SEPTEMBER 1988 £1·20

ISSN 0141-0857

Practical Wireless

The Radio Magazine

NEW UK AMATEUR LICENCE DETAILS IN FULL

Plus

Doppler Shift on Satellites Part 1

And

Valved Communications Receivers - The BC-348

REVIEWED

"They said I couldn't work DX with just 100 watts. Especially with a radio that has less than 1000 switches on the front panel.

But the truth is, I'm working lots of DX, more than some of these blockbuster types, thanks to my Yaesu FT-747GX.

You see, my no-nonsense FT-747GX was designed with me in mind, so I can hop around the band fast to nail those DX stations. While the other hams are warming up their amplifiers, I'm working the new country!

My FT-747GX has a super receiver, with a directly-driven mixer for great overload protection. And, Yaesu included the CW filter in the purchase price (I used the money I saved on postage for the QSL cards!).

And my FT-747GX is loaded with other features. The receiver works from 100kHz straight through 30MHz, and it's a fantastic shortwave broadcast receiver. I can use all twenty memories for that alone! Plus it's got dual VFOs. A noise blanker. Split frequency operation for the pile-ups. And scanning up the band helps me check out openings as they happen.

I just put in the optional crystal oven, and next month I'm going to pick up the FM board.

And with the money I saved when I bought my FT-747GX, I got a second ten-metre antenna for satellite work on the high end of the band. I use my personal computer to tell me what satellites are going by, and the computer even sets the frequencies on the radio for me.

Now my friends are getting FT-747GX rigs, too. I knew they'd figure out my secret weapon sooner or later. But now I'm setting the pace!

Thanks, Yaesu. You've made a rig that makes sense, at a price I can afford."

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

YAESU

"They laughed when they saw my radio. Then they saw my logbook."

Practical Wireless
The Radio Magazine

SEPTEMBER 1988 (ON SALE 11 AUGUST 1988) VOL. 64 NO. 9 ISSUE 978

THIS MONTH

Regular Features

NEXT MONTH

PW Reader Questionnaire
Your chance to tell us what you think of *Practical Wireless*

The *PW* "Badger" 144MHz Receiver

The Kenwood TM-721E Dual-bander Reviewed

and
All the usual features

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

On sale September 8

Contents subject to last-minute revision

Editor
Geoff Arnold T.Eng FSERT G3GSR
Assistant Editor
Dick Ganderton C.Eng MIERE G8VFH
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
Clerical Assistant
Claire Jackson
Accounts
Alan Burgess

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) 676033

ALINCO
SAVES YOU MONEY & SERVES YOU WELL

★ 144-146MHz (Rx. option 140-170MHz)
★ 25 watts output. ("HE" model 45 watts)
★ 21 memories & 2 "call" channels.
★ Programmable Scanning & Priority channel
★ 12.5kHz & 25kHz steps.
★ Includes microphone & mobile mount.
★ Bright LCD display
★ Reverse repeater etc.

2m FM Mobile ALR-22E

£249

Designed for optimum performance combined with small size, the ALINCO ALR-22E reaches new heights in both technical performance and value for money. We've managed to keep the price down to a level that cannot be matched by any other manufacturer although we believe that a small increase will shortly be made to the price. What better time therefore, than now to purchase one of these super rigs. You won't see prices like this again! Technically it's superb and inside it looks very much like some of its more expensive competitors! Measuring only 5.5" × 6.5" it will fit into most places and if you ask, we will extend the frequency range to cover 140-170MHz on receive. We could bore you with the specification but frankly its just the same as all the others (apart from the price of course). We could tell you about all the various features it has, but again its not much different from the competition. Lets be honest, apart from being scome £100 cheaper than some of its competitors and having an extended receiver coverage, it really is like most other rigs. So if money is no object and you only want 144-146MHz coverage, you probably won't be interested in the ALR-22E. If on the other hand these things are important to you, why not send for the full colour brochure today.

★ 2M FM 140-150MHz
★ 3 Watts output
★ Low power switch
★ Battery Saver
★ Memory channel
★ 2 channel scan
★ Thumbwheel Selector
★ Dial Illumination
★ Tone Burst
★ Repeater Shift
★ 5KHz steps

ALX-2E 2M FM

£189

The ALINCO ALX 2E is a true micro handheld transceiver. Measuring only 4.6" × 2.35" × .9" it can be carried anywhere. Supplied complete with removeable 450MAh ni-cad pack, carry strap, antenna, AC charger, DC 12v charger etc, it is great value. Yet another money saving product from ALINCO!

SEE PAGE 26 FOR REVIEW

ALD-24E 2m/70cm Dual Band FM
See colour photo on front cover

£449

★ 2m/70cm. Full duplex operation.
★ 25 watts FM on both bands.
★ Single antenna socket output.
★ 21 memories & 2 "call channels".
★ Programmable scanning and priority.
★ 12.5KHz & 25KHz steps.
★ Includes all hardware & microphone.
★ Bright LCD readout.
★ Reverse repeater operation.
★ 12 months warranty parts & labour.

The ALINCO Option

STOP PRESS New dual band hand-held due soon. Priced as only ALINCO know how!

Isn't it time you took a closer look at the ALINCO range? When reviewers say "I was pleasantly surprised," & "The set offers good all round performance at an economical price," then you begin to appreciate that low cost can be achieved without sacrificing performance. ALINCO may be a new name to Europe but this Japanese based company which has just celebrated its 50th anniversary has a product range that utilises the very latest technology. And remember, success can only be achieved through customer satisfaction! So next time you decide to change your equipment, take a closer look at ALINCO and find out why more customers are spending less by taking the ALINCO option.

WATERS & STANTON

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.

ICOM

The ICOM "75" Series

ICOM have a winning line-up for fixed, portable and mobile operations. The deluxe "75" series of transceivers offers a new standard of excellence from VHF to UHF communications. Each compact all mode unit delivers maximum performance, reliability and ease of operation.

The "75" series transceivers feature 99 tunable memories, twin VFO's, pass band tuning, I.F. notch, noise blanker and CW break-in. The scanning modes include memory scan, mode scan, programmable scan and frequency skip.

These transceivers can be used in a variety of ways, for propagation experiments, satellite communications, moonbounce, D'xing or straight rag chewing contacts. When high speed digital systems such as PACKET or AMTOR data communications are used then the ICOM DDS system provides a lock-up time of just 5msec.

2 Meters

ICOM's 25 watt IC-275E is a superb transceiver for contest operating and for general DX working. This prestige 144MHz multimode is also available as a IC-275H 100 watt version, which requires an external AC supply.

70cms

Enjoy 430MHz operation with the 25 watt IC-475E, or go high power using the IC-475H. An optional CT-16 Satellite Interface Unit is available for combining ICOM "75" transceivers for easy tuning.

6 Meters/10 Meters

The 10 watt IC-575 covers 28-30MHz and 50-54MHz and includes the AC supply. Join in with the recent openings to the U.S.A. with this superb transceiver. Also to be released soon is the IC-575H 50/100 watt high power version, which will operate with an external AC supply.

With the introduction of the "75" series you now have all the technical quality you'll need to enjoy VHF and UHF communications. For more detailed information on these transceivers contact your local ICOM dealer of ICOM (UK) Ltd.

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

Count on us!

NEW IC-2GE/4GE FM Handportables

Features:

- **Rugged and compact**
- **High Power option**
- **Power saver circuit**
- **20 memories**
- **Scanning**
- **Compatible with ICOM accessories**

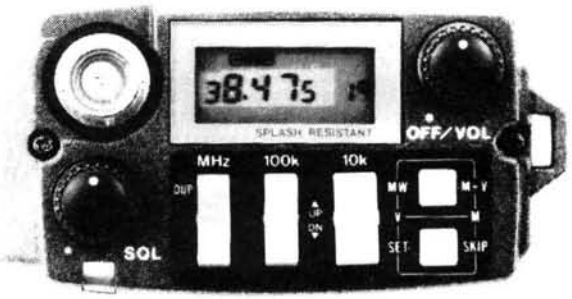
The latest range of handportables from ICOM fulfill the most important criteria for a handheld transceiver. They are small, rugged and easy to operate.

The 3 watt RF output is a compromise on battery life against power output, but for those who require extra punch, these sets can deliver 6/7 watts when used with the BP7 or external 13.8v DC. On receive, the power saver circuit reduces current drain automatically but can be overridden for packet operation.

The 20 memory channels can store all your favourite simplex and repeater frequencies, and with the programmed scan and memory scan functions there is no need to manually search for activity. The IC-2GE/4GE utilise most existing ICOM handheld accessories plus a new line of carrying cases. If you are expecting to be outdoors this summer or looking for your first handportable transceiver, the ICOM "G" series will take a lot of beating.

Shortly to be released is the IC-12GE 23cm portable equally as exceptional as the IC-2GE and IC-4GE.

◄ Actual Size ►



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.

South Midlands C

SCHOOL CLOSE, CHANDLERS FORD IND. EST., EAST

BRANCHES WITH SERVICE FACILITIES

BIRMINGHAM (021 327) 1497/6313 **LEEDS (0532) 350606**

SUMMER SPECIALS

ONLY WHILST STOCKS LAST

HANDHELDS

FT709R (4)	£199
FT703R (3)	£199
FT703R (4)	£199

MOBILES

FT770RH	£279
FT790R	£299
IC27E	£349

YM2500L	DTMF Keyboard Mic CPU2500R		£19.95
WD202	SWR/PWR/Deviation meter		£10.00
SP4 + SPV1002	Speech Processor		£29.00*
S72	Switch Box FT720 series		£10.00
E72S	Extension Cable 2m		£7.50
E72L	Extension Cable 4m		£9.50
PLT101Z	Parts List FT101Z		£1.00
FMUT101Z	FM Unit FT101Z		£39.00
AMUT101Z	AM Unit FT101Z		£5.00
NDH518	Memory Unit NRD515		£175.00
MS100	Magnetic Mobile Speaker		£9.00
MMS384	Frequency Source		£19.95
MML144/40	2M 40w Linear	2 only	£75.00*
MMF432	432MHz Filter	1 only	£19.95
MMA70	4m Preamp	1 only	£25.00
YF107F2.4	2.4KHz 10.7MHz 6 pole		£15.50
YF107H12	12KHz 10.7MHz 8 pole		£15.50
YF107H600	600Hz 10.7MHz 8 pole		£15.50
YF90F2.4	2.4KHz 9MHz 6 pole		£15.50
YF90H12	12KHz 9MHz 8 pole		£15.50
TF30F12	12KHz 3.18MHz 6 pole		£15.50
TF30H12	12KHz 3.18MHz 8 pole		£15.50
TF90H600	600Hz 9MHz 8 pole		£15.50
D4000006	FTONE to FL2100Z Cable		£1.50
D4000007	FTONE to FTV107 Cable		£1.50
D4000008	FTONE to FC707 Cable		£1.00
D3000337	FTV901 mod for FT980		£10.00
D3000253	FTONE NB Mod. Kit		£7.50
D3000112	FT901 Warc Mod. Kit		£15.00
D3000105	YO901 Bandscope Unit		£19.50
D3000098	UHF Modulator for Video YR901		£5.00
D3000071	FT301 Counter Unit (Improved Type)		£29.00
D3000286	Curtis Keyer Unit		£19.95
D3000031	FT225 Memory Unit	2 only	£59.00
MMB1	FT101/901 Mobile Mount		£10.00*
CFL230	300Hz CW Filter NRD515	2 only	£35.00*

MMB7	FT7 Mobile Mount		£7.50
FL2010	2m 10W linear		£39.00*
FF5	500KHz Low Pass Filter		£2.50
FMUT901	FM Unit FT901		£29.00
AFR901	Low Tone Mod YR901		£7.50
AMUT77	AM Unit FT77		£12.50
FP757GX	Switch Mode PSU		£69.00*
FRV7700A	Conv. 118-150MHz to 20-30MHz		£29.50*
DIG221RMOD	Digital Display Buffer Kit		£2.50
XF8.9GF	FM Filter 12KHz		£25.00
XF8.9GA	AM Filter 6KHz FT901, 101Z, 980		£19.00
FYG1	Crystal checker		£9.50
BHFRG7	Battery Holder FRG7		£1.50
IC27E	25w 2m FM Transceiver	2 only	£349.00*
FM740	70cms Transceiver FM		£199.00*
FM2033	25w 2m Transceiver FM		£199.00*
JD110	SWR/PWR meter 1.5-150MHz. Field Strength		£12.50
GP27	27MHz Base antenna		£19.00*
GP23	2m Colinear 3×5/8		£45.00*
88F	2m 8/8 Wave mobile		£19.00*
430TV	70cms for FTV series		£199.00*
444D	Shure Mic	2 only	£49.00
401B	Shure Mic Hand 600ohm		£19.95
AR50	Bell Rotator	2 only	£99.00*
CB86A	April 86 Call book		£1.00
MRKT77	Marker Unit FT77		£7.50
78B	2m 7/8 wave Ball mount Antenna		£15.00*
YD844A	Base Microphone		£19.99
XF455C	500Hz CW Filter FT102		£29.95
XF455CN	270Hz CW Filter FT102		£29.95
XF82GA	6KHz AM Filter FT102		£15.00
XF82HC	600Hz CW Filter FT102		£15.00
XF82HCN	300Hz CW Filter FT102		£15.00
XF82HSN	1.8KHz SSB Filter FT102		£19.95
MMB11	Mobile Mount FT290R		£29.95
TVHF230C	Mutek HF Transverter	SOLD	£299.00*
21/25/28	HF Module FT726R		£169.00*

*** CARRIAGE ON THESE ITEMS £2.75 ALL OTHERS £1.00**

ALL OFFERS SUBJECT TO AVAILABILITY. NO FINANCE AVAILABLE.

ALL RADIOS GUARANTEED FOR 1 YEAR EXCEPT FM740 & FP757GX – 90 DAYS ONLY

THE BEST HANDHELDS MONEY CAN BUY

FT23R/FT73R

The **FT23R** & **FT73R** are a pair of high quality miniature handhelds, designed for operation on 2m & 70cms respectively. Both radios are manufactured using the very latest technology to ensure maximum performance and reliability. Packed into these miniature sets are all the features & facilities you would expect from other units twice their size including up to 5W RF O/P (with FNB12), 10 memories c/w priority scan, selectable 12.5KHz/25KHz steps, full repeater operation with reverse mode & 1750Hz toneburst. Vox operation is now available with the VC20 and YH2 headset.

FT23R c/w FNB10 **£255**

FT73R c/w FNB10 **£275**

The **FT727R** Dual Band handheld from Yaesu is all the best features of both the FT209R and FT709R series of handhelds, added together and put in one neat, easily handheld package, with all the facilities needed for portable operation on 2m & 70cms. A 5W RF output on both 2m & 70cms (with FNB4A) is standard and other major operating features include 10 memories (4 allow split frequency) with numerous scanning modes and computer control capability (CAT), user programmable repeater shifts, and programmable power save facility for extended battery life. Also available is a large range of accessories to further enhance the pleasure and scope of operation.

FT727R

FT727R c/w FNB4A **£425**

LEEDS
SMC (Northern)
Nowell Lane
Industrial Estate
Leeds LS9 6JE
Leeds (0532) 350606
9-5.30 Mon-Sat

CHESTERFIELD
SMC (Midlands)
102 High Street
New Whittington,
Chesterfield
Chest. (0246) 453340
9.30-5.30 Tues-Sat

BUCKLEY
SMC (TMP)
Unit 27, Pinfold Lane
Buckley, Clwyd
Buckley (0244) 549563
10-5 Tues, Weds, Fri
10-4 Sat

JERSEY
SMC (Jersey)
1 Belmont Gardens
St. Helier, Jersey
Jersey (0534) 77067
9-5 pm Mon-Sat
Closed Wed

N. IRELAND
SMC N. Ireland
10 Ward Avenue
Bangor
County Down
0247 271875

BIRMINGHAM
SMC (Birmingham)
504 Alum Rock Road
Alum Rock
Birmingham B8 3HX
(021-327) 1497/6313
9.00-5.00 Tues-Fri
9.00-4.00 Sat

AXMINSTER
Reg Ward & Co Ltd
1 Western Parade
West Street,
Axminster
Devon EX13 5NY
Axminster (0297) 34918
9-5.30 Tues-Sat

Access
BARCLAYCARD VISA

Southampton Showroom open 9.00-5.00 Monday to Friday, 9.00-1.00 Saturday. Service Dept open Mon-Fri 9.00-5.00

AGENTS: JOHN DOYLE, TRANSWORLD COMMS, NEATH (0639) 52374 DAY (0639) 2942 EVE

DAVID STENNING, G4JA, LOUTH 0507 604967, (024024) 4378 EVE.

SPECTRUM COMMUNICATIONS

MANUFACTURERS OF RADIO EQUIPMENT AND KITS

CONVERTERS & TRANSVERTERS

RECEIVE CONVERTERS 4 or 6m antenna input, 10 or 2m i.f., variable gain 0-26dB, n.f. less than 3.5dB. Buffered local oscillator output, types RC4-10, RC4-2, RC6-10 and RC6-2. PCB kit **£17.25,** PCB built and tested **£24.50,** boxed kit **£29.25,** boxed, built and tested **£41.00.**

TRANSCEIVE CONVERTERS Single board version of receive converter and 500mW transmit converter. 10m drive 25mW to 500mW. Types TRC4-10 and TRC6-10. PCB kit **£39.00,** PCB built and tested **£54.00,** boxed kit **£54.00,** boxed, built and tested **£83.25.**

TRANSCEIVE CONVERTERS Separate receive converter and 2.5W transmit converter in a single boxed unit, 2m or 10m drive 10mW to 100mW only, requires r.f. sensing switch and attenuator for use with 2.5W 2m rigs. Types TRX4-10H, TRX4-2H, TRX6-10H and TRX6-2H. Boxed kit **£60.00,** boxed and built **£99.50.**

TRANSCEIVE CONVERTERS As above but including an interface providing RF sensing attenuation and PTT switching. ½W-5W 2M drive. Types TRX4-2I and TRX6-2I. Boxed kit **£68.00,** boxed and built **£115.00.**

RECEIVE PREAMPS

2, 4, 6, or 10 metres RF switched and DC sensing, 100W transmit handling power, gain 0-20dB adjustable by panel control. NF 1dB on 2M, 2dB on 4 & 6M, 3.5dB on 10M, 13.5V negative ground operation. Excellent performance at a reasonable price. Well made attractive boxed unit 77×70×39mm, an asset to any Ham shack. Types RP2S, RP4S, RP6S, & RP10S. PCB KIT **£14.75,** PCB BUILT **£22.25,** BOXED KIT **£25.00.** BOXED BUILT & TESTED **£35.50.**

FM CONVERSIONS

FOR YAESU & KENWOOD TRANSCEIVERS

FD311X & FM2000 for FT101, 101B, 101E, 101Z, 101ZD, 901, 902, 107, 107M, 77S, 77, 707, 200, 250, 7B, all **£71.**

FD311X & FM3000 for TS120V, 120S, 130V, 130S, 520, 520SE, 530, 830, 930, all **£81.**

State rig type when ordering.

CB to 10m

CB TO 10 FM CONVERSION BOARDS – THE FIRST COMMERCIALLY AVAILABLE, suits all UK FM CB rigs to give 29.31 to 29.70MHz. Size only 63 × 40 × 13mm. Built and aligned board SC29 **£18.50.** Or send your rig and we'll fit it. **£31.50** inc. return P&P for mobiles. **£35** inc. for base rigs.

MULTIMODE CB CONVERSIONS, send your 120 channel rig and we'll convert it to give 28.01 to 29.70MHz in straight sequences without gaps. Colt 1200DX, Cobra 148, Hy Gain 5, Multimode 2, Major M360, Tristar 747 & 777, Super Star 360, Concorde, etc., **£62** inc. return P&P. Jumbo or Colt Excalibur 1200, **£65.** 80 Channel rigs such as Stalker 9 or Major M588 are modified to give 28.31 to 29.70MHz in straight sequence without gaps. **£55.00** inc. return P&P. 200 Channel in 4 bands of 50 are converted to give 28.00 to 30.00MHz or 28.00 to 29.70MHz as required. Super Hy Gain 5, Lafayette 1800, Super Star 2000. **£45.00** inc. return P&P. Nato 2000 **£52.50,** Super Star 2000-5 × 40CH **£70.** Colt 1600, 4 × 40CH, **£65.50**

BARCLAYCARD VISA · Access

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

YAESU *REVCO · G.WHIP · DRAE · STAR MASTERKEY · ICOM · YAESU · WELZ · DATONG · I.C.S* **ICOM**

AMATEUR RADIO COMMUNICATIONS LTD.

EX NORTHERN BRANCH OF A.R.E. COMMUNICATIONS LTD.

"As from May 1st we parted from our Parent Company in London and we are now completely independent but still good friends. The only change is the name, there are the same Smiling faces and the same Excellent service."

Peter (G4KKN)

Always a large selection of clean Second Hand equipment and commission sales available.

E.G.

JIL SX200N	£200
ALR 206E	£195
AOR 2001	£250
FT 757GX	£650
FT 690R Mk1	£250
DAIWA A.T.U. CNA1001	£125
YAESU FT ONE	£950

Phone us NOW for Special Deals On the following:
STANDARD C-500
KENWOOD TS-680s
ICOM IC-R7000
YAESU FT-767GX

THE LATEST TNC PACKET TERMINAL PK-88 AVAILABLE EX STOCK
£109.95

Come and visit the largest Emporium in the North of England with *All* brands of equipment on display for you to try in a relaxed friendly atmosphere together with a NEW BRAND OF COFFEE!!

Access

38 Bridge Street, Earlestown, Newton-le-Willows, Merseyside WA12 9BA. Only 1 mile from Junction 23 – M6
Telephone: N-le-W (09252) 29881/2
OPEN TUES-SAT 10 a.m. - 5 p.m.

VISA

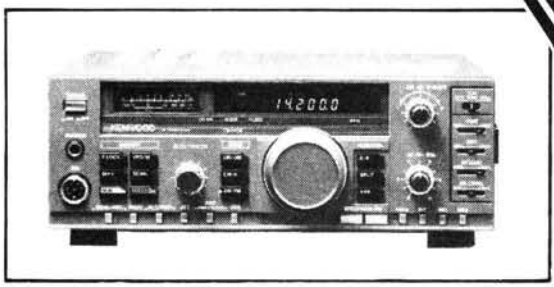
MICROWAVE MODULES · TONNA · JAYBEAM · SANDPIPER · BNOS · AKD · CAPCO · REVEX

DEWSBURY ELECTRONICS

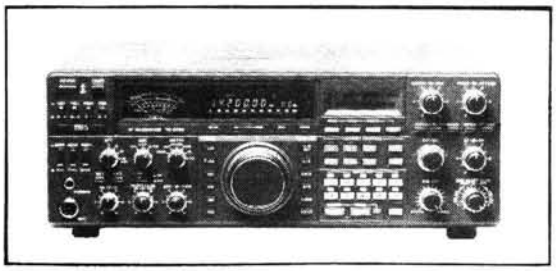
G4CLX

IF IT'S **KENWOOD** IT MUST BE **DEWSBURY**

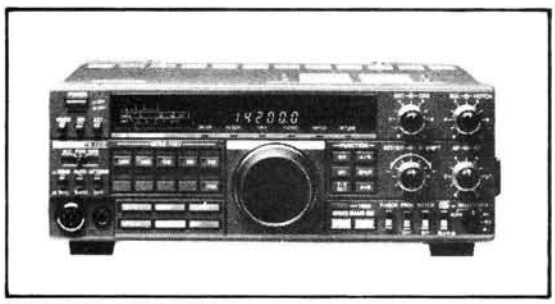
A FULL RANGE AVAILABLE



TS-140S £862.00



TS-940S £1995.00

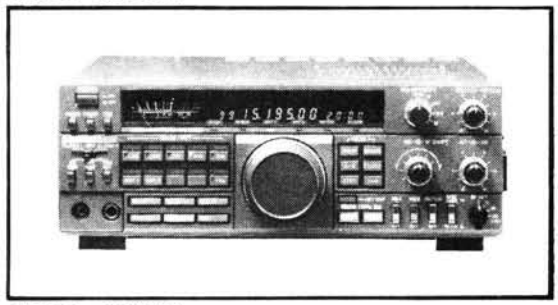


TS-440S £1138.00

APPROVED KENWOOD DEALER

APPROVED KENWOOD DEALER

R2000 £595.00



R5000 £875.00

POCOMOTOR AFR2000
RTTY ALL MODE DECODER

PRICES FROM £412.85

NEW PRODUCT NEWS

KEYBOARD TO MORSE CODE

From the makers of the **STAR MASTERKEY** a new **MORSE KEYBOARD.**
Send perfect morse as easily as typing a letter.
Variable transmission. Speed 1-99 wpm or up to 400 wpm.
Indication of speed on 7 segment display.
Type ahead buffer with status leds transmission of stored messages.
Indication of operating mode on leds. Sidetone and relay output for all types of transmitter.

Send S.A.E. for details of products shown

STAR MASTER – KEYER £54.70

Stockists of DAIWA – JRC – BENCHERS – VIBROPLEX –
MICROWAVE MODULES – YAESU – ICOM

Dewsbury Electronics, 176 Lower High Street, Stourbridge, West Midlands.
Telephone: Stourbridge (0384) 390063/371228
Telex: 336712 SHELTN G. Ref. D2850

VISA

Access

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

★ ★ ★ 25th ANNIVERSARY YEAR 1963-1988 ★ ★ ★ ★ ★ 25th ANNIVERSARY YEAR 1963-1988 ★ ★ ★

GAREX THE SCANNER SPECIALISTS

JIL SX-400
THE PROFESSIONAL SCANNER

* Basic coverage 26-520MHz
* AM, NFM & WFM
* Expandable from 100kHz to 1.4GHz with SSB and CW
* Computer control options
* IF output terminals
* Specifications set by professionals

£649

AOR 2002
THE WIDE RANGE SCANNER

* 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

REVCO RS-3000
THE COMPACT SCANNER

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

£199

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"×5.5"×2"
* Nicads, charger & BNC whip antenna included in the price

£199

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

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**
Remember this British product carries no overseas freight or Import Duty!

