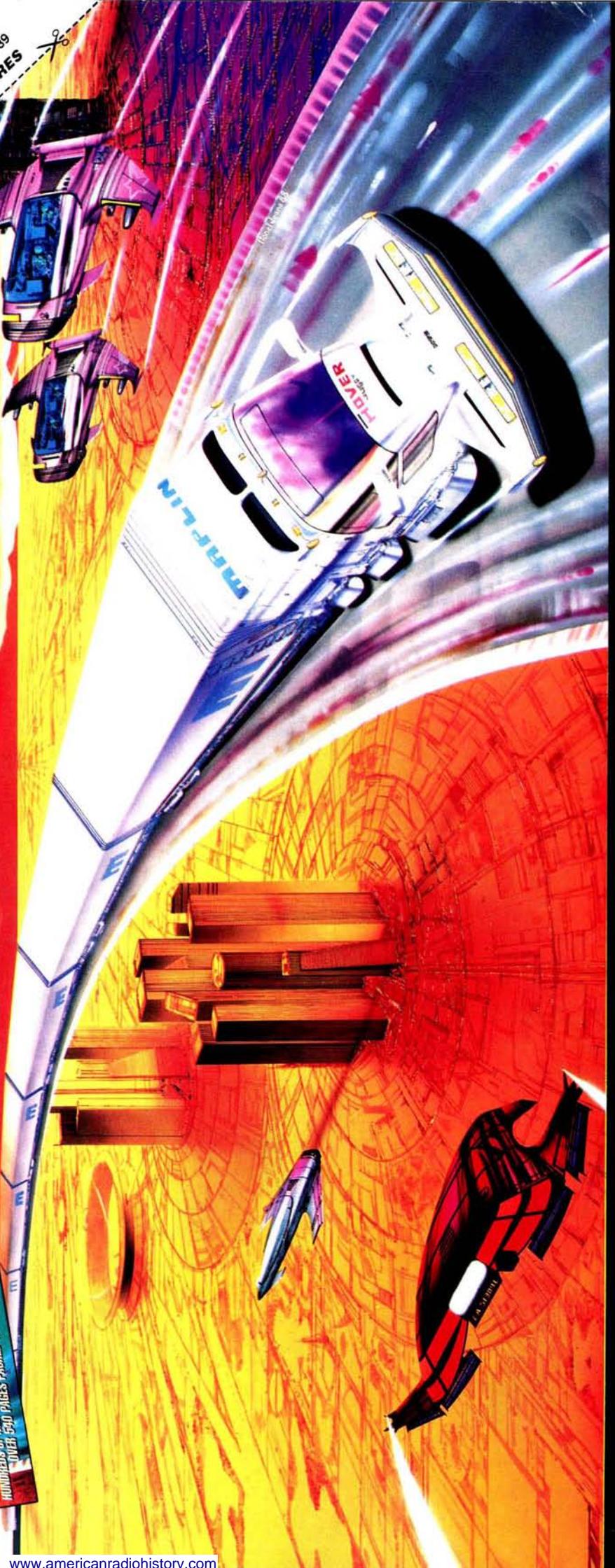
Name _____
Address _____

Send to Maplin Electronics, P.O. Box 3, Rayleigh, Essex SS6 8LR.

Post Code _____

AVAILABLE FROM 11th NOVEMBER 1988 IN ALL W.H. SMITH STORES

EE 89



Evening on the planet Oldana, as the Maplin Juggernaut thunders along the highway; captured on canvas by galaxy famous artist Lionel Jeans and featured on the cover of the new Maplin Catalogue.