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

HARROW HOUSE, AKEMAN STREET, TRING HP23 6AA.
Phone Tring (044282) 8580 & Cheddington (0296) 668684. Callers by appointment only.
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.* *Ask for our secondhand scanner bargain list.*

★ ★ ★ 25th ANNIVERSARY YEAR 1963-1988 ★ ★ ★ ★ ★ 25th ANNIVERSARY YEAR 1963-1988 ★ ★ ★

MERLIN SYSTEMS

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

Look out for Merlin Systems at the following rallies and exhibitions. RAFARS, at RAF Halton, Aylesbury, Bucks on June 18, the Longleat Rally on June 26, **the NEC Exhibition on the 15, 16, 17 July** and the Scarborough Amateur Radio Society Rally on 31 July. You may also call at the Warehouse but please ring first.

NEW SYSTEM
MERLIN SYSTEMS PC Turbo 256K Ram, 8088 CPU, 1 Diskdrive, Hires Mono Monitor, 84 Keyboard, Par printer port, Radio and MSDos software and Merlin Systems backup. **£450.00** + £15.00 P&P.

COMPUTER DESK
Up Market desk L 102cm × W 74cm × H 74cm with keyboard recess and cableing trunking. **New only £50.00** + £16.00 P&P.

POWER SUPPLIES AND TRANSFORMERS
Bench mains input PSU in a blue case with switched input and HT output 6.3vac lamp for valve heaters 250vdc HT stabilised. H 115m W 185mm D 125mm **£8.00.**

2nd USER SYSTEMS
BBC B with DFS one 40 track SS drive. **£250.00.** BBC+ 128K 1770 DFS. S way rom, one 40 track DS drive. **£350.00.** IOTEC IONA 64K CPM 2.2.2 40 track DS drives.. **£160.00.** Apple II+ with one disk drive and software. **£150.00.** FRANKLIN ACE 1000 with disk drive and software this is a Apple compatible. **£150.00.** P&P £10.00.

COMPUTER PARTS
APPLE cards. S100 cards, PSUs, NEW 12 inch green screen composit input Hires open frame monitor, only needs 12 volts DC. **£30.00.** P&P £5.00.

NEW
Made by well known Japanese manufacturer, twin cassette mechanism, complete with stereo heads, counter doors and leads only **£6.00** P&P £1.00. Complete working LW, MW, FM, stereo music center PCB (the cassette plugs in) only **£5.00** P&P £1.50.

RADIAL ELECTROLYTCIS	
10 × 4.7uf 25v	30p
10 × 22uf 10v	30p
10 × 22uf 25v	35p
10 × 47uf 25v	35p
10 × 47uf 35v	40p
5 × 47uf 250v	60p
10 × 100uf 10v	35p
10 × 220uf 10v	35p
10 × 220uf 16v	35p
10 × 220uf 25v	40p
10 × 220uf 40v	45p
10 × 220uf 50v	45p
10 × 470uf 25v	35p
10 × 470uf 50v	50p
10 × 1000uf 25v	35p
POWER ELECTROLYTICS	
5 × 50uf × 50 uf 200v	60p
2 × 220uf 315v	1.75
2 × 220uf 400v	2.00
2 × 470uf 200v	1.50
2 × 15000uf 25v	1.75
2 × 22000uf 25v	2.00
5 × 3300uf 25v	1.30
2 × 3400uf 40v	75p
MISCELLANEOUS	
1 × I.E.C. 1amp mains filter socket	1.25
1 × I.E.C. 3amp mains filter socket	1.50
1 × I.E.C. 6amp mains filter socket	1.75
5 × push latching pcb switches	70p
5 × slide pcb switches	70p
10 × phono plugs	50p
5 × 240v panel neons	70p
5 × 24v panel lamps	70p
5 × MES lamp holders	50p
5 × 2way 3pole switches with knobs	1.20
4 × 4way dill switches	30p
5 × 1.7amp 200v bridge rectifiers	1.20
3 × 1amp 50v bridge rectifiers	50p
10 × 5mm × 2mm red leds	1.00
3 × 5mm × 2mm green leds	1.00
MERLINS KIT PACKS	
1 × mixed power capacitors	1.75
1 × mixed pf capacitors	1.50
1 × mixed axial electrolytics	1.50
1 × mixed wire wound resistors	2.20

PAYMENT: Credit card, cheque, PO, cash. Post and Packing, up to £10.00 add £1.50, £10.00 to £20.00 add £1.00. Please add VAT to total.

TX - 3
RTTY/CW/ASCII TRANSCEIVE

Split-screen, type-ahead operation, 24 memories, clock, review store, callsign capture, RTTY auto CR/LF, CW software filtering and much more. Needs interface or TU. **BBC-B/Master** and **CBM64** tape £20, disc £22. **SPECTRUM** tape £35, +3 disc £37 inc. adapter board (needs interface/TU also).
Also **VIC20** RTTY/CW transceive program, tape £20.

RX - 4
RTTY/CW/AMTOR/SSTV RECEIVE

This is still a best-selling program and it's easy to see why. Superb performance on all 4 modes, switch modes at a keypress to catch all the action. Text and picture store with dump to screen, printer or tape/disc. The essential software for the SWL. 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 is still available £25, +3 disc £27.
TIF1 INTERFACE for TX-3 and RX-4. RTTY and CW filters, computer noise isolation for excellent reception. Transmit outputs for MIC, PTT and KEY. Kit £20 (assembled PCB + cables, connectors), ready-made £40 state rig. Available only with TX-3 or RX-4 software.
Also **MORSE TUTOR** £6, **LOGBOOK** £8, **RAE MATHS** £9 for BBC and CBM64 (disc £2 extra), SPECTRUM, ELECTRON, VIC20.
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

COMMUNICATION CENTRE OF THE NORTH

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

ANTENNA RANGE

FULL RANGE OF KENWOOD EQUIPMENT AND ACCESSORIES STOCKED

BUTTERNUT		**WELZ**	
HF2V 40-80m vertical	£142.00	DCP5 5 band vertical with radial kit	£195.00
20 MRK 20m add on kit	£33.49	DCP4 40-20-15-10 vertical with radial kit	£147.00
HF6VX 6 band vertical	£159.00	**JAYBEAM**	
TBR160S 160m Add on kit	£53.99	VR3 3 band vertical	£73.60
HF4B Triband Mini Beam	£235.00	TB1 Rotary Dipole	£105.80
CUSHCRAFT		Minmax Triband Mini Beam	£327.00
A3 3 element Tribander	£262.00	TB2 2 element Tribander	£202.00
A4 4 element Tribander	£350.00	TB3 3 element Tribander	£316.00
10-3CD 3 element 10m	£115.00	**SWR/POWER METERS**	
15-3CD 3 element 15m	£139.75	MFJ 815 HF 2kw SWR/PWR	£57.32
20-3C2 3 element 20m	£238.00	SWR Twin Meter 1.8-50MHz	£25.00
AP8 8 band 25ft vertical	£164.00	DIAWA CN410M 35-150MHz	£61.72
AV5 5 band 25ft vertical	£123.00	DIAWA CN460M 140-450MHz	£65.40
18 element 2m Boomer	£106.00	NS660P 1.8-150MHz + PEP	£115.00
15 element 2m Boomer	£85.00	Welz SP10X	£37.00
ANTENNA TUNERS		Welz SP220	£67.95
Kenwood AT230	£208.00	Welz SP420	£59.95
CAPCO SPC 300D	£225.00	**DUMMY LOADS**	
CAPCO SPC 3000D	£325.00	DL60 60 watt	£10.96
MFJ 962B 1.5k Tuner	£241.00	DL600 600 watt	£62.75
MFJ 949C 300W Versatuner	£157.00	CTS30 500 watt	£59.00
MFJ 941D watt Basic	£105.00	MFJ2600 300 watt	£28.35
MFJ 1601 Random Wire Tuner	£42.02		
Kenwood AT250 Automatic	£366.00		

G5RV full size **£16.50**, half size **£14.50** Full range of Antenna – Accessories plus full range of VHF – UHF – HF mobile Antennas

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 despatched by return of post.

HYGAIN

TH2 MK3 2 ele Tribander	**£249.00**
18 AVT 5 band trapped vertical	**£146.00**
EXP14 4 element 20-15-10 m	**£449.00**

Phone 0942-676790.

STEPHENS JAMES LTD.

47 WARRINGTON ROAD,
LEIGH, LANCS. WN7 3EA.

R.A.S. (Nottingham)

G6XBH
G1RAS
G8UUS

Radio Amateur Supplies
Tel: 0602 280267

AUTHORISED YAESU

Visit your Local Emporium

Large selection of New/Used Equipment on Show

AGENTS FOR:	ACCESSORIES:
F.D.K.	Welz Range
AZDEN	Microwave Modules
ICOM	Adonis Mics
YAESU	Mutek Pre-Amps
ALINCO	Barenco Mast Supports
KEMPRO	DRAE Products
	BNOS Linears & P.S.U.'s

AGENTS FOR CELLNET AND VODAFONE RADIOS

AERIALS, Tonna, Halbar, New Diamond Range of Mobile Whips, Jaybeam

BRING YOUR S/H EQUIPMENT IN FOR SALE

JUST GIVE US A RING

Monday: CLOSED Tuesday-Saturday: 10.00am to 5.00pm

3 Farndon Green, Wollaton Park, Nottingham NG8 1OU
Off Ring Rd., between A52 (Derby Road) & A609 (Ilkeston Road)

QRP KITS AT QRP PRICES!

80m CW TRANSCEIVER, DTR3

Compact and lightweight, an ideal QRP rig for 3.5MHz CW. Great for /P and holiday operation!
A COMPLETE kit! – Includes **ALL** Hardware, VFO, Audio Filter, RIT, Sidetone etc. and fully detailed building instructions.

£76.25 including postage.
Also included in our Kit Range.

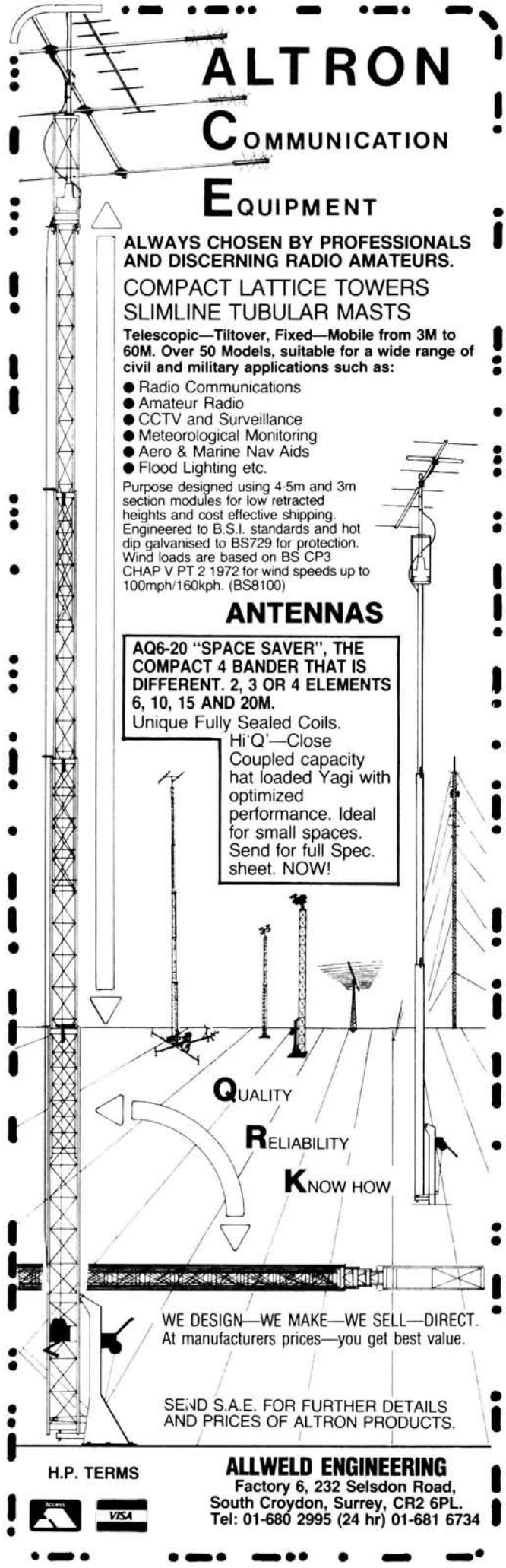
	FULL KIT	PART KIT
"CARLTON" 3 Band RX for 80/40/20m	£63.00	
TU1 Antenna Tuning Unit	£31.75	£22.50
TU2 : ATU with SWR Bridge	£39.65	£30.40
TUA1 : SWR Bridge	£11.50	£ 8.90
AF2 AUDIO FILTER	£11.50	£ 8.50
AF3 BASIC AUDIO FILTER BOARD	£ 6.90	
CM1 CAPACITANCE METER	£22.60	£14.00

REMEMBER! The "FULL" Kits are **COMPLETE** in every detail and come with **FULL** Instructions. The "PART" Kits consist of the PCB's and all board mounted components plus, of course, the detailed Instruction Manual.

All prices include postage.

For full details of these 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



ALTRON

COMMUNICATION EQUIPMENT

ALWAYS CHOSEN BY PROFESSIONALS AND DISCERNING RADIO AMATEURS.

COMPACT LATTICE TOWERS
SLIMLINE TUBULAR MASTS

Telescopic—Tiltover, Fixed—Mobile from 3M to 60M. Over 50 Models, suitable for a wide range of civil and military applications such as:

- Radio Communications
- Amateur Radio
- CCTV and Surveillance
- Meteorological Monitoring
- Aero & Marine Nav Aids
- Flood Lighting etc.

Purpose designed using 4·5m and 3m section modules for low retracted heights and cost effective shipping. Engineered to B.S.I. standards and hot dip galvanised to BS729 for protection. Wind loads are based on BS CP3 CHAP V PT 2 1972 for wind speeds up to 100mph/160kph. (BS8100)

ANTENNAS

AQ6-20 "SPACE SAVER", THE COMPACT 4 BANDER THAT IS DIFFERENT. 2, 3 OR 4 ELEMENTS 6, 10, 15 AND 20M.
Unique Fully Sealed Coils.
Hi'Q'—Close Coupled capacity hat loaded Yagi with optimized performance. Ideal for small spaces. Send for full Spec. sheet. NOW!

QUALITY
RELIABILITY
KNOW HOW

WE DESIGN—WE MAKE—WE SELL—DIRECT.
At manufacturers prices—you get best value.

SEND S.A.E. FOR FURTHER DETAILS AND PRICES OF ALTRON PRODUCTS.

H.P. TERMS

Access VISA

ALLWELD ENGINEERING
Factory 6, 232 Selsdon Road, South Croydon, Surrey, CR2 6PL.
Tel: 01-680 2995 (24 hr) 01-681 6734

Spectrum Deregulation

Many readers will have heard of the CSPI Report on Deregulation of the Radio Spectrum but know little of the potentially serious consequences to the amateur movement in the UK unless effective action is taken now. The report was commissioned by the Department of Trade and Industry (DTI) in March 1985 and was presented to them in March 1987. Interested parties were invited to comment by June 1987.

The RSGB failed to meet this deadline and indeed took another ten months to prepare a 14-page response. This response sought to pour scorn on the CSPI report but failed to make any constructive proposals whatsoever. Several members made representations to the RSGB over the long delays and asked for a positive response to be submitted. Regrettably these suggestions were ignored with comments to the effect, "We know best and there is no reason to take the report seriously".

It has now become apparent that the main recommendation of spectrum privatisation **will** be implemented before long. For the benefit of those not familiar with the CSPI proposals, a brief outline is as follows.

Each part of the spectrum would be sold by the DTI *en bloc* to a Frequency Planning Organisation (FPO) for an annual fee. The FPO would then be responsible for the detailed management of their part of the spectrum. In other words they would allocate frequencies, issue licences and charge for this service. The FPO would make whatever charges they thought fit within certain restraints. With the wide diversity of the amateur allocations it is certain that a number of FPOs would be involved. In practical terms this means that a central organisation would be needed to co-ordinate negotiations and charges between the various FPOs and the individual amateur.

Realistically the only organisation capable of doing this job at the present time is the RSGB. Thus the Society is certain to get involved, regardless of the wishes of those who presently control it.

This could be seen as bad news but in fact there is a shining light at the end of the tunnel. The RSGB can, and should, apply to be the FPO for those bands which are allocated to the amateur service on a primary basis. These are the 3.5, 7, 14, 21, 28, 50 and 144 MHz bands plus five microwave allocations. The RSGB would pay an annual licence fee for the bands to the DTI and pay the other FPOs for secondary allocations. As part of the overall package the RSGB would have to take on the responsibility for issuing amateur licences, thus relieving the DTI of an unwanted administrative burden.

If this were done the fee per megahertz could probably be negotiated at a level consistent with that currently paid. There would no longer be the need to wait years for repeater licences to be issued, nor to wait for permission for new modes such as packet. In other words, the amateur population would have much more control over its own destiny.

In a free market we are almost certainly going to have to pay more for the large segment of spectrum that we currently enjoy. The RSGB has the opportunity to minimise that increase at the same time as being able to have much more influence over the future of the hobby. I urge the Society to take this opportunity while it is still available.

P. L. Crosland G6JNS
Worcester

Top Band Plan

Reference Peter Chadwick's "Horrible Huns" on s.s.b. at the c.w. end of Top Band (page 20, July *PW*).

Having used amateur radio to teach myself sufficient German to hold a passable QSO, I have worked several stations in this area and understand the situation to be that they are restricted to a very narrow band (1832–1835kHz) for s.s.b. by their licence.

J. W. Barker G3WAL
Rugby

PW COMMENT

The New Amateur Licence

THE COMPLETION OF THE LONG-AWAITED REVISION of the Amateur Radio Licences A and B was officially announced by the Department of Trade and Industry on 25 July 1988, and will come into effect on 1 January 1989.

The new draft licence conditions appear in full in an eight-page pull-out supplement which you will find between pages 32 and 33 of this issue of *Practical Wireless*. You will find a list of some of the highlights of the new licence conditions at the end of that supplement, which replaces the promised supplement entitled "In the Know"—a guide to finding components, materials and information for your hobby. That will now appear in a future issue of *PW*.

Any new licences issued from 1 January 1989 will be in the new format. Existing licences will be varied by means of a Gazette Notice, and all licensees should receive the new licence when they pay their renewal fee during 1989.

So far as the Radio Amateurs' Examination is concerned, a new syllabus is to be introduced for the May 1989 exam, based on the new licence conditions.

What of the new licence? Well, there are changes to take care of new communication modes, some (though by no means all) of the rules that were previously scattered in bits through different sections have been drawn together into one, and some of the popular misconceptions that have arisen in past years (such as crossband working being forbidden) have been firmly shot down at last. But, as those of you that have already looked at the new conditions will have found, the language and format are not so different from the present licence, still very much in the traditional "civil service" style.

This licence revision has seen going on for a very long time—I can remember talking to a couple of officials from the Radio Regulatory Department about the licence at one of the last RSGB shows to be held in the main hall of Alexandra Palace before it was destroyed by fire, and that must be all of ten years ago. At that time, they said that if I had any suggestions about changes to the licence, I should write in with them quickly, because a revision was all but completed!

With due respect to all those who have been involved in drawing up the new licence, I must confess to being very disappointed that it has not been made much clearer, better organised, and above all written in more everyday language. Something more along the lines of the current Highway Code would be far more likely to convey to the average radio amateur just what rules are to be observed by him in following his hobby.

There are half-a-dozen or so points in the new licence which don't appear particularly clear to me, and I am querying these with the DTI. I hope to be able to bring you further comment and clarification in a future issue of *PW*.

Now that the review of the main licence is complete, the DTI has promised to turn its attention to the proposed Novice or Student Licence, intended to encourage more new entrants into amateur radio. For more information, watch this space.

In the meantime, remember that the revised conditions for Amateur Radio Licences A and B do not come into effect until 1 January 1989.

Geoff Arnold

NiCad Hazard

On a recent shopping trip I took my Yaesu FT-23R and a spare battery pack which were carried in my wife's shopping bag. All was well until on the return trip home in the car I could smell burning. On investigation it was not the car but the loose battery pack.

What had happened was that the open contacts had come into contact with some silver foil, which had shorted them out. The area around the contacts had melted with the heat, and the complete case and NiCad cells were ruined. Although there was a small shoulder to slide the pack on to the radio, which offers some protection, the contacts are not actually protected from a short circuit in any other way.

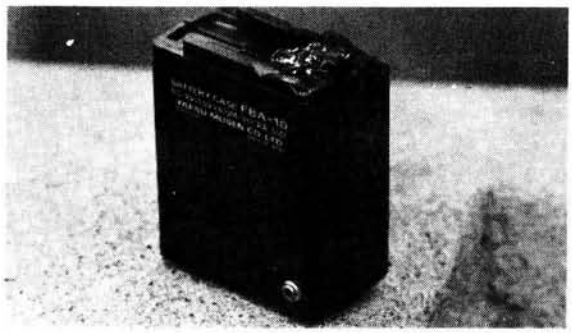
The battery pack burnt through the shopping bag and could easily have set fire to other material in and around it. The situation could have been potentially fatal!

I feel that some measures could be taken to avoid such hazards, such as: 1. adding a thermal cutout to the pack. 2. Including a plastics slide-on cover to protect the terminals whilst in transit. 3. Including a warning notice with the equipment to alert users to the potential danger of battery packs.

Ian Barnes
Bodmin, Cornwall

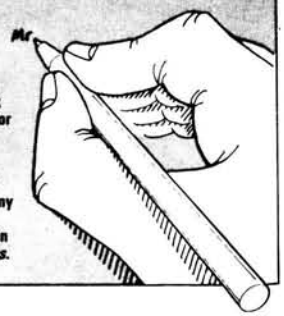
Whilst I was at radio college, a student radio technician in the aeronautical section in the classroom next to ours had the misfortune to drop a wooden-handled screwdriver across the terminals of a 24V bank of NiFe cells sitting under the equipment bench. There was one hell of a bang, and effectively all that was left of the screwdriver was the handle!

Since that day, I have had a very considerable respect for ***all*** *forms of storage batteries. I even protect the terminals of dry cells if carrying them loose. Though there may not be enough power there to start a fire, they're too expensive to risk flattening them by shorting across the terminals. — Ed.*



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*.



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.

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 42 of this issue).

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.

BACK NUMBERS AND BINDERS

Limited stocks of most issues of *PW* for the past 18 years (plus a few from earlier years) are available at £1.30 each, including post and packing to addresses at home and overseas (by surface mail).

Binders, each taking one volume of *PW* are available Price £3.95 to UK addresses, or overseas, including post and packing. Prices include VAT where appropriate

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., FREEPOST, 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 £14 per annum to UK addresses and £18.50 overseas. For further details, see the announcement on page 61 of this issue. Airmail rates for overseas subscriptions can be quoted on request.

NEWS DESK ... compiled by G4LFM and G8VFH

Tilt Over TA75

"The communications capability of a commercial or amateur radio link relies upon its antenna, which in turn relies largely upon its mast," or so says Radio Communications Hardware.

They stock a tilt over mast mounting assembly which is designed to fit standard BS spec alloy or steel scaffold tubing. The assembly allows the scaffold poles to be either wall or post mounted and can be lowered out of sight when not in use.

Supplied with the assembly are pre-stretched marine 8-plait rope, yacht quality tackle, 1000lb ratchet winch and all the necessary Rawlbolt fixings. You can have a different winch if you wish, as they can supply motorised winches and ones with brakes. The price of the

mast mounting assembly is £178 including VAT and delivery.

If you would like to know more, contact: ***Radio Communications Hardware, 28 Cunningham Close, Ringwood, Hants. BH24 1XW. Tel: 0425 479226.***

The Uniden 2830

This transceiver is a 28MHz (10m) mobile multimode. Its frequency coverage is 28–30MHz in 500kHz, 10kHz, 1kHz or 100Hz tuning steps.

The f.m. mode a has wide or narrow filter option and there is 10W available on that mode too (continuously variable). There is 10W available for a.m. and 20W p.e.p. for s.s.b.

Other features include a built-in v.s.w.r./power meter, noise blanker, r.i.t. control, r.f. input attenuator and auto squelch facility amongst others.

For the full details on this rig, contact:
Raycomm Communications Systems Ltd
International House
963 Wolverhampton Road
Oldbury
Warley
West Midlands B69 4RL.
Tel: 021-544 6767

Maxpak

Since the AGM held on June 6, Maxpak is without a secretary. The Chairman, Dave G4RVK, will be dealing with any correspondence on a temporary basis.

The group's digipeater, GB3AP, continues to be operational. The proposed site change is in an advanced stage with clearance from the IBA and DTI awaited.

The joint project with the Midland Amateur Repeater Group for a second digipeater, GB7MM, is continuing.

Dave Bentley G4RVK.
10 Churnet Grove,
Perton, Wolverhampton.

FISTS Joins EUCW

On June 1, the FISTS c.w. Club became a member of the European c.w. Association. To celebrate the first anniversary of its formation, FISTS are holding a **Straight Key Week** from 0001Z on Sunday September 4 to 2359Z on Saturday September 10. Non-members may participate and are also eligible for the FISTS Century Award.

Entrants must score 100 points for this award from contacts with FISTS members as follows:
Contact with a UK or EU member = 1 point
Contact with a member outside EU = 2 points
Contact with FISTS club station G0IPX or G0IPX/A = 3 points
The award will cost non-members £1. You must send in logs, signed by two independent operators (QSLs not required) showing date, band, call and membership number of FISTS members worked to:
Geo Longden G3ZQS,
119 Cemetery Road,
Darwen,
Lancs. BB3 2LZ.

Resurrected Callsign

The West Yorkshire RAFARS Group have applied to resurrect the callsign of the defunct radio club of RAF Yatesbury or RAF Compton Bassett.

They would like to hear from anyone who was a member, preferably an official, of either of these clubs just before the club/station closed in the 1960s.

If you can help in this matter, contact:
G3FQH.
QTHR. Tel: 0484 862390.

Derby & District Results

If you took part in the Derby and District ARS 144MHz Contest, then you'll be pleased to know the results are out. Ron Ham mentioned them in Propagation recently, but if you missed that, a copy of the full results is available upon receipt of a s.a.e. Send your s.a.e. to:
Derby & District ARS,
119 Green Lane,
Derby DE1 1RZ.

Rally Calendar

August 14:** The Flight Refuelling ARS and Bournemouth RAIBC Rally will be held at the FRARS Sports & Social Club, Merley, near Wimborne, Dorset. All the usual attractions will be there for all the family. Entrance is 50p (children free). Gates are open from 10am to 5pm. More details from: ***John Fell. Tel: 0202 691649.

August 14: The 1988 Derby Mobile Rally will take place at the usual venue of Lower Bemrose School, St Albans Road, Derby. Doors open at 11am. More details from: ***G3KQT. QTHR.***

August 28: The Annual Rally of the British Amateur Radio Teleprinter Group (BARTG) will again take place at Sandown Park Racecourse, Portsmouth Road, Esher. More details from: ***Peter Nicol G8VXY. Tel: 021-453 2676.***

August 28: The Galashiels and District ARS are holding their Open Day at the Focus Centre, Livingstone Place, Galashiels. There will be trade stands, a bring and buy as well as catering facilities. More from: ***John Campbell GM0AMB. Tel: 0835 22686.***

August 21: The Essex group of the 934MHz Club UK are holding their 4th mobile rally at Brentwood Halfway House (junction of the A127 and A128). Doors open from 10am to 4pm. There will be amateur and 934MHz stations in operation. Admission free, refreshments available. ***Steve Blinhorn G1XGP, 102 Lord Roberts Ave, Leigh-on-Sea.***

September 4: The 21st Preston ARS Annual Mobile Rally will be held at the University of Lancaster. There will be trade stands, a large Bring & Buy, licensed bar, snack bar and restaurant. Talk-in on S22. Doors open at 11am (10.30 for the disabled). Admission by programme (50p includes free draw for colour TV). Ample free parking. More details from: ***Godfrey G3DWQ. Tel: 0772 53810.***

September 4:** The Telford Radio Rally and Exhibition will be held at the Telford Racquet Centre, Telford. All the usual facilities and stands will be there. Talk-in on S22. Morse tests available through RSGB. Doors open 10.30 for the disabled, 11am for everyone else. More details from: ***John G8ARS. Tel: 0952 727719.

September 4: The National Amateur Radio Car Boot Sale will be held at the Shuttleworth Collection, Old Warden Aerodrome, near Biggleswade, Beds. Gates open from 10am to 5pm, admission 50p, parking free. The Shuttleworth Collection is a famous aircraft and motor museum. Also there is a restaurant, bar and children's playground. More details from: ***Wendy. Tel: 0582 451057.***

*PW/SWM in attendance

College courses

Bristol: Brunel Technical College, Ashley Down, Bristol will again be running three different evening classes for radio amateurs, starting in September. Monday evenings is Morse classes and Thursday evenings is a practical course for the radio amateur. Enrolment is September 6 and 7. The course tutors are Phil Brouder G3ZJH and David Heald. More details on ***0272 41241 ext 2164, Greater Manchester.*** Both courses mentioned here begin at the start of the September term at Reddish Vale Evening Centre, Reddish Vale Road, Stockport, Cheshire SK5 7HD. Enrolment will take place on 19, 20 and 22 September between 7 and 9pm. The RAE course will be for 25 sessions leading up to the exam in May 1989, but facilities will be available to sit the December 1988 exam as a re-sit or for those wishing to obtain the licence quickly. The lessons will run on Monday evenings between 7 and 9pm.

A Morse course of 25 lessons for all levels of ability up to about 17 w.p.m. is available. Several tutors will be there to assist. These classes are on Thursdays from 7 to 9pm. More details from ***Dave Wood on 061-480 9157*** most evenings.

Hendon: Hendon College, Corner Mead, Grahame Park, Colindale, London are offering the RAE course again this year. It will be held on Tuesday evenings from 7.30 to 9.30pm and the tutor will be Tony Essex. For enrolment details, please telephone: ***01-200 8300.***

Rugeley: An RAE course will be held at Rugeley Adult Education Centre (formerly Aelfgar School), Taylors Lane, Rugeley, Staffs. Classes commence on Thursday September 15 at 7pm. Details from: ***John Teece. Tel: 08894 2912.***

They are also hoping to provide a single term Morse class, but must have a minimum of twelve students guaranteed. Contact John Teece if you're interested.

Barking: The Barking Radio & Electronics Society will be holding both RAE and Morse classes starting in September. The RAE classes will be on Mondays and the Morse classes on Tuesdays, both start at 7.30pm. More details from: ***Paul G4ULK. QTHR. Tel: 01-553 1172.***

Chingford: The Adult Further Education Centre, Simmons Lane, Friday Hill, Chingford E4 will be running Morse classes on Mondays at 7.30pm.It will cater for beginners to advanced, and they arrange a Morse test for you at the end of the course. The first class is on September 19. Details from the tutor: ***Tel: 0992 715168.***

Clacton: The Clacton Adult Education and Youth Centre, Green Lodge, 180 Old Road, Clacton-on-Sea will be holding an RAE course. Enrolment starts the week commencing September 12. Course tutor available on September 14 for any specific questions regarding the course. More details: ***Clacton-on-Sea 424151.***

Harwich: The Harwich Centre, Adult and Youth Education, Main Road, Dovercourt, Essex will be holding an RAE course. Enrolment is September 10, 12 and 14. The course tutor will be available on Saturday September 10 for any specific questions regarding the course. More details on: ***Harwich 2467.***

Kidderminster: The Kidderminster College, Hoo Road, Kidderminster, Worcs. will run RAE classes on Wednesdays from 1900 to 2100. The first class is on September 14. A Morse class will run on Tuesdays 1900 to 2100 starting on September 13. Enrolment is September 5, 6 and 7 from 1400 to 2000. More details from: ***D. Oakley G0DAA on Kidderminster 820811 (day).***

Manchester: The North Trafford College of Further Education, Talbot Road, Stretford are running a series of courses for the radio amateur. Theory classes are Wednesday mornings or Thursday evenings. Morse code is Tuesday evenings or Wednesday afternoons. Amateur Television is Wednesday mornings and Advanced Morse Code is Monday evenings. Enrolment dates are September 7, 8 and 9. The lecturer is Mr J. T. Beaumont G3NGD. For more details: ***Tel: 061-872 3731.***

Welwyn: G. Stonier will be running an RAE course from De Havilland College, The Campus, Welwyn Garden City, Herts. The classes commence September 15 at 6.30pm. Enrolment may be in the previous week, or on the night.

Field Craft Trophy

One of the new arena events taking place at Hamfest '88 (at the Flight Refuelling Sports & Social Ground, near Wimborne, Dorset) will be a team antenna mast erection contest.

Teams of up to five people may enter and the winning team (those who put the mast up quickest and straightest) will be presented with the FRARS Hamfest Trophy. Dr Julian Ganaway G3YGF, Executive Vice-President of the RSGB, has agreed to present the trophy.

The mast and the guy sets will be provided on the day, together with hard hats and a teach-in beforehand. Entry forms and further details on Hamfest '88, on August 14, can be obtained from:

John Fell G0API,
14 Rectory Avenue,
Corfe Mullen,
Wimborne,
Dorset.
Tel: 0202 691649.

OB Equipment

Wood & Douglas, known to many in the amateur radio field for their kits, announced their latest in commercial equipment recently, the PMRL-030 Portable Reporter Radio Link.

This unit integrates an extended audio u.h.f. transmitter with a v.h.f. cuing receiver and "off-air" station monitor. Its features include microphone or line level output, common receiver volume control, auto off-air/cuing electronic audio switch, internal power source for electret microphones, remote p.t.t. facility, two or three antenna operation and low battery indicator.

Wood & Douglas.
Unit 12-13,
Youngs Industrial Estate,
Aldermaston,
Reading RG7 4PQ.
Tel: 07356 71444.

Can You Help?

We get some unusual requests for help in *PW* offices from time to time. James Jukes, Dodd & Co are executors for Mr J. Slater deceased and are trying to trace a missing beneficiary. Mrs Alice Bolton, who formerly lived at 6 St Philip's Close, Formby, Merseyside, has a son David Bolton who is a licensed amateur.

So if you know where David Bolton may be contacted, then please get in touch with the executors.

James Dukes, Dodd & Co.,
1 Starkie Street,
Preston PR1 3QL.
Tel: 0772 53993.

Mr Williams has been given a Trio communcations receiver, the 9R-59DE. He believes it was manufactured around 1965 and would be grateful for any information, like circuits or manuals, that readers have on this receiver.

J. J. Williams,
"Alltween",
44 Mayfield Drive,
Buckley, Clwyd CH7 2PN.

Can You Help?

continued

Does anyone know the address of PAN Interntional, or do you know where a PAN Crusader X radio may be purchased? Apparently the PAN Crusader X is very similar to a Grundig Satellit 2400, but only has one speaker. If you can help, contact:

A. A. J. Tregoning,
40a Trevan Road,
Penzance,
Cornwall TR18 2RT.

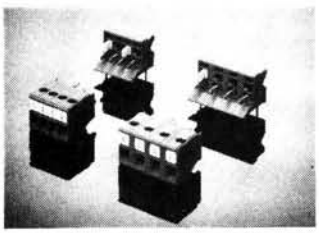
Mr Chick has approximately 12 years of *Practical Wireless* available to anyone who is interested. They date from 1964 through 1976. If you are interested, he would be grateful if you could act quickly as they are moving soon.

Michael Chick,
Mardy House,
Hengoed,
Oswestry, Salop.

Klippon Connector

The latest addition to Klippon's range of p.c.b. connectors is the SGE5 series.

These two-part connectors accept conductor up to 2.5mm² and are designed and tested for compliance to VDE 0100 groups B and C. Features include an operational current rating of 10A and voltage ratings of 380V a.c. for the 5.08mm pitch version, or 500V a.c. for the 7.62mm type.



In addition, guide pins are provided to enable accurate mating and to allow access for test plugs. The series has several accessories including a label marking system, coding pins to ensure polarisation and end plates that permit modular assembly.

Klippon,
Power Station Road,
Sheerness,
Kent ME12 3AB.
Tel: 0795 580999.

Rendar Knobs

This range of accessories are made from a highly durable phenolic material. This means they will tolerate higher temperatures than normal.

The units are available in four designs, plain, slimline, skirted and skirted with wings. Each type comes in three sizes.

Accessories include pointers, nut covers, ring nuts, transparent skirts, stators and function indication discs. The shaft size for all types is 0.25in. Outside diameters available for the skirted versions are 19.1, 28.2 and 41.9mm, unskirted types are 14, 21.1 and 29.5mm.

More details on these products from:

Rendar Ltd.
Durban Road,
South Bersted,
Bognor Regis,
West Sussex PO22 9RL.
Tel: 0243 825811.

RSGB HF Convention

The 1988 RSGB HF Convention will be held at the Belfry Hotel, Milton Common (beside the M40 just east of Oxford) on Sunday, September 25. Admission to the convention is £3 and doors open at 10am.

The event is intentionally different from the usual rally or exhibition as it focuses on the social side of the hobby. It provides a place for all interested in h.f. operating to meet and discuss their recent activities, triumphs and disasters, as well as to hear presentations from experts on various aspects of h.f. radio.

Exhibitors are expected to include RSGB affiliated interest groups such as G-QRP, BYLARA, WAB, Southern UK FM Group, RAFARS and the Chiltern DX Club. That's as well as RSGB committees covering propagation studies, e.m.c., h.f. and h.f. contests.

Pile-up experts are invited to test their skill on a fiendishly difficult simulation, and DXers can test their knowledge on a quiz compiled by RSGB DX News Sheet editor, Brendan McCartney G4DYO.

Lecturers will include members of the G-QRP Club, WOAIH on running a US contest super-station and Paul Granger F6EXV on the recent DXpedition to Kingman Reef and Palmyra.

Auction & Barbecue

The annual amateur radio auction and barbecue will again take place at the Cricket Pavilion, "B" Building Entrance, BTI Radio Station, A5 Trunk Road, Hillmorton, Rugby, on September 20. It's organised by the Rugby ATS.

The admission charge is only 20p per person and the large car park is free. Anyone may place an item in the auction, with or without a reserve price, free of charge. However, the Rugby ATS will retain 10 per cent (£10 maximum) on all items sold.

Special Event Stations

GB2CPC: The Dragon ARC in association with Penrhyn Castle, Bangor, Gwynedd will be holding their special event station from August 19 to 21. An amateur TV station will be set up and operated as well as an exhibition of vintage radios and equipment. ***Dewi Roberts GW0ABL. Tel: 0248 713647.***

GB1RLD: Two members of Radio Link–Derby Hospital Broadcasting will be operating the special event station from the outside broadcast caravan at the City Hospital, Derby. They will be using 144MHz v.h.f. on September 17 and 18 from 1000 to 1600. ***John Huddlestone G1UJX. Tel: Derby 676822.***

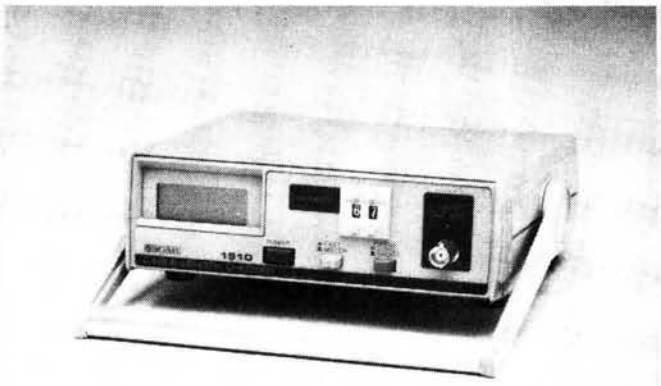
GB2NTS: This station will be on the air on August 20/21 from Culzean Castle (19km south of Ayr). It's to celebrate the 200th anniversary of the death of Prince Charles Edward Stuart. Culzean Castle is a National Trust property. More details from: ***Paddy GM3MTH. QTHR.***

GB2WVR: This station will be on the air for the World Veteran Rowing Championships in Strathclyde Country Park, Motherwell. The dates for this event are September 5 to 11. For more details contact: ***Brian GM0EGI. QTHR; or Paddy GM3MTH. QTHR.***

Cable Length Checker

Solex has added the ME1510 Cable Length Checker to its ever growing range of test equipment.

The unit incorporates many features. Fault location is available for diverse cable types including coaxial cables, twisted pair, power



1800W PSUs

The Series 9 range of SuperSwitch power supplies from Bonar Advance have a rating of 2V/220A up to 48V/36A.

Features include, user selectable input voltages of 90–132 or 180–246V a.c. (47–63Hz); output voltages of 2–48V d.c. which are user adjustable via a front panel potentiometer; an efficiency of typically more than 75 per cent and overvoltage and thermal shutdown protection as standard.

The SuperSwitcher Series 9 also has a line regulation of 5mV or 0.1 per cent and a load regulation of 10mV or 0.2 per cent at any load up to 100 per cent of rated load with remote sensing. Ripple and noise are 1 per cent or 50mV peak-to-peak, whichever is greater, and the temperature co-efficient is better than 0.02%/°C.

The power supplies are supplied in industry standard case sizes and have an operating temperature range of 0–70°C.

Bonar Advance Ltd., Raynham Road, Bishop's Stortford, Herts. CM23 5PF.

Marconi Spectrum Award

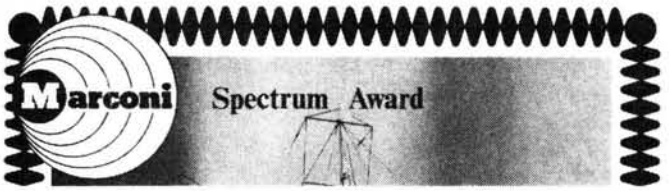
This award can be obtained for both h.f. and v.h.f. working

UK & EU h.f. section
Each applicant requires 10 stations on each of 5 different bands, but at least 10 of the total number of QSOs must have been c.w. All modes can be used. Endorsements are available for all c.w. claims.

DX h.f. section
Each applicant must work five stations in five bands, all modes count but at least five of the total QSOs must be c.w. Endorsements available for all c.w.

No QSL cards are required in either section, logs must be signed by two local amateurs or club official.

The callsigns IP1TTM and II4FGM count for five points each.



UK & EU v.h.f. section
A minimum of three bands must be used with a maximum of five stations in any one country. The award can be given for a singular record breaking contact that has international recognition.

All modes may be used, but five QSOs using c.w. are mandatory within each claim. No QSLs required, just the usual signatures.

Special event stations on the Isle of Wight and Flatholm Island count as five points.

The award costs £5.50, but for more details of the rules or any explanations, contact the Awards Manager.

V. Scambell G3FWE
Marconi Radio & Electronics Club
Solent View
78 Slade Road
Isle of Wight

cable, Cabtyre Cable and multi-conductor shielded cable.

A four-digit display enables the measuring of coaxial cable from 10 to 2000m. It also indicates whether the cable termination is "open" or "short". You can also select either feet or metres at the touch of a button.

Rechargeable Ni-Cad batteries, and a.c. adapter and car battery cigarette lighter attachment are standard accessories supplied with the unit.

Full specification details are available from:

Solex International, 95 Main Street, Broughton Astley, Leics. LE9 6RE.

Catalogues

The 1988 Rental Catalogue from Livingstone Hire makes interesting reading. The rental periods quoted for in the catalogue are for 1 week, 12 weeks or 24 weeks hire. Prices range from just a few pounds to several hundred pounds — depending upon the piece of equipment concerned.

Livingstone Hire Ltd., The Rental Centre, Livingstone House, 2–6 Queens Road, Teddington, Middx.

STC Instrument Services have produced a 320-page catalogue covering equipment ranging from computers to oscilloscopes from over 65 different suppliers. ***STC Instrument Services, Dewar House, Central Road, Harlow, Essex CM20 2TA.***

Oriel Scientific Ltd have a 12-page catalogue called Reflectance Materials & Standards. Described in the catalogue are newly developed diffuse reflectance materials. These new materials are ideal for fabricating reflectance components such as laser cavities and reflectance standards. ***Oriel Scientific Ltd. PO Box 31, 1 Mole Business Park, Leatherhead, Surrey KT22 7AU.***

The second edition of the BICC-VERO Electronics Handbook is available. It offers a complete guide to the range of products and services available from the company.

BICC-VERO Electronics Ltd. Electron Way, Chandler's Ford, Eastleigh, Hants SO5 5ZR.

A new short-form catalogue from Bruel & Kjaer gives details of their high-quality instruments and transducers.

It has 64 pages, is illustrated, and contains details on instrumentation for sound and vibration analysis, environment monitoring as well as general-purpose equipment for measurement and analysis.

Complete specifications are given, along with application examples.

For more information, contact:

Bruel & Kjaer (UK) Ltd. 92 Uxbridge Road, Harrow HA3 6BZ. Tel: 01-954 2366.

STC Services has produced their largest-ever Tool Book. It features over 2600 products, some are illustrated in full colour.

The catalogue is sectioned into four main areas covering tools, assembly aids, production materials and batteries.

Copies are available free of charge from:

The Tool Group. STC Electronic Services, Edinburgh Way, Harlow, Essex CM20 2DF. Tel: 0279 626777.

The Summer 1988 edition of the Cirkit constructors' catalogue is now available. A special attraction for the first 500 constructors to send in an order over £50 (excluding VAT) is a free digital travel alarm. Cirkit is also running its popular competition once again, with one of the new 10MHz oscilloscopes as first prize. Prizes for runners-up are auto-ranging multimeters and electronics toolkits.

For customers wishing to place orders by telephone, Cirkit have made the number 0992 444111 a direct line to the sales desk. A new number, 0992 441306, is now available for enquiries to other departments.

Apartment HF TX Antennas

Part 3
In this final part of this article by Richard Q Marris, we'll look at practical designs for "in-room" loop antennas.

The half wave loop antenna consists of a λ/2 of wire bent as in Fig. 3.1a. It is a question of opinion as to whether it is a true loop antenna or a bent dipole; but anyway it does look like a loop! The maximum field direction is as shown, but having said that there is no direction in which the radiation from the loop falls to zero. The radiation resistance of this antenna is reckoned to be around 50Ω.

The loop has many attractions to the "in-room" amateur particularly on the h.f. bands. If a 14MHz version is taken as an example, each side of the antenna is about 2.44 metres, and on 28MHz this dimension would only be 1.2 metres. In the case of the 28MHz version it could be mounted on a frame and with a little manoeuvering both vertical and horizontal sloped orientation could be tried.

On 14MHz physical circumstances will, in all probability, necessitate horizontal erection, which can obviously be fitted around the room. Make sure that the antenna is spaced away from the ceiling and walls by at least 300mm. The antenna could also be diamond shaped, allowing the feed point to be in one corner; a much more convenient spot for the transceiver. It also means that the antenna insulators are conveniently sited in the corners of the room. At frequencies below 14MHz this antenna becomes too large for most situations; with a side measurement of nearly 5 metres for the 7MHz band.

Construction

Having cut the loop wire to the optimum frequency, it will be found necessary to adjust the antenna to resonance. This can be done as shown in Fig. 3.1b with short tuning stubs bent back against the radiator loop. However, this arrangement makes for a rather tricky installation, with extra insulators, etc. An alternative and preferred method is shown in Fig. 3.1c. This matching system consists of a length of 300Ω ribbon feeder which is pruned back until resonance is achieved. Bear in mind the transmitter must be turned off during the act of cutting the 300Ω line.

This type of antenna has been used on both the 21MHz and 14MHz bands to good effect.

Multi-turn Round Room Loop

Several variations of this 3.5MHz loop have appeared in American magazines over the years, but the design has never been tried by the author. A second version is also recalled for the 7MHz band. This antenna has been included for interest, as someone might like to experiment with the idea.

The basic details for the 3.5MHz antenna can be seen in Fig. 3.2. It consists of a λ/2 of pvc covered wire wound around the circumference of the room in three turns. The loops are suspended at the corners of the room with string, with a spacing of 150mm between turns. In one article the λ/2 length was wound 4 times around the room and appeared to be rectangular in shape.

The antenna is tuned to resonance with a 500pF variable capacitor C2, with L apparently matching the device to the low impedance of the transmitter. In some versions C1 was included but in others it was not.

The write-ups in every magazine on the performance of this type antenna have been good, though no transmit power has been mentioned. It was also stated that this loop is a little tricky to use! Well . . .

Conclusion

An efficient 100W transmitter feeding an efficient outdoor antenna will invariably out-perform a 10W transmitter being used with an "in-room" antenna. However, the latter will outperform a 100W transmitter feeding an inefficient outdoor antenna, in which only a small percentage of the 100W is being actually radiated. After years of experience the author knows this situation not to be too uncommon.

The cure for a poorly radiating antenna does not lie in feeding the antenna with more power, but in improving the efficiency of the antenna.

The ideas promoted in this article will hopefully spur on those amateurs and s.w.l.s that have restricted living conditions. Most, if not all the antennas shown will work equally well outside, i.e. in small pocket handkerchief gardens.

In most locations it should be possible to cook up an "in-room", or restricted space h.f. antenna; feed it with r.f. power and get acceptable results. This after all is far better than just giving up, and the DX worked will seem all that more exciting.

You will probably find on the 14MHz and 3.5MHz bands, that the reports given by stations within an approximate radius of 80km, are not very favourable. The author has noticed that these stations seem to be jumped over by the signals being radiated from an "in-room" antenna. At the present QTH, operating to the east and west is good; south isn't bad but the north is very poor. This can probably be explained by the mass of the building being greater in a northerly direction.

The answer to the whole problem really, is to develop crafty, even devious non-conformist technical antenna skills, together with high operating standards. If the textbook accepted rules will not fit into the space available, then bend or break these rules. A well-known American authority on antennas once told the author "if an antenna works then it must be right—however unorthodox it is"—or words to that effect. **PW**

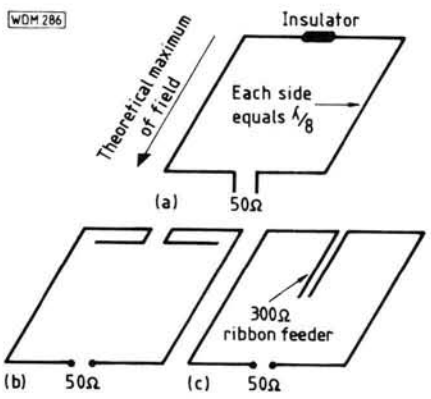


Fig. 3.1

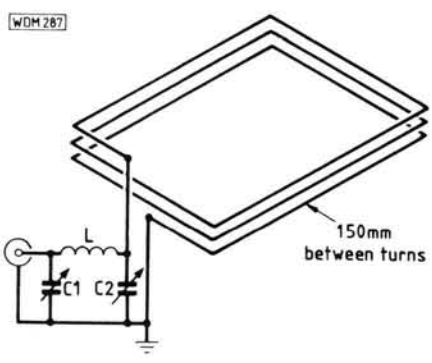


Fig. 3.2

REALISTIC®

PROGRAMMABLE SCANNING RECEIVERS

THE BEST CHOICE FOR YOUR HOME OR CAR

A **Realistic PRO-2004.** The ultimate in today's solid-state high-technology scanners! Delivers a wide range of frequencies not found on most scanners. Search mode finds new channels, selectable scan and search speeds, two-second scan delay. Lock-out key for temporarily bypassing channels. Squelch control and priority function. Continues tuning from 25-520 MHz and 760-1300 MHz. 300 channels for storing frequencies. Large LCD channel/frequency display with electroluminescent back lighting, built-in speaker, telescoping aerial. Jacks for external aerial, headphone, external speaker, tape record and DC power supply. Measures: $2^{3}/_{16} \times 10^{11}/_{16} \times 8^{11}/_{16}$". Mains operation (or 13.8 VDC neg. gnd. power cord, extra). Memory back-up requires 9v battery. **20-9119** **£349.95**

B **Realistic PRO-2021.** Features direct keyboard entry, search and scan in two speeds and two-second scan delay. Priority function will automatically switch to the priority channel when a call is received on it and individual lock-outs for temporarily bypassing channels. Scan up to 200 channels in these bands: VHF Lo 68-88 MHz, VHF AIR 108-136 Mhz, VHF Hi 138-174 MHz, UHF Lo 380-470 MHz and UHF Hi 470-512 MHz. Easy-to-read LCD channel/frequency display with electroluminescent back-lighting, squelch control and built-in speaker, telescoping aerial. Jacks for external speaker, external aerial, tape recorder and DC power supply. Size: $3^{1}/_{8} \times 10^{1}/_{4} \times 8$". Includes mounting bracket for mobile use and DC power cord. Mains operation (or 13.8 VDC neg. gnd.). Memory back-up requires 9v battery. **20-9113** **£219.95**

Tandy

Over 400 Stores And Dealers Nationwide

Prices may vary at Dealers. Offers subject to availability.

Tandy, Tandy Centre, Leamore Lane, Bloxwich, Walsall, West Midlands. WS2 7PS

Valved Communications Receivers The BC-348 (Part 1)

Beginning this month, Chas E. Miller looks at the famous BC-348 series of airborne receivers, used by the US Air Force during World War 2 and for a number of years afterwards. In this issue he describes the circuit arrangements used, and in Part 2 he deals with modifications and realignment procedures.

The BC-348 series ran to several mark letters during its long production history, and although the outside appearances were similar, internally there were considerable divergences, particularly with the later models. The basic common specification was of a superhet having two r.f. stages, frequency-changer, three i.f. stages, detector/a.g.c., and output stage. There was no intermediate a.f. amplifier between detector and output. The frequency-changer stage in the earlier marks consisted of separate mixer and local oscillator valves, later altered to a single-valve configuration. The early marks had a b.f.o. combined with the 2nd i.f. amplifier, whilst the later types had it combined with the detector/a.g.c. valve. The frequency coverage was the same for all marks: 200–500kHz, 1.5–3.5MHz, 3.5–6MHz, 6–9.5MHz, 9.5–13.5MHz and 13.5–18MHz.

The power source being the aircraft 24V service battery, the valve heaters were arranged in series-parallel to present a nominal 25.2V load. The h.t. was supplied by a dynamotor rated at 28V input and approximately 235V output at 75mA. Why 28V, you may ask.

Well, a lead-acid accumulator of nominally 24V (12 two-volt cells) gives 26.4V when fully charged (2.2V per cell). However, when on charge the terminal voltage will be of the order of 28V, hence the input rating of the dynamotor. Resistors were also placed in the heater circuit to reduce the voltage suitably, as the battery was expected to be on charge throughout operational flights. Similarly, a nominal 12V battery gives 13.2V fully charged and has a terminal voltage of around 14V on charge.

Another series of receivers numbered BC-224 was in concurrent production, these models being identical with the BC-348 except for the power source, viz., 12.6V battery. The following notes will, therefore, be generally applicable to the two types.

Circuit Description

Models prior to suffix -J (Fig. 1.1)

The antenna input is taken via a small trimmer to the control grid of the 1st r.f. amplifier (V1, VT86/6K7) which is an r.f. pentode operating with both manual and automatic gain control. Single tuning inductances for the grid circuit are selected by the band switch. Transformer coupling is used to transfer the signals to the 2nd r.f. amplifier (V2, VT86/6K7), another r.f. pentode having manual and automatic control, and which additionally has a balancing potentiometer in its cathode circuit (commoned with that of V1 for manual control) which is adjusted for minimum "noise". Similar coupling passes on the signals to the mixer valve (V3, VT91/6J7), a straight r.f. pentode with cathode-coupling to the local oscillator triode (V4, VT65/6C5). The intermediate frequency is 915kHz.

The first i.f. coupling transformer incorporates an optional narrow-bandwidth crystal filter for c.w. reception. The first i.f. amplifier (V5, VT86/6K7) is followed by a double valve having triode and vari-mu pentode sections (V6,VT70/6F7). The latter is employed as the 2nd i.f. amplifier. Both these stages share the manual and auto-gain control applied to the r.f. amplifiers. The 3rd i.f. amplifier (V7, VT93/6B8) is the pentode section of a double-diode-pentode valve. This is operated with neither type of gain control, a fixed bias of 21V being applied to its cathode. Most of this voltage is used to delay the a.g.c. action, the diode concerned having a common cathode, and thus part of the voltage is fed back to the control grid of the pentode so that it receives an effective bias of no more than 2V. The a.g.c. diode, being returned to chassis by its load resistor, receives the full 21V bias whilst the detector, being returned to cathode, receives zero bias.

Audio frequency signals appearing on the secondary of the fourth i.f. transformer are taken directly to the manual volume control without any elaborate i.f. filtering network. When automatic gain is in use the manual control operates normally, passing signals at the desired level to the grid of the output valve (V8, VT48/41, or VT152/6K6GT). When manual gain control is selected, the a.f. control is bypassed to maximum and the output of the receiver controlled entirely by the cathode voltage applied to V1, V2, V5 and V6. The a.f. and r.f. gain controls are mounted in tandem and operated by one and the same knob. (Cf. R1155). The earlier VT48/41 output valve is, in fact, electrically identical to the VT152/6K6GT which superseded it, the difference lying in the shape of the envelope and the type of base. The 41 is a UX-base valve with conventional curved envelope whereas the 6K6GT has an octal base and a small tubular envelope.

The optional b.f.o. employs the triode section of V6 in a conventional tuned-anode, tuned-grid circuit with permeability tuning of the induc-

tances. The output is coupled to the anode of the pentode section of V6 by a small capacitor consisting of a few turns of wire around the lead to the i.f. transformer primary.

Circuit Description

Models with suffix -J and later (Fig. 1.2)

The antenna input passes to one of the r.f. transformers selected by the band-switch and having tuned secondaries, but with a measure of direct coupling (via a 7pF capacitor) to the control grid of the first r.f. amplifier (V1, VT117/6SK7). This is the single-ended version of the 6K7, and is electrically similar. It has, however, an improved mutual conductance and different inter-electrode capacities. Resistance-capacitance coupling is employed to the coils in the grid circuit of the 2nd r.f. amplifier (V2, VT117/6SK7). Those for the 1.5–18MHz band are r.f. transformers, whilst the 200kHz–500kHz band has a single winding. A very similar system is used to couple the signals from V2 to the frequency-changer stage. Both r.f. amplifiers have manual and automatic gain control but the balancing potentiometer in the cathode circuitry is omitted.

The resistance-capacitance intervalve coupling appears to have been a somewhat retrograde step on a pentagrid frequency-changer valve in place of the former mixer/local oscillator arrangement. The type chosen for the job (V3, VT150/6SA7) has a good performance up to 6MHz, above which even the makers admitted that oscillator action was a little tricky to obtain and maintain consistently throughout tuning bands; therefore a separate local oscillator was recommended. Nevertheless, in the BC-348 the 6SA7 was used on its own, with the typical cathode-coupled oscillator circuit. The intermediate frequency is

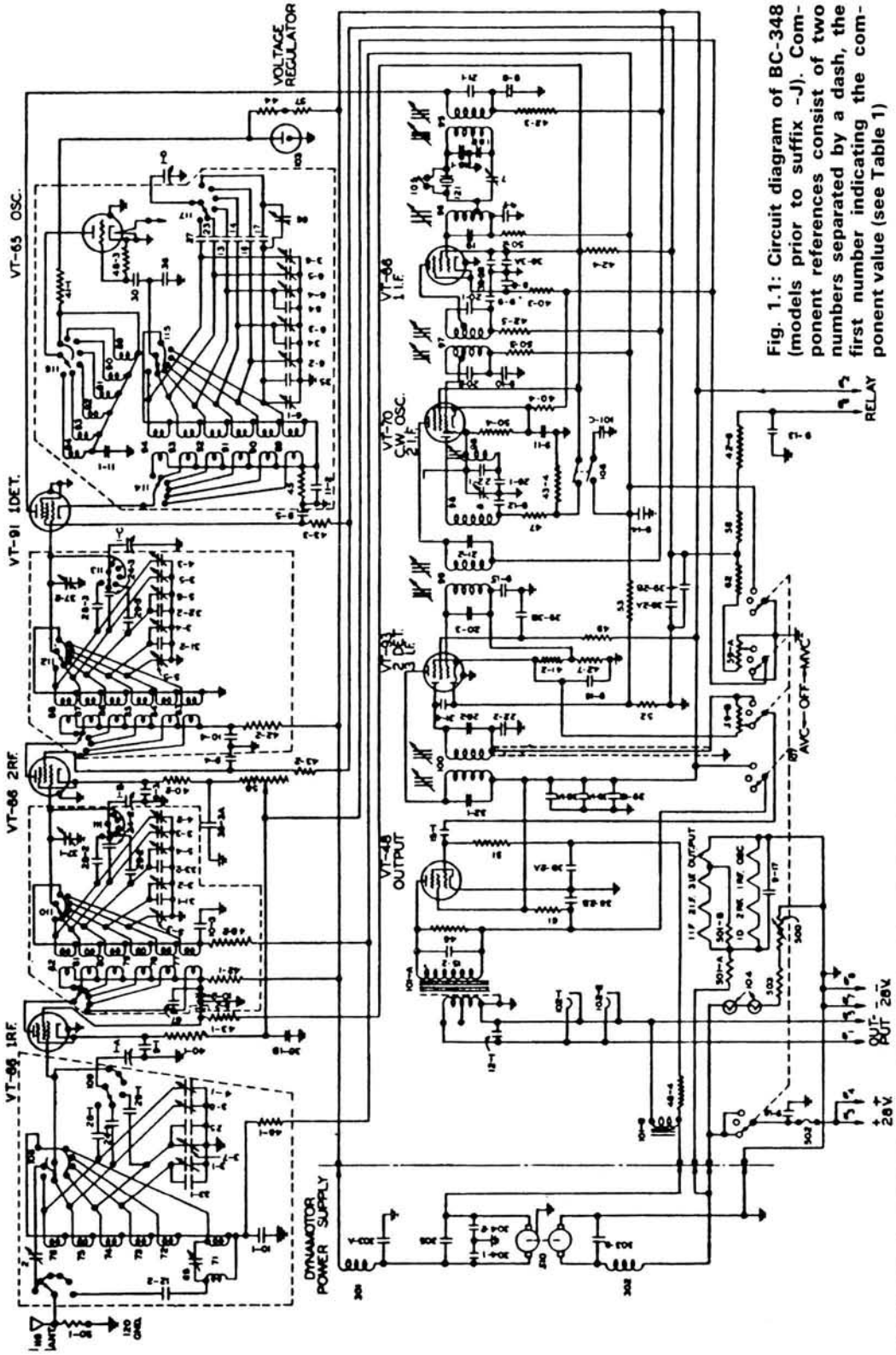


Fig. 1.1: Circuit diagram of BC-348 (models prior to suffix -J). Component references consist of two numbers separated by a dash, the first number indicating the component value (see Table 1)

TABLE 1

Components Ref	Value										
1	13.5–331.6pF	10	10nF	21	250pF	32	47pF	43	10kΩ	56	10kΩ	101-C	50nF
2	50pF max.	11	10nF	22	240pF	33	50pF	44	12kΩ	57	27kΩ	303	0.5µF
3	50pF max.	12	5nF	23	170pF	34	85pF	45	15kΩ	58	3.5kΩ var.	304	10nF
4	50pF max.	13	390pF	24	155pF	35	47pF	46	56kΩ	59-A	20kΩ var.	305	1µF
5	25pF max.	14	2.24nF	25	25pF	36	30pF	47	68kΩ	59-B	350kΩ var.	500	200Ω var.
6	25pF max.	15	1.5nF	26	150pF	37	25pF max.	48	100kΩ	61	2.4kΩ	501-A	3Ω
7	10pF max.	16	670pF	27	135pF	38	0.5µF	49	180kΩ	62	47kΩ	501-B	190Ω
8	10pF max.	17	130pF	28	135pF	39	0.5µF	50	470kΩ	64	35pF	503	60Ω
9	10nF	18	500pF	29	470pF	40	470Ω	51	560kΩ	65	10pF max.		
		19	235pF	30	100pF	41	1kΩ	52	1.5MΩ	66	25pF		
		20	260pF	31	75pF	42	4.7kΩ	53	220kΩ	67	750pF		

once again 915kHz.

Conventional i.f. transformer coupling is used from the anode of V3 to the grid of the 1st i.f. amplifier (V4, VT117/6SK7), operating with manual/auto gain and sharing a common cathode resistor with the 2nd i.f. amplifier (V5, VT117/6SK7). Between these two valves is another example of resistance-capacitance coupling with a rudimentary tuning arrangement in the grid circuit of V5. There is also an optional crystal filter included in this coupling device, shorted out when not required. A normal i.f.t. couples V5 to the 3rd i.f. amplifier (V6, VT115/6SJ7). This is a straight r.f. pentode operating in much the same way as the 6B8 in the earlier marks as regards bias arrangements, although the detector/a.g.c. diodes are now to be found in another valve (V7, VT233/6SR7). The latter is a double-diode-triode with the triode section used for the b.f.o. Its cathode is connected to that of V6 to provide delay bias for the a.g.c. The a.f. coupling to the output stage (V8, VT152/6K6GT) is as described for the earlier marks. The r.f. gain control, heater and h.t. provisions are also virtually identical.

NEXT MONTH

Chas E. Miller looks at some of the modifications appropriate to the BC-348, including the provision of mains power supplies, loudspeaker output, extra i.f. and a.f. sensitivity, separation of r.f. and a.f. gain controls, fitting an S-meter, and adding medium-wave coverage, plus notes on servicing and realignment.

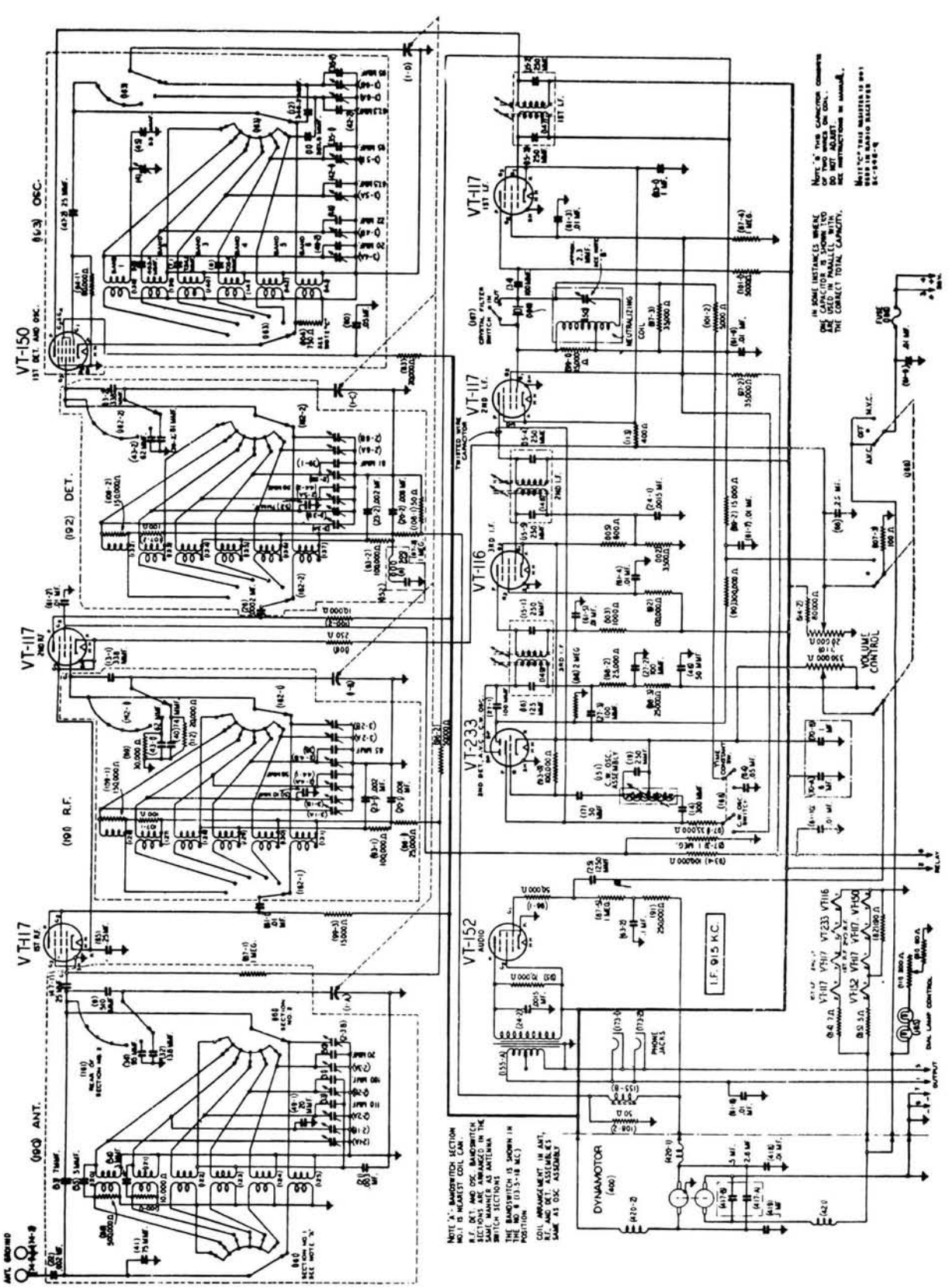


Fig. 1.2: Circuit diagram of the BC-348 (models with suffix -J and later)

SCANNERS

BEARCAT BY uniden

UBC 175XL

UBC 100XL
UBC 50XL
UBC 70XL

RAYCOM ARE TRADE AND RETAIL DISTRIBUTORS FOR THIS SUPERB RANGE OF QUALITY SCANNERS. THE POPULAR UBC 100XL HAND HELD HAS SOLD IN THOUSANDS, BUT IS NOW COMPLIMENTED BY THE UBC 70XCL POCKET SIZED HANDHELD. ALSO THE NEW COST EFFECTIVE UBC 50XL HANDHELD. SEE THE NEW MODELS IN OUR SHOWROOMS OR SEND A S.A.E. FOR DETAILS.

FROM £95.00 + carriage

RAYCOM

COMMUNICATIONS SYSTEMS LTD

TEL: 021-544 6767

SUMMER SPECIAL OFFERS

WHILE STOCKS LAST

Icom ICR7000 + Royal 1300	**£899.00**
Icom IC3200E 25W Dual Band Mobile	**£399.00**
BJ200 Mk2 Handheld AM/FM Scanner	**£199.50**
Sony ICF2001D SW Receiver plus Airband	**£289.00**
Sony ICF7600DS Super SW Receiver	**£199.00**

SCANNERS

YAESU FRG9600 from the company who specialises in fitting extra options, as supplied to Government departments and professional bodies. We also upgrade existing models, please call for more details, prices, delivery and information.

Yaesu FRG9600 Basic Model Improved 'S' Meter + Sens	**£465.00**
Yaesu FRG9600/RWC Mk2 60-950MHz 'N' Connector Fitted	**£495.00**
Yaesu FRG9600/RWC MK3 HF 100KHz-950MHz plus Mk2 Spec.	**£595.00**
Yaesu FRG9600/RWC Mk5 HF 50KHz-950MHz Active Mixer	**£625.00**
Yaesu PAL Video Unit for above	**£27.50**
Icom ICR7000 25M-2GHZ superb quality professional Rx	**£859.00**
Icom ICR7000/AH7000 Receiver plus Matching Discone	**£937.50**
Kenwood RZ 1 New 500kHz-950MHz. Wide and Narrow AM/FM	**POA**
Fox VHF-UHF Multi Function Mobile Scanner FM only	**£139.00**
Uniden-Bearcat UBC 50XL VHF-UHF 10ch. H/held Scanner	**£95.00**
Uniden-Bearcat UBC 70XL VHF-UHF 20ch. Miniature H/held	**£179.00**
Uniden-Bearcat UBC 100XL VHF-UHF-Airband H/held Scanner	**£189.00**
Uniden-Bearcat UBC 175XL VHF-UHF-Airband Desk-Top	**£175.00**
BJ200 Mk2 VHF-UHF-Airband-Military Airband H/held	**£199.50**
AOR 2002 25-550, 800-1300MHz Desk-Top/Mobile AM/FM	**£469.00**
Sony Air 7 Top Quality VHF-Airband Handheld Scanner	**£245.00**

Package deal on above Mk3/5 FRG9600 c/w AH7000 discone, G5RV, PA4 AC PSU, complete receiving station HF-UHF including delivery UK mainland. Add £100.00 to above price.

PACKAGE DEAL AVAILABLE ON ALL MAKES.

IF IT'S GOOD, WE STOCK IT!

A new concept in Amateur Radio . . . uniden 2830

It's here at last! A beautifully-made processor-controlled full feature 10w (20w PEP) multimode transceiver with LCD readout and all functions necessary to work DX with Sporadic E and in the forthcoming sunspot maxima and also for transverting to the VHF and UHF bands. Work out the facts . . . how much is a Two Metre Multimode? How much is the Uniden 2830 Ten Metre Multimode and a 2 metre transverter? With the Uniden 2830 you can have two bands for the price of one, with 10 watts on each band and all modes including CW. ★ S.A.E. for copy of Review.

10 metre band amateur transceiver

£279.00
£10.00 post and packing

Features

- ★ All modes, AM/FM/USB/LSB/CW
- ★ LCD readout of frequency/functions
- ★ CW with Sidetone
- ★ FM bandwidth compatible with VHF/UHF
- ★ 10Watts continuously variable o/p AM and FM
- ★ Scanning feature, up and down steps on mic.
- ★ Selectable frequency steps, 10kHz, 1kHz, 100Hz.
- ★ Ten metre band selectable in 500kHz steps
- ★ Build-in VSWR meter and protection circuit
- ★ Superb receiver sensitivity <.3uV FM

Just TEN of the many reasons for choosing the UNIDEN 2830

THIS PRODUCT IS EXCLUSIVE TO RAYCOM, WE ARE THE U.K. DISTRIBUTOR. WHOLESALE ENQUIRIES WELCOME

Matching transverters
2M transverter £169.00
6M transverter £189.00
Package Deal: 2M + 2830 ..... **£399.00** Post £10

HANDHELDS

* = Extended Receiver coverage available, call for details.

YAESU FT727R/FNB4A 2.5W (5W) DUAL BANDER. C/W CHRGR	**£395.00**
*YAESU FT23R/FBA10 2.5W (5W) 2MTRS	**£229.00**
*YAESU FT73R/FNB10 2.5W (5W) 70CMS C/W CHARGER	**£259.00**
*ICOM MICRO 2E 2.5W 2MTR HANDHELD WITH CHARGER	**£209.00**
CTE1600 (SAME AS ICOM IC2E) C/W NICAD CHARGER	**£179.00**

Many other types of handheld stocked, please enquire.

SHORT WAVE RECEIVERS

Yaesu FRG8800 Short Wave 100KHz-30MHz all Mode + Mem.	**£589.00**
Yaesu FRG8800/FRV8800 as above with VHF Conv. fitted	**£679.00**
Icom ICR-71 Top Grade Communications Receiver	**£799.00**
Sony PRO80 HF/VHF Handheld Scanner c/w accessories	**£345.00**
Sony 2001D Short Wave/Airband Receiver	at **£349.00**
Sony SW1 Micro Short Wave Receiver	**£249.00**

Many more makes and models in stock, PLEASE CALL FOR PRICES. DELIVERY COSTS and any advise or information, or send large SAE. (Insured post and packing £10.00. Carrier £12.50)

MOBILES

YAESU FT211RH 45W 2MTR MOBILE WITH FREE 1/4 WAVE ANT	**£299.00**
YAESU FT212RH NEW 45W 2MTR MOBILE DVS FEATURE OPT	**£349.00**
*ICOM IC28E 2MTR 25W MOBILE WITH FREE 5/8 ANTENNA	**£359.00**
Alinco Dual Band ALD-24E	**£445.00**
ICOM IC48E 70cm 25W	**£428.00**
ICOM IC3200 Dual Band 25W	**SPECIAL £399**

Compare our prices!

Many other types and makes stocked, please enquire

PORTABLES

FT290RMK2 2.5W MULTIMODE STANDARD ACCESSORIES	**£399.00**
FT290RMK2 2.5 WATT M/M AS ABOVE C/W NICADS CHRGR	**£425.00**
FT290RMK2/FL2025 (STD) WITH 25W LINEAR AMPLIFIER	**£489.00**
FT690RMK2 6MTR 2.5W MULTIMODE STANDARD ACCES.	**£399.00**
FT690RMK2 6MTR 2.5W M/M AS ABOVE C/W NICADS CH.	**£425.00**
FT790RMK2 NEW 70CM 2.5W MULTIMODE DUE OUT SOON	**£499.00**

ANTENNAS & ACCESSORIES

NOW AVAILABLE AT RAYCOM: CUSHCRAFT, BUTTERNUT, HY-GAIN ANTENNAS, JAYBEAM, TONNA, MET, HAM-M ROTATORS, Call for full details, prices, availability and delivery costs.

ICOM AH7000 SUPER 250-1300MHz DISCONE	**£79.50**
G5RV HALF SIZE HF ANTENNA ready to use	**£16.50**
G5RV FULL SIZE HF ANTENNA ready to use	**£18.50**
G8KW-TYPE 7.1MHz TRAP DIPOLE KIT SO239	**£24.50**
G8KW-TYPE as above for use with 75 OHM	**£23.50**
G8KW-TYPE 2X 7.1 TRAPS ONLY. LESS CABLE	**£9.95**
RAYCOM AIRBAND-VHF SIX ELEMENT DISCONE	**£12.50**
RAYCOM DISCONE VHF 60-600MHz 8E.SO239	**£29.50**
SUN KG209 SE2M 5/8 MOBILE TILT-OVER 259	**£14.50**
RAYCOM CAST GUTTERMOUNT C/W SO239/COAX	**£8.50**
GAMMA TWIN 2 METRE SLIM JIM KIT inc. instr.	**£14.50**
RAYCOM/RWC HB9CV 2 METRE 2E MINI BEAM	**£12.50**
RAYCOM/RWC HB9CV 70CM 2E MINI BEAM	**£8.95**

The above popular products POST FREE.
(UK mainland only)

YAESU FT 747GX

£649.00 including our FREE fitted MOD Board!

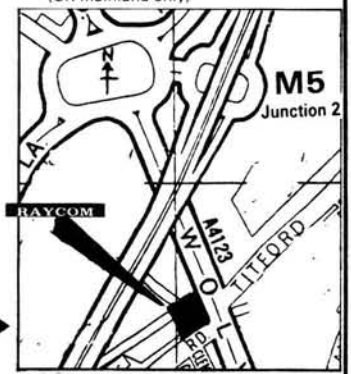
We improve the reciprocal mixing performance by up to 15dB which gives you receive performance of higher priced rigs! **Only available from Raycom, buy it elsewhere if you want SECOND BEST! YAESU IS STILL BEST VALUE FOR MONEY!**

ALL CURRENT YAESU AND ICOM HF RIGS STOCKED, CALL FOR A DEAL!

ROYAL 1300 WIDEBAND DISCONE

Following the huge success and popularity of the 25-1300MHz, wideband discone antenna – Icom AH 7000 & Welz – Diamond D109 with transmit facilities on VHF-UHF amateur bands, Raycom decided to persuade a UK manufacturer to make a "BRITISH COPY!" at a very competitive price!

COMPLETE WITH PROFESSIONAL CABLE & CONNECTORS AT ONLY £59.50
P&P £5.



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 →

Opening hours 9am-5.30pm 6 days, late nights Thursday & Friday till 7pm. We stay open later!

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.

Raycom credit card

NEW INFOLINE 0836 282228
available 5-9pm (weekdays only)

RAYCOM COMMUNICATION SYSTEMS LIMITED

FOR THE BEST IN AMATEUR RADIO

ORDERING INFORMATION

ALL PRODUCTS WE ADVERTISE ARE NORMAL STOCK ITEMS. OUR NEW MAIL ORDER DEPARTMENT CAN NOW 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 CHEQUES TO CLEAR. PLEASE CALL **BEFORE ORDERING** AND FOR MORE INFORMATION

PLEASE TEL: 021 544 6767

THROUGH YOUR CONTINUOUS AND VALUED CUSTOM, RAY WITHERS COMMUNICATIONS LTD. HAS MOVED AND EXPANDED TO ENABLE US TO OFFER YOU EVEN BETTER SERVICE AND PRICES - STILL WITH THE RAYCOM GUARANTEE, BEST EQUIPMENT, BEST SERVICE, BEST PRICES, BEST BACK-UP, AND PLENTY OF PARKING FACILITIES AND EASIER TO GET TO! WE NOW BOAST THE BEST CENTRAL FACILITIES IN THE COUNTRY, WHY NOT POP ALONG AND SEE THE LATEST TRANSCEIVERS, SHORTWAVE/SCANNING RECEIVERS AND ACCESSORIES? MOST OTHER PRODUCTS ADVERTISED IN THIS MAGAZINE ARE AVAILABLE AT RAYCOM, AND DON'T FORGET OUR EXCLUSIVE PRODUCTS AND MODIFICATIONS!

PW REVIEW

Alinco ALD-24E VHF/UHF Dual Band FM Transceiver

In this "user review", Ken Michaelson G3RDG gives his impressions of this 144/430MHz f.m. mobile transceiver.

The last piece of equipment that I reviewed made by Alinco Electronics Inc was the ALM-203E, a 144MHz hand-held, and it is interesting to come across this manufacturer again with a product that should prove very popular.

The ALD-24E is about the same physical size as a normal car radio and could, if the owner so wished, use the car radio position in the vehicle. In all my remarks, it must be remembered that the rig is really two units in one case with a built-in diplexer. The 144MHz (2m) band coverage uses VFO A, and the 430MHz (70cm) band uses VFO B. There are three rotary controls on the left-hand side of the front panel, two of them being concentric. The left-hand control turns in steps, and is called the main dial in the instruction manual. When using VFO A, turning this control changes the frequency in 12.5kHz steps, whereas when VFO B is used the stepping rate is 25kHz, but either band can be made to step at 12.5kHz or 25kHz rate, as the operator wishes. To the right of this knob are concentric controls for squelch and gain/on-off.

Below these two knobs are four small push-button switches controlling high/low transmit power (25/5 watts), up and down frequency stepping, and scan/priority. The scan button, which operates in both the normal v.f.o. mode and the memory mode, is self-explanatory, but when the priority button is used (by first pressing the "F" button) one can select a channel which will be sampled for 1 second every 6 seconds when a signal is heard, even though you are listening on another frequency.

When the Up or Down button is pressed once, the frequency is increased or decreased by one step, 12.5 or 25kHz as previously decided. Keeping the button depressed will change the frequency rapidly at about 20 steps per second. These buttons are also used for the selection of the 21 memory channels, when in the memory mode.

The right-hand side of the front panel contains eight more small push-button switches, arranged vertically in two banks. These are, in the right-hand column: Call 1/Call 2 (automatically calling up either memory channel 1 or 2); Memory write/Skip; Memory recall/Offset frequency check; and VFO A, VFO B/ Channel spacing. In the left-hand column the buttons control: Tone; Offset/Write; Lock/Dual; and "F" (function).

Above this group of buttons are three l.e.d.s indicating whether the rig is in the transmit or receive (unsquelched) mode, and whether the "F" button has been depressed to select the secondary operations indicated in red lettering below seven of the push-buttons. The fist microphone supplied with the transceiver is an electret type, and has the now standard Up and Down buttons for altering the operating frequency.

On the top surface of the unit are three miniature slide switches. The first of these, marked BZ, switches the beep on or off. The second, marked Time, controls the scanning. If it is in the "S" position the rig resumes scanning immediately after finding a station, but when in the "L" position it will pause for four seconds before continuing the scanning routine. I found this facility very useful, as in the "L" position it gave me an opportunity to hear what was going on during scanning. The third switch selects the scanning speed, either 4 or 20 channels per second. Finally, adjacent to this group of switches is a small hole marked Reset. If one gets the micro-

★ MAKER'S SPECIFICATIONS

GENERAL

Frequency range:	144–146MHz 430–450MHz (see text)
Channel steps:	12.5/25kHz (user selectable)
Repeater shift:	±600kHz (2m band) ±5MHz (70cm band)
Emission mode:	F3E (f.m.)
Antenna impedance:	50Ω unbalanced
Supply requirements:	13.8V d.c. Transmit: 5A (high power) 2.5A (low power) Receive: 300mA (squelched)
Dimensions:	140W x 50H x 164D mm
Weight:	1.2kg (2.64lb) approx.

RECEIVER

Circuit type:	Double superhet (IF1 21.6MHz, IF2 455kHz)
Sensitivity (for 12dB SINAD):	<0.16μV
Selectivity (–6/60dB):	>6/12kHz
Audio output:	>2W (8Ω, 10% t.h.d.)

TRANSMITTER

RF output power:	5W/25W into 50Ω
Maximum deviation:	±5kHz
Spurious emissions:	>60dB below carrier

processor tied up in a knot, or wants to start afresh with new memories, a small screwdriver may be inserted into the hole and the button pressed (with the power on), to clear all the memory data.

The 15-page instruction manual is well presented and includes both a full circuit diagram and a block diagram. There are occasional mis-spellings but the information is clear enough.

The rear panel of the rig has the usual 3.5mm jack for an external speaker. The internal speaker is disconnected when a plug is inserted. The remaining external connections for power, antenna and microphone are in the form of flying leads. This is, in my view, a most excellent arrangement. My own rig, a Yaesu FT-480R, has sockets for antenna and power projecting through the rear panel, and what a fiddle it can be to get them correctly threaded when room is very tight in a car installation. The Alinco arrangement simplifies the whole job, having an SO239 socket at the end of the antenna lead and an 8-pin socket for the microphone lead. The power lead has a non-reversible socket.

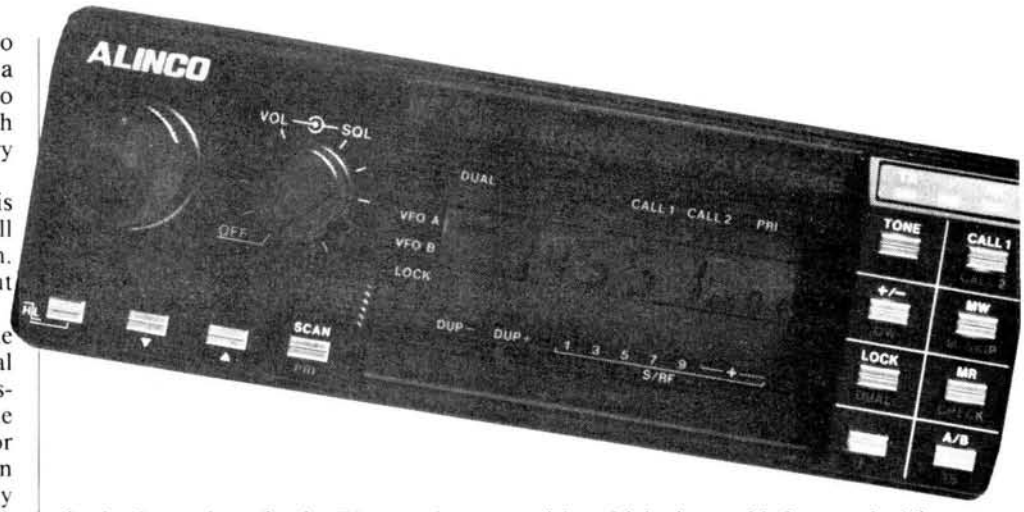
Installation

Installation into the car was simplicity itself, using the supplied "U"-shaped mobile mounting bracket screwed to the underside of the dashboard towards the passenger's side. The heavy-duty power lead, which has fuses in both conductors, was passed through the engine compartment bulkhead and connected directly to the battery terminals.

The antenna used for the review was a Diamond DP-EL770H dual-band whip with a quoted gain of 3.0dB at 144MHz and 5.5dB at 430MHz. It was attached to the roof of the car by means of a SAGMS magnetic mount, which had a length of coaxial cable connected to it terminating in a PL259 plug. The feeder was fed through the top of the rear window and under the carpet to the front of the car. Fortunately, I did not suffer from any noticeable interference from the car electrics on either band.

The rig was used on a journey up to Cumbria, where I spent a few days. A number of repeaters were accessed without difficulty on both bands, including GB3AS and GB3EV on 2m, with GB3CA and GB3LA on 70cm. Since the rig took only 5 amps for full power transmit, it was possible to operate "static mobile" on a number of occasions while the XYL admired the fine views of the countryside and tried her hand at painting some of them. It was surprising, though, to be able to access these and other repeaters using the low power position, giving an output of 5 watts. This draws only 2.5 amps from the battery and allowed me to operate for a longer period while parked, without worrying about flattening the car battery.

The loudspeaker is fitted into the bottom plate and, in my opinion, this is the best place for it. The received signal is tailored to give the clearest speech quality and no trouble was experienced in following the other stations' remarks.



Memories

There are 21 memories available in the rig, and as previously mentioned, Call 1 and Call 2 can instantly call up memories Nos. 1 and 2. This is very convenient when two known repeaters are programmed into the memories, because no adjustment has to be made beyond the pressing of a button.

Frequencies can be written into memories very easily. Pressing the "MR" (memory recall) button causes a memory channel number to appear in the display. Choice of a particular channel (apart from memories 1 and 2, which are reserved for Call 1 and Call 2) is then made by pressing the Up or Down buttons. The frequency required is then selected by the use of either the main dial or the Up and Down buttons. Having done this, the frequency is recorded in the memory channel by pressing the "MW" (memory write) button.

The repeater access tone can only be sent by pressing the Tone button on the right-hand side of the front panel. I consider this a disadvantage as it was, for me at least, an awkward thing to do whilst driving the car. Other mobile rigs seem to have a switch which allows the tone to be sent when the p.t.t. switch on the microphone is operated initially, and then switched off until the next time an access tone is required. I did not use a boom microphone; it would certainly have made operating easier when on the move.

Cross-band

The ALD-24E is capable of cross-band duplex working, using VFO A and VFO B together. To operate in this mode one would set one of the v.f.o.s to the desired transmit frequency, then pressing the "A/B" button access the second v.f.o. to set the receive frequency. Pressing the "F" button followed by Dual enables you to transmit on the first frequency and receive on the second. To invert these two settings you just press the "A/B" button again. I did not use this facility myself for an actual QSO, but I did check the ease with which it could be used. The instruction manual comments that it is inadvisable to have the transmit and receive frequencies in multiples of three, as this spacing would result in severe loss of receive sensitivity.

The back-lit liquid crystal display is excellent in normal daylight, and certainly caused no dazzle when used at night. The tens and hundreds digits are displayed in smaller numerals than the units and decimal readings of frequency, and the stepping rate is shown in yet smaller numerals. Amongst other readings shown in the l.c.d. area is a combined signal strength/r.f. output display in the form of a series of diagonal lines of increasing height.

I think that it is quite extraordinary that a maufacturer is able to get what amounts to two rigs into one box no larger than a car radio, and yet have the number of facilities available. As far as I was concerned, the rig performed excellently, the only point about which I would quibble is the fact that, as I said previously, the repeater access tone cannot be operated by the p.t.t. switch on the microphone.

The sensitivity was very good using the dual-band antenna mounted on the centre of the car roof, and the two levels of power output gave a good choice. It seems to me that at its price, bearing in mind that it has a built-in diplexer, the rig is a must for anyone requiring a dual-bander.

In its standard form, the transceiver covers 144–146MHz and 430–440MHz. If requested by the customer, the v.h.f. section can be modified to provide transmit coverage from 134–160MHz and receiver coverage from 134–168MHz. For an additional £20 inclusive, to cover labour costs, a more complex modification can be carried out which has the effect of giving receiver coverage on the u.h.f. section from 430–453MHz, at the same time extending the transmit coverage from 430 to 450MHz.

The cost of the ALD-24E is £449, the Diamond EL770H dual-band mobile antenna £30, and the SAGMS magmount £19. All prices include VAT. Thanks are due to **Waters and Stanton Electronics, 18–20 Main Road, Hockley, Essex SS5 4QS, telephone 0702 206835,** for the loan of the review transceiver and antenna. ***PW***

Crops and Coils Part 2

A Schoolboy Radio Experimenter in the late 1930's

The "bread board" method of construction provided an excellent introduction to radio, and by using components salvaged from old domestic receivers, the cost was negligible. The only real expense was for batteries, but drain could be minimised by using a small triode valve in the output stage to drive a pair of headphones. Audio gain contributed virtually nothing to the sensitivity of a regenerative detector. Indeed, world wide reception was possible with an 0V0 receiver by simply connecting a pair of high impedance phones to the detector valve, says George Pickworth.

I had now progressed to specialised short wave components and metal chassis, but still used battery valves with 2 volt heaters, or filaments as they were called. The advantage of battery valves over mains valves of that period, which used a.c. for their heater current, was that they avoided the problems of mains hum. Moreover, they generated virtually no heat to cause the receiver to "drift". This could be a real problem with mains type valves.

High frequency (h.f.) pentode valves were highly efficient and it is doubtful if they could have been improved upon as a regenerative detector. Furthermore, being directly heated, battery valves became operational almost as soon as they were switched on.

Like many other schoolboy experimenters, my objective was to develop the "ultimate" regenerative short wave receiver and believed good design and engineering was the key to success. This was balanced by alternative farm projects as well as "extra-mural" interests, and favourite was poaching pheasants in the surrounding woodland. Indeed, it was these interests that made it possible to buy components for my radio projects.

Factory surplus chassis, with many components still in place, were sometimes available for a few shillings and could save the constructor a lot of work. But they were unattractive, and performance would almost certainly be inferior to a receiver built on a custom made chassis. So I made my own, using heavy gauge metal to give strength and stability.

They were formed by clamping a metal sheet between two blocks of hardwood in the workshop vice, then bending to shape, often with the help of a farm worker. Holes for valve and plug-in coil sockets, were made by first boring a ring of small holes, using a hand-drill, knocking out the centre and finally, filing to a perfect finish. When all the holes had been cut, the chassis was rubbed down with emery cloth and treated with a coat of aluminium lacquer.

As a result of my poaching activities, I was able to buy a famous Raymart

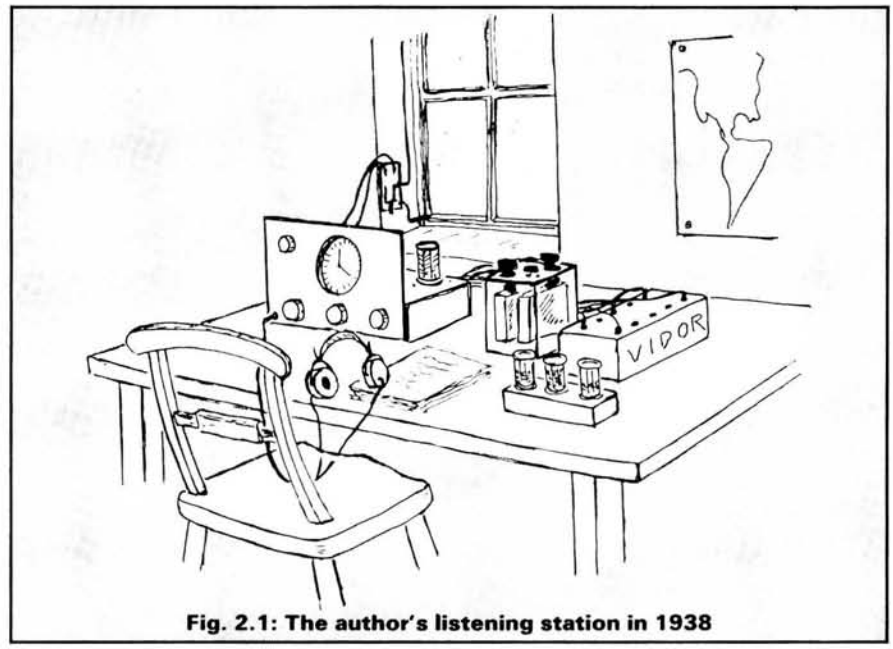


Fig. 2.1: The author's listening station in 1938

Logging Dial, considered the ultimate by many experimenters. This was mated to an Eddystone 0.00016μF tuning condenser, and a set of 4 Raymart 6-pin tuning coils, covering from 1.6 to about 25MHz. Regeneration increased the *Q* of the coils to a point where selectivity was very high, so a good slow motion dial was crucial.

These coils had an aperiodic antenna coupling coil in addition to the tuning and regeneration windings. To complete the kit of specialised components, an Eddystone regeneration condenser, r.f. choke and various high grade knobs were acquired.

The final result was a highly sensitive and stable receiver, capable of world-wide reception, but as with all regenerative receivers without an r.f. stage, the antenna loaded the detector to such an extent that regeneration ceased whenever its natural resonance corresponded to the frequency to which the receiver was tuned.

A simple but effective "cure" was to insert a small variable condenser in the antenna lead, and tune it to another frequency. Nonetheless, it was annoying because shifting resonance from one place made it turn up in another. An r.f. stage was obviously a more elegant approach.

The law regarding regeneration, introduced when domestic medium wave sets used this technique, made it clear that when regeneration was adjustable, it must be preceded by an r.f. stage. This was understandable on the medium wave bands where numerous receivers were in close proximity to each other, but short wave experimenters were few and far apart. For most people, short wave reception was only possible by using an 0V1 regenerative receiver, and was probably the reason why the law was not enforced.

Alignment

As the short wave bands extended over a range approaching 30MHz, it had to be sub-divided in order to obtain acceptable resolution, and the only feasible approach for experimenters was to use plug-in tuning coils. But they were not easy to align when using a ganged r.f. and detector tuning condenser. A common approach was to fit an additional trimmer condenser across the r.f. stage, and adjust this from the panel.

In common with other many experi-

menters, my first approach was to use an untuned r.f. stage, as it required little more than a second high gain pentode, and a carefully selected r.f. choke. This eliminated the "blind spots" caused by antenna resonance, but there was virtually no increase in the receiver's sensitivity. However, experimenters claimed that a tuned stage was far superior, and the higher the *Q* of the r.f. coil, the more efficiently it accepted energy from the antenna. Could there still be a message here to designers of modern receivers with broad band r.f. stages?

A matching set of r.f. tuning coils, and a second tuning condenser was therefore acquired so that it could be converted to a tuned stage. Again, to avoid alignment problems, it was tuned independently of the detector, which even then seemed retrogressive. Nonetheless, this design was simple, effective and popular with experimenters. One could hardly imagine that independently tuned r.f. stages would come back into use in the 1980's!

The problem with this arrangement was that scanning across the bands required "three hands". One for tuning the detector, one to keep the r.f. stage in step, and last but far from least, one to control regeneration. The logical approach was to re-design the stage, so as to operate in the untuned mode when scanning, and in the tuned mode when searching a narrow sector of band. RF tuning was not critical, and once set to approximately the same frequency as the detector, only needed to be "peaked" for maximum signal strength.

To those unfamiliar with sensitive regenerative receivers, the regeneration control was first advanced to a point where a "hiss" indicated that the valve was approaching its most sensitive state. Then the band was scanned, and if a signal was present, it brought the valve into actual oscillation with the characteristic "howl". AM signals were resolved by adjusting the tuning condenser to zero-beat, and backing off the regeneration control until the sound became intelligible.

To resolve c.w., (on-off transmission) the receiver was slightly detuned, and the regeneration backed off to a point that gave a pleasant beat note. Needless to say, the two controls had to be adjusted in complete unison, this is why it was so important that the controls were placed in the most convenient position. It could be compared to the throttle and clutch of a motor cycle. I used my right hand for tuning, and my left for adjusting the regeneration. Both controls were placed low so that I could rest my wrists on the table.

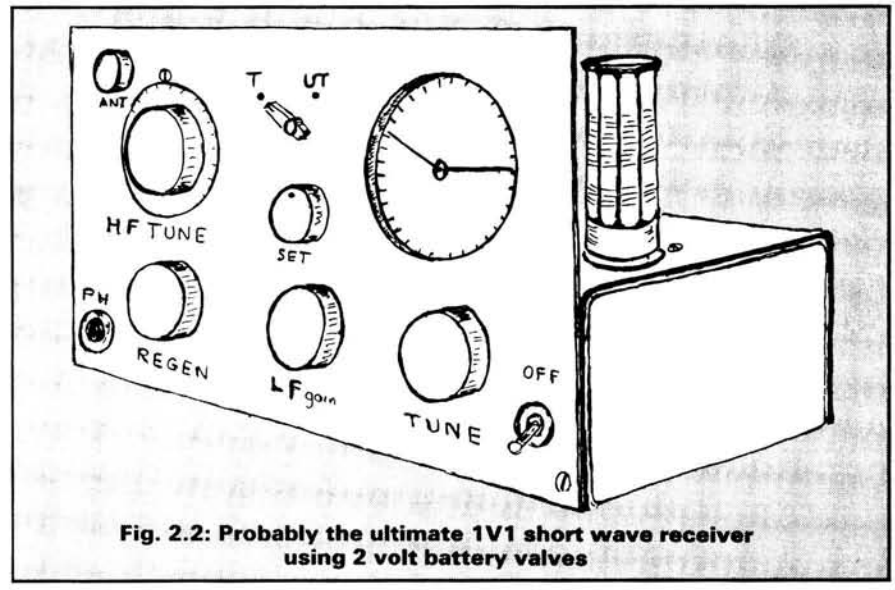


Fig. 2.2: Probably the ultimate 1V1 short wave receiver using 2 volt battery valves

Antennas

The advantage of living on a farm, was that there was very little man-made electrical interference, and plenty of space for my antenna, or aerial as it was generally called. The only criterion was that it should be as long and as high as possible. Mine was about 31m long, strung from the apex of the farm house to the apex of the barn. Erection was no problem as we had ladders, and the farm workers were only too pleased to give me a hand.

The receiver had to be close to the window so that the antenna lead-in was as short as possible. To improve coupling with the r.f. tuning coil, a small variable condenser was inserted in series with the lead-in, so that the antenna system could be tuned to present a fairly high impedance to the receiver. This worked well, probably because the tuning coils were designed to match antennas with a wide range of impedances, although their nominal impedance was about 300 ohms.

The Farm House

Both my Eddystone 358 receiver of 1944 vintage, and my Eddystone 680 of about 1960 vintage, still had inputs with a nominal impedance of 300 ohms, which could account for why they also worked well over a wide frequency range with simple random length antennas. Antenna tuners made little or no improvement, in fact, there was often attenuation. But of course, this arrangement doesn't work so well with modern receivers, and is why a.t.u.s have become necessary.

The farm house was quite large, so I was fortunate to have a small room to myself as my "den". The problem was that this was upstairs and created difficulties with earth systems. Radio books stressed the importance of short earth leads, but seemed to forget that most short wave experimenters had their equipment upstairs in their bedrooms.

The only alternative to a long earth lead from an upstairs room, was a counterpoise system. I tried one, but it gave no improvement on the earth lead which was perfectly satisfactory with a long wire antenna. However, I ultimately replaced the long wire with a tuned dipole connected to the receiver, with an open feeder, using Eddystone transposition blocks which "twisted" the feeder to minimise extraneous signals.

Unique

Each receiver was a unique "animal" needing a close relationship with it's owner. This was lost with factory made sets and accelerated its demise. Unfortunately, it was never designed to resolve side band transmissions, but having said that, regenerative receivers could be made to operate direct conversion mode, as the previous generation of experimenters had discovered when using this type of receiver on the medium wave bands.

I could not measure the sensitivity of my regenerative receivers, but subjectively comparing them with modern receivers, I am convinced that in terms of sensitivity, they could hold their own with many present day receivers. One day, I plan to make a replica, and measure it with modern equipment. In the meantime, it could be an interesting exercise for readers to figure out just how the regenerative detector worked.

The story continues in Part 3 with Measurements, Mains Eliminators and Battery Charges.

Modular VHF Monitor – Design Variations

In PW *April 1988, the Rev G. C. Dobbs G3RJV gave details of a very low cost receiver using easily obtained surplus modules. Following this popular design R. Wander G4RPS has come up with some interesting variations on the theme.*

After the Toko tuner head had been modified, as described in the original article, the unit would tune over the range 120MHz to 150MHz. The slow motion drive fitted to the tuner was more than adequate for tuning in to the wideband signals found on Band II, the original coverage of the module. However, it proves less useful when tuning, for instance, across the 144MHz amateur band. The entire 144MHz to 146MHz range is covered in approximately 36 degrees of dial rotation, making fine tuning very difficult. Fortunately the unit already contains a varicap diode D101 intended originally for a.f.c. (automatic frequency control).

To provide a "fine tune" control all we need to do is apply a low variable voltage to pin 5 of the module. This is the unused pin between the 0V connection and the p.c.b. edge. In order to obtain a low variable voltage, a fixed resistor (R1) is used in conjunction with a variable potentiometer (R2), placed between earth and the 9V supply rail, as shown in Fig. 1.

The values are not particularly critical, those shown give a reasonably fine control.

In use, set R2 at mid-travel, tune through a signal with the original tuning control, and then bring it precisely on tune with the new fine tuning control.

Receiving Other Modes

The original receiver uses a wideband i.f. and f.m. demodulator. As you may already be aware, all aviation traffic is amplitude modulated (a.m.), and so are a lot of other services. While the original demodulator seems to cope well with both f.m. and a.m., you may wish to narrow the i.f. bandwidth down. You may even be interested in demodulating amateur single sideband (s.s.b.) transmission.

If you have a general coverage receiver use the tuner head only. Modify and connect the tuner as described in the original article. Next tune your general coverage receiver to 10.7MHz and feed the i.f. output from the tuner module into the receiver's antenna socket. You have now got a ridiculously cheap v.h.f. converter. To give even finer tuning on s.s.b. signals the general coverage receiver can be tuned around the 10.7MHz point.

Incidentally the unit inverts s.s.b. signals, so upper sideband signals will need to be resolved on the lower sideband on the main receiver. If your receiver doesn't have an f.m. demodulator then the signal can be slope-detected on the a.m. demodulator, by detuning slightly to one side of the signal.

Simple Band Monitor

Sporadic E propagation on 144MHz occurs suddenly, is not predictable, and gives amazing signal strengths. Whilst working on other bands, say 50MHz, it would be useful to have a visual display of the activity on the 144MHz band. It could help in catching a few of those elusive openings.

Many amateurs and electronics enthsiasts will have an oscilloscope in the shack. The chances are that it will

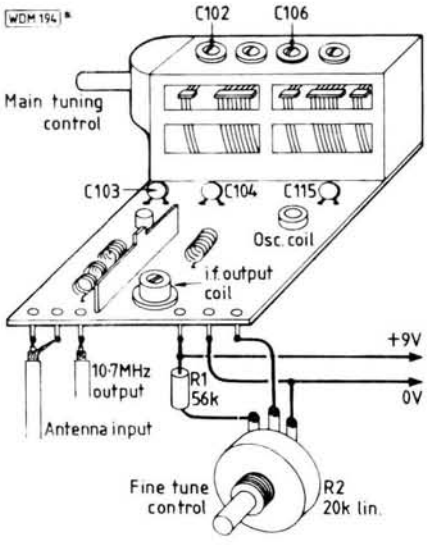


Fig. 1: Additional circuitry to give the original receiver a fine tuning control

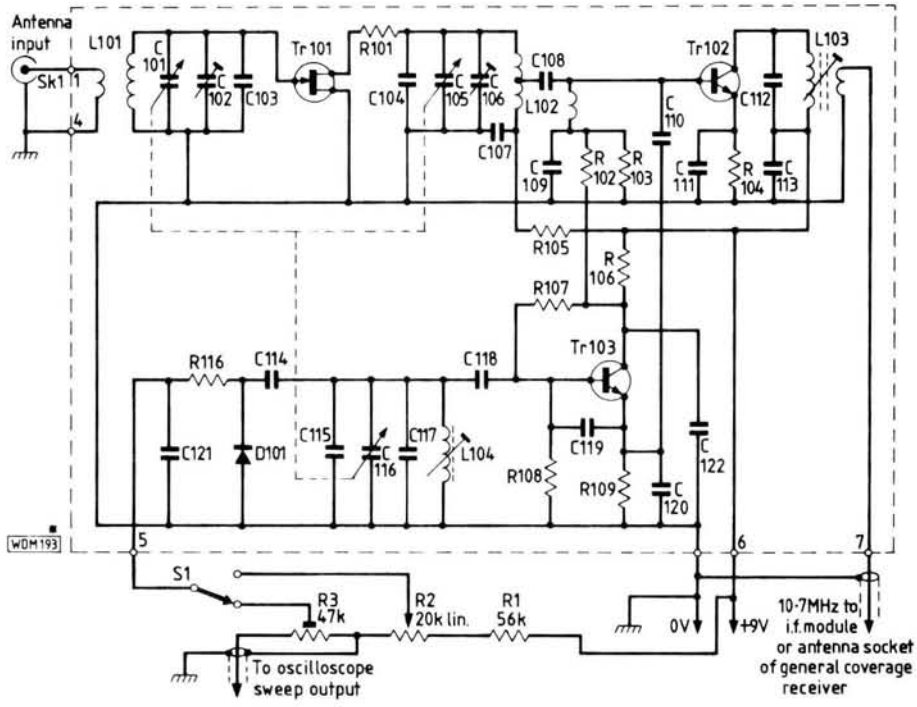


Fig. 2: Additional circuitry for spectrum scanning and fine tuning ▶

be unused for the most part, because either it's uncalibrated or the h.f. response is limited to audio frequencies. But by linking up the tuner head and your general coverage receiver to the oscilloscope you can make a useful 144MHz spectrum monitor. All that is required is to take a lead from either the tape auxiliary socket or headphone jack to the oscilloscope vertical input. Then with the converter switched on but no signal being received, set the oscilloscope vertical gain control to a level where the background noise is just showing on the trace. Next adjust the horizontal scan speed to a point where the trace flicker almost disappears.

If we now make a connection from the horizontal sweep output of the oscilloscope to the varicap diode in the tuner head, the ramp voltage from this output will sweep the tuner across a range of frequencies, preset by the main tuning control. In practice only a small proportion of the available sweep voltage is needed so a preset potentiometer (R3) is used to set the scan frequency range. To cover 144.1MHz to 144.4MHz the pot only needs to be about 10 degrees round from the earthy end.

Once set up as in Fig. 3, any signals that appear in the passband of the receiver will be displayed as a "blip" on the oscilloscope trace. The "blip" is caused by brief bursts of audio from the receiver as the tuner passes through the appropriate frequency. The set-up shown in Fig. 3, works amazingly well considering its simplicity. Switch (S1) is to change from "Scan" to "Manual" tuning, this completes the system, as shown in Fig. 2.

Setting Up

A small 144MHz hand-portable transmitter, set to low power and run into a dummy load is ideal for calibrating the system. Set the transmitter to 144.3MHz, then using the main tuning control identify the "blip" and tune it to mid-screen on the oscilloscope. Next retune the transmitter to the desired scan limits and identify them on the screen, then adjust the preset (R3) to bring the scan limits to the screen edges.

The author's oscilloscope screen was fitted with a horizontal strip of white card, which when calibrated forms a frequency scale. This allows a quick visual frequency check on any likely looking signals that may appear, enabling them to be found quickly on the main 144MHz transceiver. Remember to leave R2 in its mid position, so when the system is switched to manual tuning the "fine tune" control need only be rocked from side to side to peak the signal.

Automatic Gain Control

The main problem encountered is with strong local signals which cause the main receiver's automatic gain control (a.g.c.) to operate. This causes all other signals on the band to be reduced in signal strength. This effect is particularly marked if the a.g.c. has a long recovery time. When using the band scanner it is best, if possible, to disable the main receiver's a.g.c. system. It may be found that it is worth experimenting with the receiver's various modes of operation. The author found the best mode to use on his Trio R-600 receiver was c.w.

Unfortunately, due to the incredible popularity of the original project, all known stocks of the Toko tuner heads have now been exhausted. The electronic tuning offered by the varicap diode in the Toko tuner head may be added to other types of tuner, with a suitable i.f. output frequency. All that needs to be done is to identify the local oscillator of the tuner and to add a varicap diode and isolating capacitor to the oscillator tank circuit. The results should be similar to those obtained when using the Toko tuner. The idea is simple, cheap and obviously has limitations but it does work. It's quite amusing watching the aircraft band, and active channels can be very quickly identified.

Exact construction details are not given, as layout is not critical. A small piece of tag strip combined with switch terminals form the basis of a hard wired system. Once the tuner has been modified it is advisable to replace its screening can. **PW**

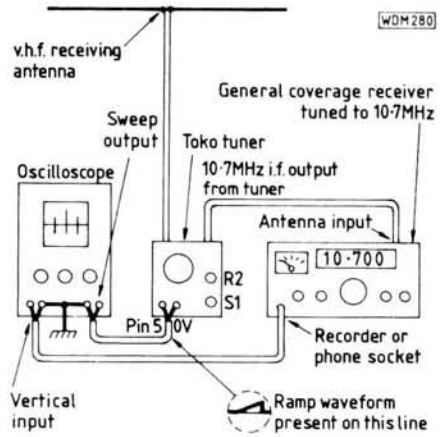


Fig. 3: General layout of equipment for using a tuner head with oscilloscope and general coverage receiver

Ideas

For the more adventurous among you, it might be worthwhile applying some of the ideas shown in this article to TV tuners. These are tuned completely by varicap diodes, in the front end and local oscillator stages. They are not so adaptable, at first sight, as the Toko module, as most TV tuners have a centre intermediate frequency (i.f.) of 35MHz. However, there may be enough output at 29MHz to enable your general coverage receiver to act as a tunable i.f.

There are a number of foreign TV tuners available on the surplus market, for example the F400 type tuner. These were made originally for an export version of Thorn TX10 TV. This particular tuner covers frequencies from 50MHz right through to 850MHz, minus a few gaps. They are available for £3.00 plus VAT and £1 P&P, with data and circuit diagram from: Sendz Components, 63 Bishopsteignton, Shoeburyness, Essex SS3 8AF. Tel: 0702 332992.

Also see the Scanning column in *Short Wave Magazine* August 1988.

THE NEW UK AMATEUR LICENCE
EFFECTIVE 1 JANUARY 1989
THE FINAL DRAFT—IN FULL

The Annual Validation Document

VALIDATION DOCUMENT

UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND,
THE CHANNEL ISLANDS AND THE ISLE OF MAN

WIRELESS TELEGRAPHY ACT 1949

AMATEUR RADIO LICENCE (.....) CEPT EQUIVALENT LICENCE CLASS .....

(a) Licensee's Name (b) Call Sign .....

.....

(c) Mailing Address (d) Main Station Address

....
....
....
....
....

(e) Date for Renewal .....

This licence (the "Licence") granted on ..... ("Date of Issue") by the Secretary of State for Trade and Industry to the Licensee named in paragraph (a) above under section 1 of the Wireless Telegraphy Act 1949 authorises the Licensee to establish, instal and use sending and receiving apparatus for wireless telegraphy at the Station [as defined in sub-clause 1(10)] in accordance with the Terms and Limitations Booklet BR68 which is incorporated into and forms a part of this Licence.

This Licence also authorises the Licensee to operate in countries which have implemented CEPT Recommendation T/R 61-01 in accordance with clause 11 of Terms and Limitations Booklet BR68.

ISSUED ON BEHALF OF THE SECRETARY OF STATE FOR TRADE AND INDUSTRY
...../...../.....
The Validation Document is issued upon receipt of the current licence fee.

Other Countries which have implemented CEPT Recommendation T/R 61-01

(For guidance see note (y) to Terms and Limitations Booklet BR68)

The Terms and Limitations Booklet BR68

AMATEUR RADIO LICENCE (A) OR (B)
TERMS AND LIMITATIONS BOOKLET BR68

These terms and limitations shall be read as an integral part of the Amateur Radio Licence (A) or (B).

CONDITIONS OF USE

Purpose

1. (1) The Licensee shall use the Station for the purpose of self-training in communication by wireless telegraphy, which use (without limiting the generality of the foregoing) includes technical investigations.

(2) The Licensee may use or permit the use of the Station, as part of his self-training in communication by wireless telegraphy, during any operation conducted by a User Service [defined in sub-clause 12(1)(q)] or during any exercise relating to such an operation for the purpose of sending Messages on behalf of the User Service to other licensed amateur stations.

(3) Notwithstanding sub-clauses 1(1) and 1(4)(a) of this Licence and subject to the limitations in paragraphs 2, 3, 4, 5, 6 and 8 of Resolution 640 of the International Telecommunication Union, the Licensee may use the following frequency bands to meet the needs of international disaster communications: 3.5 MHz to 3.8 MHz, 7.0 MHz to 7.1 MHz, 10.10 MHz to 10.15 MHz, 14.00 MHz to 14.35 MHz, 18.068 MHz to 18.168 MHz, 21.00 MHz to 21.45 MHz, 24.89 MHz to 24.99 MHz and 144 MHz to 146 MHz.

Messages

(4) The Licensee shall address Messages only to other licensed amateurs or the stations of licensed amateurs and shall send only:
(a) Messages relating to technical investigations or remarks of a personal character; or
(b) Signals (not encyphered) which form part of, or relate to, the transmission of Messages.

(5) "Messages" and "Signals" include communication by:
(a) telephony;
(b) morse telegraphy;
(c) visual communications (which include slow scan television (SSTV), fast scan television (FSTV) and facsimile); and
(d) digital communications (which include data, radio teletype (RTTY) and amateur teleprinting over radio (AMTOR)).

(6) The Licensee may use codes and abbreviations for communications as long as they do not obscure the meaning of, but only facilitate, the communications.

(7) The Licensee shall not send Messages (other than initial calls) for general reception by licensed amateurs, but shall send Messages only to:
(a) individual licensed amateurs; or
(b) groups of licensed amateurs as long as communication is first established separately with at least one licensed amateur in any such group.

(8) The Licensee shall not transmit such material as music, public broadcasts or speeches.

Location

(9) Subject to clause 11, the Licensee shall operate the Station only:
(a) at the Mair Station Address ("Main Station Address" means the main station address of the Licensee set forth in paragraph (d) of the Validation Document);
(b) at a Temporary Location ("Temporary Location" means a location, other than the Main Station Address, in the United Kingdom, and in a fixed position);
(c) while Mobile ("Mobile" means located in the United Kingdom in any vehicle, as a pedestrian or on any Vessel in Inland Waters); or
(d) while Maritime Mobile ("Maritime Mobile" means located on any Vessel At Sea).

(10) "Station" means the station of the Licensee at the Main Station Address, a Temporary Location or while Mobile or Maritime Mobile, as the case may be.

(11) The Licensee shall give prior written notice to the Secretary of State at the address specified in note (a) to this Booklet of any change in the Main Station Address (or mailing address, if different).

Standard Frequency Service

(12) The Licensee may use the Station for the reception of transmissions in the Standard Frequency Service (a radiocommunication service for scientific, technical and other purposes, providing the transmission of specific frequencies of stated high precision, intended for general reception).

LIMITATIONS ON USE

2. (1) Subject to other, more specific, terms in this Licence, the Licensee shall only use:
(a) the frequency bands specified in the first column of the Schedule to this Licence subject to the limitations set out in the second and third columns of the Schedule;
(b) a power relating to such frequency bands not exceeding the maximum specified in the fourth and fifth columns of the Schedule; and
(c) the types of transmissions specified in the sixth column of the Schedule.

(2) If the Licence is an Amateur Radio Licence (B), then the Licensee:
(a) shall transmit only in the frequency bands above 30 MHz specified in the first column of the Schedule;
(b) may receive Messages on the frequency bands below 30 MHz listed in the first column of the Schedule as long as he transmits only in the bands above 30 MHz specified in the first column of the Schedule.

(3) The Licensee may receive Messages from an overseas amateur on a frequency band not specified in the first column of the Schedule as long as the Licensee transmits only in a band specified in the first column of the Schedule which is authorised under sub-clause 2(1) or (2).

Unattended Operation

(4) Subject to sub-clause 2(5), the Licensee may conduct Unattended Operations ("Unattended Operation" means the operation of the Station when unattended by the Licensee) only:
(a) of a beacon:
(i) in the frequency bands including and above 70 MHz specified in the first column of the Schedule (except the bands 144 MHz to 146 MHz, 430 MHz to 435 MHz, 438 MHz to 440MHz, 1240 MHz to 1325 MHz and 24050 MHz to 24250 MHz and the sub-bands 435.0 MHz to 436.6 MHz, 436.8 MHz to 438.0 MHz, 10250 MHz to 10270 MHz and 10300 MHz to 10400 MHz), with a maximum power of 14 dBW erp carrier or pep, or

(ii) for the purpose of direction finding competitions, in the frequency bands 28.0 MHz to 29.7 MHz (when the Licensee is operating under an Amateur Radio Licence (A)) or 144 MHz to 146 MHz, with a maximum power of 14 dBW erp carrier or pep

which is capable of transmitting the call sign of the Licensee periodically (in accordance with clause 7) and capable of being switched off within two hours of a demand to close down given by a person authorised by the Secretary of State;
(b) of a low power device to control apparatus at the Main Station Address or a Temporary Location by remote control, in the frequency bands including and above 70 MHz (except the bands 144 MHz to 146MHz, 430 MHz to 435MHz, 438 MHz to 440 MHz, 1240 MHz to 1325 MHz and 24050 MHz to 24250 MHz and the sub-bands 435.0 MHz to 436.6MHz, 436.8 MHz to 438.0MHz, 10250 MHz to 10270MHz and 10300 MHz to 10400 MHz) specified in the first column of the Schedule, with a maximum power of -20 dBW erp carrier or pep, in such a way that no electromagnetic energy capable of reception by any station or apparatus outside the curtilage of the premises in which the Station is situated is emitted from the Station; or
(c) by digital communications at the Main Station Address or at a Temporary Location notified in accordance with sub-clause 7(3)(b):
(i) in the frequency band 50 MHz to 51 MHz, with a maximum power of 10dBW erp carrier or pep, or

(ii) in the frequency bands including and above 144 MHz specified in the first column of the Schedule (except the bands 430 MHz to 435 MHz, 438 MHz to 440 MHz, 1240 MHz to 1325 MHz and 24050 MHz to 24250 MHz and the sub-bands 435.0 MHz to 436.6MHz, 436.8 MHz to 438.0 MHz, 10250 MHz to 10270 MHz and 10300 MHz to 10400 MHz) with a maximum power of 14 dBW erp carrier or pep.

(5) The Licensee shall not conduct the Unattended Operation of a beacon unless he has given at least 7 days' written notice of the location (within 5 km), period of operation, frequency, power (dBW), identity of other users of wireless telegraphy who share the site and shut down procedures of the beacon to the Manager of the Radio Investigation Service office in whose district the operation is to take place. The Manager may, before the commencement of operation of the beacon, prohibit the Unattended Operation of the beacon or allow the operation on compliance with the conditions which he may specify.

(6) The Licensee is not required to log the operation of a low power device under sub-clause 2(4)(b), although he shall log the operation of the Station in accordance with clause 6.

Pulse Emissions

(7) The Licensee shall not use pulse emissions:
(a) on frequency bands below 1000 MHz;
(b) with a mean power which exceeds the carrier power; or
(c) with a peak power which exceeds the pep.

Operators

(8) The Licensee shall operate or permit the operation of the Station only under the terms and limitations of this Licence and the Station shall be operated only:
(a) by the Licensee personally (except in the case of Unattended Operations under sub-clause 2(4)); or
(b) in the presence of and under the direct supervision of the Licensee:
(i) by a person who holds a current United Kingdom Amateur Radio Licence,
(ii) by a person who holds a Radio Amateurs' Examination Certificate issued by the City and Guilds of London Institute or an Amateur Radio Certificate issued by the Secretary of State,
(iii) by a CEPT Amateur visiting the United Kingdom who is operating in accordance with clause 10, or
(iv) by a representative of a User Service in accordance with sub-clause 1(2).

(9) The Licensee may permit any person to type the Message of the Licensee for transmission by the Licensee from the Station.

Vessels

(10) On a Vessel, the Licensee shall:
(a) instal, use or make changes to the Station only with the written permission of the Vessel's master; and
(b) observe radio silence on the advice of the Vessel's master.

(11) When on a Vessel in international waters, the Licensee shall use only those frequency bands which, in accordance with the Radio Regulations, have an allocation to the amateur service in the International Telecommunication Union (ITU) region being visited.

Aircraft

(12) The Licensee shall not establish or use the Station in any aircraft or other airborne vehicle.

OTHER REQUIREMENTS

3. (1) The Licensee shall hold:
(a) a Radio Amateurs' Examination Certificate issued by the City and Guilds of London Institute; and
(b) in the case of an Amateur Radio Licence (A), either an Amateur Radio Certificate issued by the Secretary of State or an Amateur Morse Test Pass Slip issued on behalf of the Secretary of State; or
any other qualification recognised by the Secretary of State.

(2) The Licensee shall comply with:
(a) the relevant provisions of the Telecommunication Convention and Radio Regulations unless such compliance would result in a breach of the Licence; and
(b) all relevant statutory enactments including (without limiting the generality of the foregoing) the Act, the Wireless Telegraphy Act 1967 and the Telecommunications Act 1984.

(3) The Licensee shall:
(a) have no pecuniary interest (direct or indirect) in any operations conducted under this Licence; and
(b) except as provided by sub-clauses 1(2) and (3) and except in the case of activities on behalf of a non-profit organisation established for the furtherance of amateur radio, not use the Station for business, advertisement or propaganda purposes including (without limiting the generality of the foregoing) the sending of news or messages of, or on behalf of, or for the benefit or information of, any social, political, religious or commercial organisation.

APPARATUS

4. (1) The Licensee shall ensure that:
(a) the emitted frequency of the apparatus comprised in the Station is as stable and as free from Unwanted Emissions as the state of technical development for amateur radio apparatus reasonably permits; and
(b) whatever class of emission is in use, the bandwidth occupied by the emission is such that not more than 1% of the mean power of the transmission (not including the power contained in spurious emissions) falls outside the frequency band.

(2) Notwithstanding any other term of this Licence, the Licensee shall ensure that the apparatus comprised in the Station is designed and constructed, and maintained and used, so that its use does not cause any Undue Interference or Harmful Interference to any wireless telegraphy.

(3) If any Undue Interference or Harmful Interference to wireless telegraphy is caused by the radiation of Unwanted Emissions or field strengths from the Station, then the Licensee shall suppress the Unwanted Emissions or field strengths to the degree satisfactory to the Secretary of State.

(4) The Licensee shall conduct tests from time to time to ensure that the requirements of this clause 4 are met.

(5) The Station shall be capable of receiving Messages on the same frequencies and with the same classes of emission in use for the transmission of Messages by the Station.

RECORDED OR RETRANSMITTED MESSAGES

5. (1) The Licensee may record and retransmit Messages addressed to the Licensee from other licensed amateurs:
(a) with whom the Licensee is in direct communication; or
(b) which are intended for retransmission to a specified licensed amateur.

(2) The Licensee may send Messages by (or as part of) the intermediate relaying of the Messages to or from other licensed amateurs.

(3) When recording and retransmitting the Message of another licensed amateur, if the Licensee also records and retransmits the call sign of the licensed amateur, then the Licensee shall transmit the call sign in such a way that the origin of the Message and the origin of the retransmission are clear.

(4) When operating under sub-clauses 5(1)(b) and (2), the Licensee is not responsible for the content of Messages sent by digital communications which did not originate at the Station when he could not reasonably be expected to review their content (and did not review their content) before relaying them.

(5) Notwithstanding sub-clauses 5(1) and (2), the Licensee shall not operate
(a) a mailbox or bulletin board (each being a facility which receives and stores Messages for or on behalf of other licensed amateurs for retransmission at a later time on the request of (and to) the intended recipient of the Message); or
(b) a telephony repeater (a facility which receives and simultaneously retransmits Messages by telephony for or on behalf of other licensed amateurs).

LOG

6. (1) Subject to sub-clause 2(6), the Licensee shall keep a permanent record (the "Log") of all wireless telegraphy transmissions at the Main Station Address and all Temporary Locations showing:
(a) dates of transmission;
(b) the times (in Coordinated Universal Time (UTC)) during each day of:
(i) the first and last transmissions from the Station (except when using automatic operations involving digital communications), or
(ii) switching the Station on and off for the purpose of enabling transmissions (when using autpmatic operations involving digital communications), and
changing the frequency band, class of emission or power;
(c) frequency band of transmission or, in an Unattended Operation, the specific frequency employed;
(d) class of emission;
(e) power;
(f) initial calls("CQ" calls) (whether or not they are answered);
(g) except during automatic operations involving digital communications, the call sign of licensed amateurs or licensed amateur stations with which communications have been established (not including those amateurs or stations which form part of the intermediate relay of Messages);
(h) details of tests carried out in accordance with sub-clause 4(4); and
(i) location when the station is operated at a Temporary Location.

(2) The Log shall be written in a book or maintained on a magnetic tape or disc.

(3) Where the Log is maintained:
(a) in a book, the book shall not be loose-leaf and no gaps shall be left between the entries;
(b) on a magnetic tape or disc, the tape or disc shall be used only to keep the Log.

(4) The Licensee shall keep the Log for inspection by a person authorised by the Secretary of State for at least six months from the date of the last entry whether or not this Licence has expired or been revoked.

(5) The Licensee shall record in the Log those matters required to be recorded by a person authorised by the Secretary of State for the period specified by that person.

IDENTIFICATION

7. (1) During transmissions, the Licensee shall transmit the call sign specified in paragraph (b) of the Validation Document:
(a) during initial calls ("CQ" calls);
(b) at the beginning and at the end of each period of communication with a licensed amateur and when the period of communication is longer than 15 minutes, at the end of each interval of 15 minutes;
(c) at the beginning of transmission on a new frequency (whenever the frequency of transmission is changed);
(d) by the same type of transmission that is being used for the communication;
(e) on the same carrier frequency that is being used for the communication; and
(f) by morse telegraphy or telephony at the end of each 30 minute period during which transmissions are sent from the Station (unless already transmitting in morse telegraphy or telephony).

(2) When another person is using the Station under the Licence in accordance with sub-clause 2(8)(b), the Licensee shall ensure that the call sign specified in paragraph (b) of the Validation Document is transmitted in accordance with sub-clause 7(1).

(3) At a Temporary Location, the Licensee shall:
(a) use the suffix "/P" with his call sign and give the location of the Station to an accuracy of at least 5 km by a generally used identifier [for guidance see note (v) to this Booklet], or
(b) give prior written notice of the location to the Manager of the Radio Investigation Service office in whose district the operation is to take place.

(4) When Mobile, the Licensee shall use the suffix "/M" and when Maritime Mobile, the suffix "/MM".

(5) When away from the Main Station Address, the Licensee shall use the appropriate Regional Secondary Locator specified in note (w) to this Booklet.

(6) When operating a low power device under sub-clause 2(4)(b), this clause 7 shall not apply to the operation of the low power device (although this clause 7 shall continue to apply to the operation of the Station).

INSPECTION AND CLOSE DOWN

8. (1) The Licensee shall permit a person authorised by the Secretary of State:
(a) to have access to the Station, and
(b) to inspect the Licence and Log and to inspect and test the apparatus of the Station
at any and all reasonable times (or when, in the opinion of the Secretary of State, an urgent situation exists, at any time) for the purpose of verifying compliance with the terms of the Licence.

(2) When, in the opinion of the Secretary of State:
(a) the Licensee is in breach of the Licence; and
(b) the breach justifies immediate restriction or close down,
the Licensee shall restrict the operation of, or close down and cease to operate, the Station (or any apparatus comprised in the Station) forthwith in accordance with the demand of a person authorised by the Secretary of State for the temporary period specified in the demand.

(3) When Maritime Mobile, the Licensee shall cease to operate the Station on the demand of the Vessel's master.

(4) For the purposes of sub-section 1(4) of the Act, this Licence may be revoked, or its terms, provisions or limitations varied, by a notice in writing of the Secretary of State served on the Licensee, or by a general notice addressed to all holders of an Amateur Radio Licence (A) or Amateur Radio Licence (B) published in the London, Edinburgh and Belfast Gazettes or broadcast nationally by the British Broadcasting Corporation.

PERIOD OF LICENCE AND FEES DUE

9. (1) Subject to the payment of the fee in the manner indicated in sub-clause 9(2), this Licence shall continue in force from year to year unless revoked by the Secretary of State.

(2) The Licensee shall pay to the Secretary of State before the anniversary date of the Date of Issue in each year, the fee on renewal prescribed by the Regulations for the time being in force under sub-section 2(1) of the Act, and on the payment of the fee the Secretary of State will issue to the Licensee a document in the form of the title page of this Licence (the "Validation Document") which will indicate the next date for renewal.

(3) If the Licensee does not pay the fee in the manner described in sub-clause 9(2), then the Licence shall expire at the end of the day before the relevant anniversary date of the Date of Issue.

(4) The Licensee shall surrender the Validation Document to the Secretary of State forthwith upon the revocation of the Licence.

(5) Any licence, however described, which the Secretary of State has previously granted to the Licensee under the Act in respect of the Station is revoked.

(6) Sub-clauses 9(1), (2) and (3) do not apply to a temporary licence.

OPERATIONS BY CEPT AMATEURS IN ACCORDANCE WITH CEPT RECOMMENDATION T/R 61-01

10. The following additional provisions apply to licensed non-resident amateurs temporarily visiting and operating wireless telegraphy apparatus in the United Kingdom in accordance with CEPT Recommendation T/R 61-01, as enabled by statutory instrument ("CEPT Amateurs").

(1) CEPT Amateurs may operate in the United Kingdom under a CEPT equivalent licence which is:
(a) valid and in force;
(b) not temporary; and
(c) issued by an administration which
(i) has implemented CEPT Recommendation T/R 61-01, and
(ii) permits persons licensed to use amateur stations under section 1 of the Act to use such stations in its territory (with or without conditions) without making application in that behalf.

(2) CEPT Amateurs shall transmit their home call sign after:
(a) the United Kingdom call sign prefix 'G';
(b) followed by the appropriate Regional Secondary Locator (if any); and
(c) followed by the symbol '/'
[for guidance see note (w) to this Booklet].

(3) Subject to this clause 10, CEPT Amateurs shall comply with:
(a) the terms of their CEPT equivalent licence, unless such compliance would result in a breach of the requirements of the United Kingdom;
(b) this Terms and Limitations Booklet BR68 (insofar as its terms and limitations may reasonably be applied); and
(c) the relevant provisions of CEPT Recommendation T/R 61-01.

(4) CEPT Amateurs who possess the equivalent of a CEPT Class 2 licence shall use only those frequencies above 144 MHz specified in the first column of the Schedule.

(5) CEPT Amateurs shall operate only:
(a) a mobile or a portable station (which includes a station powered from the mains electricity at a temporary fixed location such as an hotel); or
(b) the station of an amateur licensed under the Act.

OPERATIONS BY THE LICENSEE IN ACCORDANCE WITH CEPT RECOMMENDATION T/R 61-01

11. Subject to sub-clause 11(2), the Licensee may operate in countries which have implemented CEPT Recommendation T/R 61-01 in accordance with the following terms.
(1) The Licensee shall:

(a) be a temporary visitor and non-resident in the host country;
(b) operate only:
(i) a mobile or a portable station (which includes a station powered from the mains electricity at a temporary fixed location such as an hotel), or
(ii) the station of an amateur licensed by the relevant authority in the host country;
(c) comply with the requirements applicable to the use of wireless telegraphy apparatus at the location of operation in the host country;
(d) comply with this Licence unless such compliance would result in a breach of the requirements of the host country;
(e) present this Licence upon request to the relevant supervisory authorities in the host country;

(f) if he possesses an Amateur Radio Licence (B), use only those frequencies above 144 MHz authorised for use by licensed amateurs in the host country;
(g) use his home call sign after the appropriate host country call sign prefix; and
(h) comply with the relevant provisions of CEPT Recommendation T/R 61-01.

(2) If this Licence is a temporary Licence, then the Licensee shall not operate under this clause 11.

INTERPRETATION

12. (1) In this Licence, unless the context otherwise requires:
(a) words and expressions have the same meaning as they have in the Act and the words "station" and "apparatus" have the meanings ascribed to the expressions "station for wireless telegraphy" and "wireless telegraphy apparatus", respectively, in section 19 of the Act;
(b) words importing the masculine include the feminine, words in the singular include the plural and words in the plural include the singular;
(c) the expression "Coordinated Universal Time" has the same meaning as it has in the Radio Regulations [for guidance see note (s) to this Booklet];
(d) any reference to a statute in this Licence includes a reference to that statute and to any statutory instruments made under that statute as the statute or statutory instrument may be amended from time to time and to any other statute or statutory instrument that has the effect of adding to, replacing or superseding the statute or statutory instrument, whether before or after the Date of Issue;
(e) "Act" means the Wireless Telegraphy Act 1949;
(f) "At Sea" means in the Tidal Waters or territorial sea of the United Kingdom or in international waters;
(g) "CEPT" means the European Conference of Postal and Telecommunications Administrations;
(h) "Harmful Interference" means interference which endangers the functioning of a radio navigation service or of other safety services or seriously degrades, obstructs or repeatedly interrupts a radiocommunication service operating in accordance with the relevant governmental requirements;
(i) "Inland Waters" means any canal, river, lake, loch or navigation which is not Tidal Water;

THE SCHEDULE TO TERMS AND LIMITATIONS BOOKLET BR68 (AMATEUR RADIO LICENCE (A) AND (B))

Those licensed under an Amateur Radio Licence (B) may not transmit on those bands between 1.810 and 29.700 MHz.

1	2	3	4	5	6
	Status of Allocations in the United Kingdom to:		Maximum Power:		
Frequency bands in MHz	The Amateur Service	The Amateur Satellite Service	Carrier	PEP	Permitted Types of Transmission
1.810-2.000	Available on the basis of non-interference to other services (inside or outside the United Kingdom)	(Not allocated)	9dBW	15dBW	Morse Telephony RTTY Data Facsimile SSTV
3.500-3.800	Primary. Shared with other services				Morse Telephony RTTY
7.000-7.100	Primary	Primary	20dBW	26dBW	Data
10.100-10.150	Secondary	(Not allocated)			Facsimile
14.000-14.250	Primary	Primary			SSTV
14.250-14.350					
18.068-18.168	Available on the basis of non-interference to other services. Antennas limited to horizontal polarisation, maximum gain 0dB with respect to a half-wave dipole	(Not allocated)	10dBW	-	Morse, A1A only
21.000-21.450	Primary	Primary	20dBW	26dBW	Morse Telephony RTTY Data Facsimile SSTV
24.890-24.990	Available on the basis of non-interference to other services. Antennas limited to horizontal polarisation, maximum gain 0dB with respect to a half-wave dipole	(Not allocated)	10dBW	-	Morse, A1A only
28.000-29.700	Primary	Primary	20dBW	26dBW	Morse Telephony RTTY Data Facsimile SSTV

(j) "Licensee" means the licensee named in paragraph (a) of the Validation Document or a CEPT Amateur [as defined in clause 10], as the case may be;
(k) "Secretary of State" means the Secretary of State for Trade and Industry;
(l) "Telecommunication Convention" and "Radio Regulations" mean the International Telecommunication Convention and the Radio Regulations thereunder and include any Convention or Regulation which may from time to time be enacted or brought into force in substitution for, in amendment of, or in addition to, the Telecommunication Convention or Radio Regulations;
(m) "Tidal Water" means any part of the sea or a river within the ebb and flow of the tide at ordinary spring tides;
(n) "Undue Interference" means interference to wireless telegraphy which, in the opinion of the Secretary of State, goes beyond that which is appropriate or warranted in all of the circumstances;
(o) "United Kingdom" means the United Kingdom of Great Britain and Northern Ireland, the Channel Islands and the Isle of Man;
(p) "Unwanted Emissions" means spurious emissions and out-of-band emissions as defined in the Radio Regulations;
(q) "User Service" means the British Red Cross Society, the St John Ambulance Brigade, the St Andrew's Ambulance Association, the County, Chief, Regional or Islands Emergency Planning Officer or any United Kingdom police force, fire or ambulance service, health authority, government department or public utility; and
(r) "Vessel" includes a hovercraft and any other floating structure which is capable of being manned.

(2) The Licence consists of the Validation Document, Terms and Limitations Booklet BR68, the Schedule to the Booklet and the Notes to the Schedule, as any of them may be varied from time to time.

(3) References to a certificate issued by the Secretary of State include references to a certificate issued or granted by the Secretary of State for the Home Department, the Postmaster General or the Minister of Posts and Telecommunications.

(4) The headings in this Licence are for ease of reference only and shall not affect the interpretation of the Licence.

1	2	3	4	5	6
	Status of Allocations in the United Kingdom to:		Maximum Power:		
Frequency bands in MHz	The Amateur Service	The Amateur Satellite Service	Carrier	PEP	Permitted Types of Transmission
50.00-51.00	Primary. Available on the basis of non-interference to other services outside the United Kingdom. Antennas limited to 20 metres above ground level, with horizontal polarisation only. No Mobile or Maritime Mobile operation		14dBW erp	20dBW erp	Morse Telephony RTTY Data Facsimile SSTV
51.00-52.00	Secondary. Available on the basis of non-interference to other services outside the United Kingdom. Antennas limited to 20 metres above ground level, with horizontal polarisation only. No Mobile or Maritime Mobile operation	(Not allocated)			
70.00-70.50	Secondary. Available on the basis of non-interference to other services outside the United Kingdom		16dBW	22dBW	
144.0-146.0	Primary	Primary	20dBW	26dBW	
430.0-431.0	Secondary. Not available for use within the area bounded by: 53°N 02°E, 55°N 02°E, 53°N 03°W and 55°N 03°W				
431.0-432.0	Secondary. Not available for use: a) within the area bounded by: 53°N 02°E, 55°N 02°E, 53°N 03°W and 55°N 03°W; b) within a 100 km radius of Charing Cross, London (51°30'30"N, 00°07'24"W)	(Not allocated)	10dBW erp	16dBW erp	Morse Telephony RTTY Data Facsimile SSTV FSTV
432.0-435.0					
435.0-438.0	Secondary	Secondary	20dBW	26dBW	
438.0-440.0		(Not allocated)			

1	2	3	4	5	6
	Status of Allocations in the United Kingdom to:		Maximum Power:		
Frequency bands in MHz	The Amateur Service	The Amateur Satellite Service	Carrier	PEP	Permitted Types of Transmission
1240-1260		(Not allocated)			
1260-1270	Secondary	Secondary Earth to Space only			
1270-1325		(Not allocated)			
2310-2400					
2400-2450	Secondary. Users must accept interference from ISM users	Secondary. Users must accept interference from ISM users			
3400-3475		(Not allocated)			
5650-5670	Secondary	Secondary. Earth to Space only			
5670-5680					
5755-5765		(Not allocated)			
5820-5830	Secondary. Users must accept interference from ISM users	Secondary. Users must accept interference from ISM users. Space to Earth only	20dBW	26dBW	Morse Telephony RTTY Data Facsimile SSTV FSTV
10000-10450	Secondary	(Not allocated)			
10450-10500		Secondary			
24000-24050	Primary. Users must accept interference from ISM users	Primary. Users must accept interference from ISM users			
24050-24250	Secondary. May only be used with the written consent of the Secretary of State. Users must accept interference from ISM users	(Not allocated)			
47000-47200					
75500-76000	Primary	Primary			
142000-144000					
248000-250000					

ISM (Industrial, Scientific and Medical)

NOTES TO THE SCHEDULE

(a) Maximum Power refers to the rf power supplied to the antenna. Maximum power levels will usually be specified by carrier power. For emissions having a suppressed, variable or reduced carrier, the power will be specified by the peak envelope power (pep) under linear conditions.

(b) In the case of frequency bands above 1000 MHz, since high intensities of rf radiation may be harmful, the following safety precaution must be taken. In locations to which people have access, the power flux density on transmit must not exceed the limits recommended by the competent authorities (currently, this limit is 10 mW per square centimetre).

(c) Primary, permitted and secondary services

For the purpose of this Licence, frequency bands allocated to the Amateur Service and the Amateur Satellite Service on a primary basis cannot claim protection from Harmful Interference or Undue Interference from any other authorised services, such protection being afforded only to users whose frequencies have been registered nationally or internationally. In the United Kingdom, individual frequency assignments are not registered in the Amateur Service, except for beacons and repeaters. This applies equally to bands allocated on a secondary basis where stations of the Amateur Service and the Amateur Satellite Service are also required not to cause Harmful Interference or Undue Interference to stations of a primary or permitted service to which frequencies are already assigned or to which frequencies may be assigned at a later date.

(d) Any modulation technique (except for pulse emissions below 1000 MHz) may be used for the types of transmission specified in the sixth column of the Schedule which are defined as follows:

Morse: hand or automatically-sent international morse code

Telephony: speech, including selective calling signals

RTTY: radio teletype and AMTOR

Data: digital codes representing numbers, text, speech, images, measurements, computer programs or other information authorised by the Licence

Facsimile: transmission of fixed or graphic images

SSTV: slow scan (i.e., reduced bandwidth) television

FSTV: fast scan television.

(e) Interpretation

(i) Carrier Power: The average power supplied to the antenna by a transmitter during one radio frequency cycle taken under the condition of no modulation.

(ii) Effective Radiated Power (erp): The product of the power supplied to the antenna and its gain in the direction of maximum radiation.

(iii) Gain of an Antenna: The ratio, usually expressed in decibels, of the power required at the input of a loss free reference antenna to the power supplied to the input of the antenna to produce, in a given direction, the same field strength or the same power flux-density at the same distance. When not otherwise specified, the gain refers to the direction of maximum radiation. The gain may be considered for a specified polarisation. The reference antenna is usually a half-wave dipole. The gain may be referred to as decibels relative to a half-wave dipole (dBd).

(iv) Mean Power: The average power supplied to the antenna by a transmitter during an interval of time which is sufficiently long relative to the lowest frequency encountered in the modulation taken under normal operating conditions.

(v) Peak Envelope Power (pep): The average power supplied to the antenna by a transmitter during one radio frequency cycle at the crest of the modulation envelope taken under normal operating conditions.

NOTES TO TERMS AND LIMITATIONS BOOKLET BR68

(a) Remittances and correspondence should be sent to the Radio Amateur Licensing Unit, Post Office Counters Ltd, Chetwynd House, Chesterfield, Derbyshire S49 1PF, Tel: 0246 217555/217699. Do not send the Licence when making remittances.

(b) A list of Radio Investigation Service district offices (see sub-clauses 2(5) and 7(3)) may be obtained from the address given in note (a).

(c) If any message, the receipt of which is not authorised by this Licence, is received by means of the Station, neither the Licensee nor any person using the Station should make known the contents of any such message, its origin or destination, its existence or the fact of its receipt to any person except an authorised officer of Her Majesty's Government or a competent legal tribunal, or retain any copy or make any use of such message, or allow it to be reproduced, copied or made use of. It is an offence under section 5 of the Act deliberately to receive messages the receipt of which is unauthorised or (except in the special circumstances mentioned in that section of the Act) to disclose any information as to the contents, sender or addressee of any such message.

(d) It is an offence to send certain misleading messages, viz:

"Any person who -
(a) by means of wireless telegraphy, sends or attempts to send, any message which, to his knowledge, is false or misleading and is, to his knowledge, likely to prejudice the efficiency of any safety of life service or endanger the safety of any person or of any vessel, aircraft or vehicle, and, in particular, any message which, to his knowledge, falsely suggests that a vessel or aircraft is in distress or in need of assistance or is not in distress or not in need of assistance;" (underlining added) (Section 5, WT Act 1949).

(e) This Licence does not authorise the doing of any act which is an infringement of any copyright which may exist in the communication sent or received.

(f) Notwithstanding sub-clause 2(2)(a), if the Licensee holds an Amateur Radio Licence (B), then he may transmit on frequency bands below 30 MHz if he is operating under the licence of, in the presence of, and under the direct supervision of a person who holds an Amateur Radio Licence (A).

(g) References to the operation of the Station include references to the speaking into the microphone comprised in the Station.

(h) Any operation under this Licence must also comply with the "General Licence for Wireless Telegraphy Systems" issued under the Post Office Act 1969 and continued in force under the Telecommunications Act 1984. Copies of the General Licence are available from the Office of Telecommunications, Atlantic House, Holborn Viaduct, London EC1N 2HQ.

(i) It is an offence under the Wireless Telegraphy (Content of Transmission) Regulations 1988 to send a message, communication or other matter in whatever form that is grossly offensive or of an indecent, obscene or menacing character.

(j) If the Station is situated within 1 km of the boundary of an aerodrome, then the height of the antenna or any mast or structure supporting it must not exceed 15 m above ground level. An antenna which crosses above, or is liable to fall or to be blown on to, any overhead power wire (including electric lighting) or power apparatus must be guarded to the reasonable satisfaction of the owner of the power wire or power apparatus.

(k) This Licence does not absolve the Licensee from obtaining any necessary consent before entering on private or public property (including a public transport vehicle) with any apparatus.

(l) Sub-clause 4(2) of the Licence requires that the apparatus in the Station be so designed, constructed, maintained and used that the use of the Station does not cause any Undue Interference or Harmful Interference with any wireless telegraphy. In order to prevent interference due to close coupling of antennas, the antenna used for the Station should be sited as far as possible from any existing television or other receiving antennas. This is particularly important in the case of the installation of an indoor transmitting antenna, eg, in a loft, where transmissions may be conducted through the electricity supply wiring. In some circumstances it might not be possible to use an indoor antenna. In densely populated areas sufficient separation of the amateur equipment from surrounding transmitters, receivers and electronic equipment may not be possible to permit the amateur to operate with high power without the high probability of causing interference. Adjacent transmitters may produce intermodulation products on other frequencies and excessive field strengths may cause breakthrough even in receivers which display an adequate level of immunity to unwanted transmissions. While owners of receivers should take steps to ensure that their apparatus has a reasonable standard of immunity, in some circumstances the amateur may need to modify his transmission practice to minimise a problem to neighbours.

(m) In the event of a demand by an authorised officer to close down or restrict the operation of the Station under sub-clause 8(2), the Licensee must act in accordance with the demand immediately. He will at that time be given oral reasons for the demand and will have an opportunity to provide reasons why the demand should not be met. If the demand is affirmed, then it will be confirmed in writing to the Licensee as soon as practicable. Written reasons will be given by a Manager of the Radio Investigation Service and the Licensee will again be invited to comment. The temporary period referred to in sub-clause 8(2) will usually be 28 days, but may be a greater or lesser period as the circumstances warrant. Where appropriate and where circumstances allow the Radio Investigation Service will be available to discuss with the Licensee how a breach of Licence might be corrected, however, if the Licensee does not comply with the demand or if the breach resulting in the demand is not rectified within a reasonable period of time to the satisfaction of the Secretary of State, then revocation or variation of Licence procedures may be commenced under sub-section 1(4) of the Act or a prosecution may be initiated (depending on the circumstances of each case).

(n) Sub-section 19(5) of the Act applies for the purposes of this Licence as it applies for the purposes of the Act:

"In considering for any of the purposes of this Act, whether, in any particular case, any interference with any wireless telegraphy caused or likely to be caused by the use of any apparatus, is or is not undue interference, regard shall be had to all the known circumstances of the case and the interference shall not be regarded as undue interference if so to regard it would unreasonably cause hardship to the person using or desiring to use the apparatus."

(o) The bandwidths of emissions should be such as to ensure the most efficient utilisation of the spectrum; in general this requires that bandwidths be kept at the lowest values which technology and the nature of the service permit. Where bandwidth-expansion techniques are used, the minimum spectral power density consistent with efficient spectrum utilisation should be employed.

(p) Under section 1 of the Act, it is an offence to use any station or apparatus otherwise than under and in accordance with a licence granted by the Secretary of State. The Licensee is responsible for ensuring that at all times persons operating under this Licence observe its terms and limitations. Breach of this provision may result in prosecution of the Licensee or operator and the revocation of this Licence.

(q) The Licence is not transferable.

(r) No Log need be kept in respect of Mobile and Maritime Mobile operations.

(s) For the purposes of the Licence, "Coordinated Universal Time" may be regarded as equivalent to Greenwich Mean Time (GMT).

(t) Codes for classes of emission

Under the Telecommunication Convention, classes of emission are designated by groups of a minimum of three characters. The symbols used to designate classes of emission are listed in the Radio Regulations of which the following is a full list.

FIRST SYMBOL - Type of modulation of the main carrier

N Emission of unmodulated carrier

Emission in which the main carrier is amplitude modulated (including cases where sub-carriers are angle modulated):
A Double sideband
H Single sideband, full carrier
R Single sideband, reduced or variable level carrier
J Single sideband, suppressed carrier
B Independent sidebands
C Vestigial sideband

Emission in which the main carrier is angle modulated:
F Frequency modulation
G Phase modulation

D Emission in which the main carrier is amplitude and angle modulated either simultaneously or in a pre-established sequence

Emission of pulses:
P Sequence of unmodulated pulses
A sequence of pulses:
K Modulated in amplitude
L Modulated in width/duration
M Modulated in position/phase
Q In which the carrier is angle modulated during the period of the pulse
V Which is a combination of the foregoing or is produced by other means

NB: Emissions where the main carrier is directly modulated by a signal which has been coded into quantised form (eg, pulse code modulation) should be designated by A, H, R, J, B, C, F or G as appropriate.

W Cases not covered above, in which an emission consists of the main carrier modulated, either simultaneously or in a pre-established sequence, in a combination of two or more of the following modes: amplitude, angle, pulse

X Cases not otherwise covered

NB: For the purpose of this Licence, modulation used only for short periods and for incidental purposes, such as identification or calling, may be ignored when calculating the emission designator. Double sideband emissions with reduced or suppressed carrier are included in the first character A.

SECOND SYMBOL - Nature of signal(s) modulating the main carrier

0 No modulating signal

1 A single channel containing quantised or digital information without the use of a modulating subcarrier (excluding time-division multiplex)

2 A single channel containing quantised or digital information with the use of a modulating subcarrier (excluding time-division multiplex)

3 A single channel containing analogue information

7 Two or more channels containing quantised or digital information

8 Two or more channels containing analogue information

9 Composite system with one or more channels containing quantised or digital information, together with one or more channels containing analogue information

X Cases not otherwise covered

THIRD SYMBOL - Type of information to be transmitted (in this context, the word "information" does not include information of a constant, unvarying nature such as that provided by standard frequency emissions or continuous wave or pulse radars).

N No information transmitted

A Telegraphy - for aural reception

B	Telegraphy - for automatic reception
C	Facsimile
D	Data transmission, telemetry, telecommand
E	Telephony
F	Television (video)
W	Combination of the above
X	Cases not otherwise covered

The following examples of classes of emission and their symbols are given for the purpose of guidance only:

Telephony (speech):	
Single side band, suppressed carrier (SSB)	J3E
Frequency modulation (FM)	F3E
Phase modulation (PM)	G3E
Amplitude modulation (AM)	A3E
Morse:	
Hand sent, on/off keying of the carrier	A1A
Hand sent, on/off keying of the audio tone (FM transmitter)	F2A
Automatic reception, on/off keying of the carrier	A1B
RTTY/AMTOR:	
Direct frequency shift keying of the carrier	F1B
Frequency shift keyed audio tone (FM transmitter)	F2B
Frequency shift keyed audio tone (SSB transmitter)	J2B
Packet/Data:	
Direct frequency shift keying of the carrier	F1D
Frequency shift keyed audio tone (FM transmitter)	F2D
Frequency shift keyed audio tone (SSB transmitter)	J2D
Television:	
Vestigial sideband (AM transmitter)	C3F
Slow scan television (SSB transmitter)	J2F
Facsimile:	
Frequency shift keyed audio tone (SSB transmitter)	J2C

(u) When telephony is used, the letters of the call sign may be confirmed by the pronouncement of well-known words of which the initial letters are the same as those in the call sign. The phonetic alphabet contained in Appendix 24 of the Radio Regulations, reproduced below, should be used:

A	Alfa	J	Juliett	S	Sierra
B	Bravo	K	Kilo	T	Tango
C	Charlie	L	Lima	U	Uniform
D	Delta	M	Mike	V	Victor
E	Echo	N	November	W	Whiskey
F	Foxtrot	O	Oscar	X	X-ray
G	Golf	P	Papa	Y	Yankee
H	Hotel	Q	Quebec	Z	Zulu
I	India	R	Romeo		

(v) When the Station must be identified in accordance with sub-clause 7(3)(a), it is recommended that one of the following location identifiers be used:

(i) the full postcode,
(ii) latitude and longitude in degrees and minutes,
(iii) National Grid Reference correct to six figures,
(iv) International Amateur Radio Union (IARU) locator, or
(v) the address or other geographical description correct to 1 km.

(w) The following Regional Secondary Locators should be used immediately after the United Kingdom prefix 'G' when identifying the Station in accordance with sub-clauses 7(5) or 10(2) of this Booklet:

D	Isle of Man
I	Northern Ireland
J	Jersey
M	Scotland
U	Guernsey
W	Wales
(No secondary locator)	England.

(x) When identifying in accordance with clause 7, please observe the following extract from article 25 of the Radio Regulations (Regulations 2071 to 2075):

"Identification signals shall wherever practicable be in one of the following forms:
(a) speech, using simple amplitude or frequency modulation;
(b) international morse code transmitted at manual speed;
(c) a telegraph code compatible with conventional printing equipment;
(d) any other form recommended by the CCIR (International Radio Consultative Committee)"

(y) CEPT member countries which have implemented CEPT Recommendation T/R 61-01 are listed in the Validation Document by abbreviation. These abbreviations are given solely for the purpose of the Validation Document and are not the country prefixes for use when identifying under sub-clause 11(1)(g). CEPT member countries are identified by abbreviations as follows:

A	Austria	M	Malta
B	Belgium	MC	Monaco
CY	Cyprus	NL	Netherlands
DK	Denmark	N	Norway
SF	Finland	P	Portugal
F	France	RSM	San Marino
D	Germany (FRG)	E	Spain
GR	Greece	S	Sweden
IS	Iceland	CH	Switzerland
IRL	Ireland	TR	Turkey
I	Italy	SCV	Vatican City
FL	Liechtenstein	YU	Yugoslavia
L	Luxembourg		

(z) CEPT Recommendation T/R 61-01 does not deal with the import or export of amateur apparatus which is subject to the relevant requirements of the countries visited.

(aa) Amateur apparatus operating only in the frequency band 28.0 MHz to 29.7 MHz may not be imported, manufactured or assembled in the United Kingdom without specific authority. Requests for such authority should be addressed to the Department of Trade and Industry, Radio Investigation Service, Room 102, Waterloo Bridge House, Waterloo Road, London SE1 8UA. "Manufacture" includes conversion.

Highlights of the New Licence

● All licensees will receive a yearly Validation Document to confirm the renewal and validity of the licence. The Licence Regulations, Schedule and Notes are contained in a separate booklet.

● The new licence conforms with the requirements of CEPT Recommendation T/R 61-01, which will enable UK amateurs to operate under their UK licence in a growing number of European countries, and amateurs from much of Europe to operate here in the same manner.

● Operation at any fixed location other than the main station address is permitted with the option either of identifying as "/P" and giving details of the station location during transmissions, or of notifying the local Radio Investigation Service office of the station location and identifying with the main station callsign only.

● Operation on a public transport vehicle is permitted, with the consent of the owner.

● Restrictions on RAYNET operation are relaxed, with a widening of the scope of permitted "user services".

● Maritime mobile operation is included in the main licence.

● Operation using digital communications including packet radio is permitted. Unattended digital operation is permitted on some bands, but mailbox operation will require a separate authority available through the RSGB.

● Restrictions on message handling are relaxed; messages may be relayed between licensed amateurs, or recorded for onward transmission.

● Cross-band working is specifically authorised, either for a "B" licensee to transmit on v.h.f. or above and receive on h.f., or for any UK licensee to transmit on one of his authorised bands and receive the reply from an overseas amateur on a band not available to UK amateurs.

● Operation of the station is permitted, under the supervision of the licensee, by anyone who has passed the Radio Amateurs' Examination.

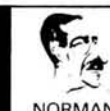
● Unattended operation of beacons and of low power transmitters for "foxhunts" is permitted, also the localised remote control of radio equipment at fixed locations.

● A station log must still be kept for operation at fixed locations, but is no longer required for mobile operation. The details to be recorded remain as before, with the addition of transmitter power. The log may be kept in a book, or on magnetic disk or tape reserved for log-keeping only.

● The 1.850–2.000MHz band is made available for RTTY.

● The likely courses of official action in dealing with complaints of interference to other radio users are more clearly explained, including close-down procedures, requirement to reduce power, right of appeal. ***PW***

Lee Electronics



NORMAN
G4THJ

C500

★ Frequency coverage 144-146 & 430-440MHz with Full Duplex available. ★ Extended receive capability:– 130-169.995 & 410-470MHz. ★ 2.5 to 5 Watts output (depending on battery pack). ★ High or Low switchable RF output. ★ Step sizes:– 5/10/12.5/25/50kHz (user programmeable). ★ Keyboard programmeable repeater offset (0-39.9MHz). ★ Reverse repeater mode. ★ Priority Channels available on both bands. ★ Each band has 10 memories for frequency and repeater offset. ★ Dual synthesised VFO's. ★ User programmeable CALL button (instant QSY to your favourite channel – either band). ★ Numerous scanning modes (Pause or Busy – memories – band etc.). ★ Auto Power Off – with Alarm (4mA current drain on standby). ★ Battery Save on receive – 9 user programmeable Rx/Off ratios. ★ Vacant Channel Search – for easier QSYing. ★ Lock – disables keypad and/or PTT. ★ Squelch Off button (saves twiddling the knob). ★ Low Battery indicator. ★ Easy to read Liquid Crystal Display with backlight. ★ LCD S/Power output meter. ★ Can be powered directly from a car's cigar lighter (5W output). ★ Keypad or Rotary Knob frequency selection. ★ Dimensions:– 173mm H × 60mm W × 34mm D.

£375

STANDARD COMMUNICATIONS

C5200

The new Standard C5200 leads the way into a new generation of dual band mobile transceivers. It is virtually two radios in one box. There are two individual bright green LED displays — one for 70cms and one for 2m — each with a separate frequency indicator, S meter and Busy indicator. Both bands can be received simultaneously and the powerful 2W of audio from each band can be heard from the built-in speaker. If this gets a little confusing, there are two separate external speaker outputs on the back of the set — one for each band — or one external speaker can be used for both bands. Each band has its own separate Volume and Squelch controls and there is also an Automatic Mute control that can be set to mute the audio from one band while the other one is being received.

The C5200 can also be used for full duplex communications with either band being used for transmit or receive. An unusual feature of this set is that when it is being used in the duplex mode for crossband working, the received frequency (either 70cms or 2m, whichever you have chosen) can be tuned while you are transmitting on the other frequency. Thanks to the well-designed fan cooled PA stage, 45 Watts of RF is available on each band.

There are 4 different Scan modes which are available independently on each band and each band has 10 memory channels. Five step sizes are provided and different ones can be set for each band so it is easy to have, for instance, 12.5kHz spacing on 2m and 25kHz on 70cms.

Remote control of some of the many functions is possible with the supplied microphone and a tone squelch unit (CTN500) and an AQS Controller are available as optional extras.

This radio really is different to the run-of-the-mill dual banders that you may have seen before so come into the shop and try it for yourself.

£599.00
(Special Show Price still held)

AS THE *SOLE* IMPORTER OF STANDARD EQUIPMENT IN THE UK, WE ARE ABLE TO OFFER A FULL BACKUP SERVICE AND CURRENT SPARES FROM STOCK.

SWR METERS

		P+P
SWR3	3.5-30MHz 200 Watts/50-150MHz 50 watts	34.00 (1.50)
SWR50	3.5-150MHz 1KW PEP with back light facility	34.00 (1.50)
FS500H	This peak reading meter has RMS/PEP with follow/hold facility in the range 1.8 to 60MHz-20/200/2KW	75.00 (2.00)
SWR15	Single meter SWR/Field Strength 3.5-150MHz	9.77 (1.50)
SWR50B	Twin meter SWR/Power-Field Strength 3.5-150MHz	19.00 (1.50)
T435	VHF/UHF Twin Meter 2/20/120W	52.50 (1.50)

MORSE KEYERS

HK707	Straight Up/Down Keyer	19.25 (1.00)
HK702	As HK707 only with a Heavy Marble Base	34.75 (1.50)
HK704	Squeeze Keyer	24.50 (1.50)
MK705	Squeeze Keyer	31.50 (1.00)
MK702	Manipulator Key on Marble Base	40.50 (1.00)
BK100	Semi Automatic Bug Key	32.95 (1.00)
EKM-1A	Morse Code Practice Oscillator with variable Tone	10.25 (1.00)

ANTENNAS

TA285D	2M Colinear Base Antenna	35.00 (7.50)
TA285D	2M 70cm Colinear	35.00 (7.50)
X50	Base Antenna 70/2	60.00 (7.50)
DPCP5	Base Antenna 80-10m	198.00 (7.50)
DPL EL770H	Mobile Antenna 70/2	29.95 (7.50)

POWER SUPPLIES

EPL40	4.2 Amps	39.95 (4.00)
EPL70	6.5 Amps	69.00 (4.00)
EPL122	12 Amps	95.00 (5.00)
EP2510	25A Continuous 30A Max 13.8VDC Fully Stabilized	155.00 (6.50)
DRAE	13.8VDC 12 Amps	86.50 (5.00)
DRAE	13.8VDC 6 Amps	65.00 (4.00)

METERED UNITS AVAILABLE AT EXTRA COST PLEASE PHONE

ADONIS MICS

AM303	Base Mic SSB/FM Switch	49.50
AM503	Desk Compressor Mic as 803 with One Output. Two levels of compression	59.00 (1.15)
AM803	As 503 with Meter & 3 Outputs	89.50
FX1	Swan Neck Fet Mic with Control Box	49.00 (1.15)
202S	Flexible Neck Clip Mic with Control Box	37.50 (1.15)
HW7	Head Set Boom Mic For Yaesu/Icom/Trio	27.50 (1.15)

WE ALSO STOCK ROTATORS – COAX SWITCHES – PLUGS – SOCKETS – ETC.

STANDARD ★ C120 ★

£239.00 inc. VAT (P & P £2.50)

SPECIFICATIONS

Frequency 144-147.995MHz
RF Output
Hi .... 5W (with CNB120)
4W (with CNB111)
2.5W (with dry cells)
Lo 0.4W
Sensitivity ....0.58µV (20dB QS)
S/N @ 1µV More than 30dB
Audio Output 40mW @ 8Ω
(10% distortion)

★ STOP PRESS ★

DUE TO THE UNPRECEDENTED SUCCESS OF THE STANDARD HANDHELD RANGE, WE ARE CONTINUING OUR POLICY OF DISCOUNTS OR **FREE ACCESSORIES.**

THE C5200 IS **STILL** HELD AT THE SPECIAL SHOW PRICE OF **£599!!**

PHONE FOR FURTHER DETAILS.

400 EDGWARE ROAD,
LONDON W2
01-723 5521 Tlx 298765

BARCLAYCARD VISA · Access

Normally 24hr despatch but please allow 7 days for delivery.

NEAREST TUBE:
EDGWARE ROAD
PADDINGTON

OPENING TIMES:
9.30am-5.30pm Mon-Fri.
10am-4.30pm Sat.

VISA 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
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. *398 pages* **£11.95**

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. Penfold
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 (BP192)
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* **£2.95**

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* **£2.95**

THEORY

AMATEUR RADIO & ELECTRONICS STUDY GUIDE
3rd Edition
Ian Ridpath ZL1BCG
This book aims to fill the gap between high level amateur radio handbooks and over-simplified beginners manuals. It is written in a "students own notes" format that hopes to put the reader more at ease than formally written text books do. *216 pages* **£7.00**

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* **£8.95**

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**

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**

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, callsign, 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
6th 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 callsign 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**

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 (Updated)
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* **£17.95**

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* **£7.25**

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 callsign 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**

HOW TO PASS THE RADIO AMATEURS' EXAMINATION (RSGB)
G. L. Benbow G3HB
The background to multiple choice exams and how to study for them with nine sample RAE papers for practice, plus maths revision. *91 pages* **£3.00**

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* **£2.95**

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 amateurs prefix boundaries, continental boundaries and zone boundaries. *760 × 636mm* **£2.25**

★ RADIO AMATEUR'S PREFIX MAP OF THE WORLD (USA)
Showing prefixes and countries, plus listings by order of country and of prefix. *1014 × 711mm* **£2.50**

★ RADIO AMATEUR'S WORLD ATLAS (USA)
17 pages of maps, including the world-polar projection. Also includes the table of allocation of international callsign series. **£2.95**

★ 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* **£19.25 (hardback)**

VHF HANDBOOK FOR RADIO AMATEURS (USA)
H. S. Brier W9EGQ & W. I. Orr W6SAI
VHF/UHF propagation, including moonbounce and satellites, 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 & HIFI ENGINEER'S POCKET BOOK
Vivian Capel
The 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**

★ MODERN ELECTRONIC TEST EQUIPMENT
Keith Brindley
This book describes in a down-to-earth manner how the main categories of test equipment work. The subjects covered include analogue and digital meters, oscilloscopes, signal sources, frequency, time and event counters, spectrum and logic analysers, displays and automatic test equipment. *134 pages* **£6.95**

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* **£2.95**

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**

TEST EQUIPMENT FOR THE RADIO AMATEUR (RSGB)
H. L. Gibson G2BUP
Techniques and equipment for tests and measurements on devices, systems and antennas. *142 pages Hardback* **O/P**

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 × 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* **£1.95**

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 unstabilised types, fixed voltage regulated types and variable voltage stabilised designs. *91 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 QRPer. 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* **£1.95**

ALL ABOUT CUBICAL QUAD ANTENNAS (USA)
W. I. Orr W6SAI & S. D. Cowan W2LX
Theory, design, construction, adjustment and operation of quads. Quads vs. Yagis. Gain figures. *109 pages* **O/S**

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
14th 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* **£9.10**

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. Cowen W2LX
Yagi, quad, quagi, l-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* **£4.95**

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* **£1.75**

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

AMATEUR RADIO SOFTWARE (RSGB)
John Morris GM4ANB
Using a computer for c.w., RTTY, data, plus calculations for antennas, distance, bearing, locators, satellites, sun, moon and circuit design. *328 pages Hardback* **£9.41**

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**

SWAP SPOT

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 Sony ICF-2001 portable shortwave receiver a.m., c.w., s.s.b., plus f.m. band. Would exchange for airband receiver or Pentax KA bayonet lenses. Pentax flash (to fit P30) or w.h.y? G4VLB. Tel: 061-480 1549 evenings or weekend. *E432*

Have Yaesu FT-290R as new with soft case and NiCads. Would exchange for equivalent 430MHz or 50MHz transceiver. Tel: St Helens 20370. *E435*

Have Rolex Oyster Perpetual Chronometer, Explorer I, waterproof to 100 metres, cost £681 13 months ago. Would exchange direct for Sony ICF-2001D, preferably with active antenna. K. Miller, 15 The Rise, Green Lane, Whitby, Yorkshire YO22 4ES. *E440*

Have 20 new and boxed wax phonograph cylinders, recorded May 1894. Also two Pye PF91 audio amplifiers with KT66 output valves, v.g.c. Plus Unica receiver ideal for beginner s.w.l., 500kHz–30MHz, mains or 12 volts. Would exchange for military radio bits pre 1960. Tony. Tel: 0908 73114. *E441*

Have Spectrum conversion 28MHz multimode, a.m., f.m., u.s.b., l.s.b., rig frequency coverage 28.01–29.7MHz, plus frequency counter 0–50MHz. Would exchange for 35mm SLR or good compact. Tel: 0952 57670. *E442*

Have 5HP Wolseley cultivator and accessories, never used. Would exchange for general coverage transceiver with s.s.b. facility. J. Richards. Tel: 0734 507976. *E446*

Have Eumig standard 8 cine projector, excellent condition with zoom lens, autoread, spare bulb, beaded screen, original packing. Would exchange for EC10 receiver, v.h.f. scanner or battery signal generator. Tel: 0647 6753. *E447*

Have Lafayette HA600 communications receiver (circa 1968), with circuits. Would exchange for v.h.f./u.h.f. pocket TV. M. L. Richardson, 20 Dale Close, Skegby, Sutton-in-Ashfield, Notts NG17 3AF. *E449*

Have Agfacolour 50 35mm projector type 5920 50W Q.I. Would exchange for f.e.t. dip oscillator. Eldridge. Tel: Beccles (0502) 712129. *E448*

Have 15m free-standing tower with ladder incorporated, 4 sections, 1.2m square base, no stay wires needed. Would exchange for good Yaesu or Kenwood, a.t.u. or AOR AR2002 scanner, w.h.y? T. Devlin EI5FO, 4 Legion Terrace, Longford, Eire. Tel: 043 41455. *E452*

Have original mains p.s.u. suitable for ex-RAF 1392 receiver. Would exchange for mains transformer 450-0-450V at 200mA. Callers only as item heavy. Write first: Heslop, 75 Alder Park, Brandon, Durham DH7 8TJ. *E453*

Have B2 spy set complete good working order. Would exchange for Type A Mk. III spy set. No other offers please. Tel: 0634 253056 (Rochester). *E454*

ARE COMMUNICATIONS

Kenwood TS440S HF Transceiver

Now available once again from **ARE Communications** the excellent Kenwood TS440S. General Coverage Receiver 100W output between Top band and 10m. FM fitted as standard. Auto Tuning Unit optional extra. Offered at a discounted price of **£1,039.00** or, with ATU **£1,199.00.**

Kenwood TS680S HF and SIX metre Transceiver

Since our introduction of this remarkable transceiver last year, October 1987 to be precise (Dales of Derby please note), many of these are now in use throughout the U.K. From 160m to 10m, including the ever-popular 6m band and a General-Coverage Receiver. Price: **£929.00** including MC43S microphone.

Yaesu FT23R 2M HANDIE

Due to A.R.E.'s continued policy of direct importing from Japan and cutting out the **Sub Marine Corporation** we continue to offer Yaesu's best seller at the discounted price of full U.K. spec with FBA9 empty battery case, helical antenna and strap. Price: **£195.00** or complete with FNB10 and NC28C charger **£249.00.**

Standard C500 Dual Band Handie

You must have read our adverts by now, we've sold hundreds! 2m & 70cm full duplex 138-170 MHz + 420-469 MHz. Many additional features. Price: **£369.00**

Yaesu FT690R Mk II

Still not on SIX METRES?! Our special offer cannot last forever! The last batch of FT690R has just arrived from Japan. Phone now to avoid disappointment.

Price: **£349.00** c/w empty battery case, carry strap and antenna
£375.00 including a 15W output linear amplifier.

Yaesu FT767GX HF + 2m + 6m + 79cm.

Our latest batch direct from Japan guarantees you will not be investing in earlier production models. A complete ham station in one package. All band, all mode, built-in Automatic Tuning Unit, Power Supply Unit, General Coverage Receiver, Digital Power/SWR Meter 100W out, optional 2m/6/70cm modules which just plug in. Price: **£1,369.00** including MH1B8 microphone. Also available with one or all VHF modules fitted. Phone for unbeatable price on part-exchange.

Yaesu FT736R quad band multimode

The KING of VHF/UHF Base stations, the FT736R has all the facilities any discerning user may need, plus the two most important features: Uncompromised receive performance and a clean transmitted signal. A.R.E.'s continued policy of direct importing guarantees you an unbeatable price of **£1,289.00** including MH1B8 microphone; **£1,475.00** including 6m card and microphone.

STOP PRESS . . . DISCOUNTED PRICES ON KENWOOD TS940S AND TL922. BOTH AVAILABLE EX-STOCK.
PHONE FOR DETAILS.

PHONE 01-997-4476

Opening Hours London Mon/Fri 9.30 to 5.30 Saturday by appointment.

Now that the N.E.C. is over, most of you who visited our stand, if only to say hello or purchase equipment, realise how dedicated Bernie and Brenda are to offering you fantastic deals, both as cash purchases or part-exchange. As usual ARE have more new and used equipment to offer AND will continue to do so for many years. You may have also noticed that the competition is getting increasingly nervous about our pricing structure. Comments like "40 quid off John" and "no back-up" can only be regarded as a myth. After trading for over twelve years and continuing to offer discounted prices to YOU the Radio Amateur, I suppose we should expect the competition to get just a little bit upset! 73's Martin G4HKS

Buy it with Access

A.R.E. Communications Limited, 6 Royal Parade, Hanger Lane, Ealing, London W5A 1ET, England Professional Tel: 01-997 4476 Fax: 01-991 2565

VISA

Reading & Understanding Circuit Diagrams

(with a bit of theory thrown in)

In Part 7 of this series, R.F. Fautley finishes looking at the t.r.f. receiver and starts to look at the more complex superhet.

In a t.r.f. (tuned radio frequency) receiver, an audio frequency amplifier is used to increase the level of the detected (or demodulated) a.f. signal to that required. In our case it needs to be sufficient to operate a pair of headphones.

A typical common emitter amplifier is shown in Fig. 7.1 and is the final stage of the t.r.f. receiver. Actually, it's the same circuit as Fig. 3.6 which appeared in Part 3. Capacitor C1 passes the a.f. input signal to the base of transistor Tr1, while isolating the "live" input terminal from the d.c. bias on the transistor base. Resistors R1 and R2 form a potentiometer (voltage divider) across the 12V d.c., with the junction of the two resistors applying the correct d.c. bias to the transistor base.

The value of d.c. through Tr1 is controlled by R4, and capacitor C2 bypasses the resistor. "Bypasses"? Another term to learn. It means that

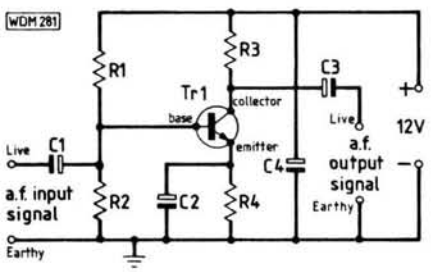


Fig. 7.1: An a.f. amplifier suitable for headphone reception

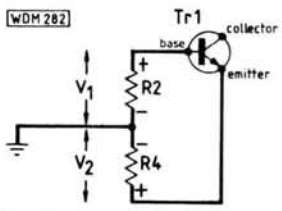


Fig. 7.2: The base-to-emitter signal

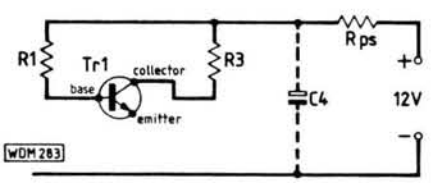


Fig. 7.3: A power supply having a high impedance

the reactance of C2 is low enough to act as a short-circuit across R4 at all the audio frequencies to be amplified, i.e. it "bypasses" the resistor at audio frequencies so that, although there is a d.c. voltage developed across the two paralleled components, there is (ideally) no a.f. signal.

Why don't we want any signal voltage there? Because if R4 were left unbypassed, that is if C2 were to be removed, the resultant signal input to Tr1 between base and emitter would be the sum of two signals; one from the input terminals developed across R2, and another developed across R4. Now, if the base were to be positive at one instant in time with respect to earth, then the emitter would also be positive with respect to earth at the same instant. Remember the part headed Common Collector Amplifier (Emitter Follower) with Fig. 3.5?

Take a quick look at Fig. 7.2. If signal voltage V1 is 1 volt, then V2 will be about 0.7 volts, but when they are added together the sum will not be 1.7 volts because they are opposing polarities; the actual input signal between gate and emitter will be:

$$V1 + V2 = (+1) + (-0.7)$$
$$= 1 - 0.7$$
$$= 0.3V$$

This reduction of effective signal input will result, of course, in a reduction of signal output. In fact, it's a simple form of negative feedback, which is not needed when the object is to obtain the maximum gain possible! So much for the reason for C2!

Amplified output signals are developed across R3 and fed via C3 to the output load, which in this case is intended to be a pair of high impedance headphones, typically 2000Ω to 4000Ω. Capacitor C3 will pass the a.f. signals without allowing d.c. from the transistor collector to reach the headphones. The only reason for C4 is to ensure that the power supply impedance is very low to audio signal frequencies. In fact, ideally any power supply should be a short-circuit at ALL frequencies — except 0Hz or d.c. Why does this matter? Well, any impedance in series with the power supply would be COMMON to both R1 and R3, see R_{ps} ($R_{power\ supply}$) in Fig. 7.3, and some input signal and some output signal would appear across it. As the two signals would be in opposition, the effective input signals would be reduced and the gain of the stage reduced, again something undesirable. Connecting C4 across the power supply ensures that the +12V ends of R1 and R3 are both directly "earthed" to all a.c. signals. Thus any impedance such as $R_{power\ supply}$ can be ignored as from the a.c. or a.f. signal point of view the impedance of the d.c. source is very low, provided that C4 is large enough (about 100μF).

Superhet Receiver

This receiver, although very much more complicated than the t.r.f. type, is far more popular (except for beginners who want to make their very own first set!) because its sensitivity, selectivity and frequency stability can be made much greater.

There are seven basic stages to the superhet receiver:

i: an r.f. amplifier
ii: a mixer
iii: an hf. oscillator
iv: an i.f. (intermediate frequency) amplifier
v: a beat frequency oscillator, or b.f.o.
vi: a demodulator
vii: an a.f. amplifier

There are also additional refinements such as frequency synthesisers, crystal filters, r.f. attenuators, a.f. filters, i.f. shift circuit, variable bandwidth filters, signal strength meters, etc. This series is only concerned with being able to **identify the main stages** of a superhet receiver from a study of its circuit diagram.

First, let's get the meaning of "superhet" out in the open. It's a contraction of an even worse phrase "supersonic heterodyne". The word supersonic in this context simply means "of higher frequency than can be heard", and heterodyne refers to the "beat" produced when two signals having different frequencies are applied to a "non-linear" device such as a mixer — all to be explained in due course! So, the term superhet infers that the principle

of operation is to produce a signal too high in frequency to be heard, by applying two other signals to a device which has a non-linear characteristic.

Let's try another way of understanding this idea of the operation of the heterodyne principle. Suppose you were to use a pair of headphones suitable for stereo reproduction to listen to two separate audio signals, a fixed 1000Hz signal in the right earphone and a signal able to be varied in frequency between 300Hz and 2000Hz in the left earphone. Imagine that you are sitting comfortably with the headphones on. Adjust the level of the tones to sound roughly the same loudness in each ear. Now, vary the frequency of the tone in the left ear from 300Hz upwards until about 700Hz, then very slowly up to 1000Hz, listening carefully for any other added tones. You should hear another signal getting lower and lower in pitch as the left ear signal approaches 1000Hz; this signal is called the "beat frequency". When the left ear signal is exactly the same frequency as that in the right ear the "beat" will be zero frequency. This is referred to as "zero beat". Increasing the left ear signal frequency should result in the beat increasing in pitch. If you were able to measure the beat frequency you would find it was always **exactly equal** to the **difference** between the frequency of the two original signals.

So what? First of all, why should this beat frequency occur at all? The answer is that our hearing system is not perfect in that if the level of a sound is actually doubled in intensity we do not **hear** it as twice as loud. That is, the characteristic of our hearing is not linear, as our ears have to be able to accommodate a large dynamic range of sounds without deafening us and the result is that our hearing system is able to **compress** the actual range of sound levels to a range that we are able to hear without pain! Thus the ear is a non-linear device.

The next problem is: "**Why** should a non-linear device cause beats at all?" Without rather complicated mathematics this can't really be answered, so unfortunately as it is beyond the scope of these articles, the student must be referred to the standard text books for a rigorous mathematical explanation of the phenomenon.

In a similar way, two signals applied to an electronic non-linear device will produce a beat, in fact several beats. The actual frequencies of the beats can be predicted by the following.

$n(F_1) \pm m(F_2)$

where n and m are any integers (whole numbers). The value of n and m may either be the same or different.

If F_1 is 14.200MHz and F_2 is 14.665MHz, then some of the beat frequencies will be:

For $n = m = 1$; $1 \times 14.200 \pm 1 \times 14.665$ = 28.865MHz and 0.465MHz

$n = m = 2$; $2 \times 14.200 \pm 2 \times 14.665$ = 57.730MHz and 0.930MHz

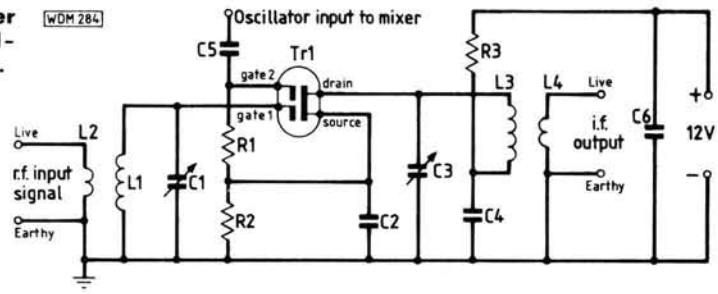


Fig. 7.4: A mixer using a dual-gate m.o.s.f.e.t.

$n = m = 3$; $3 \times 14.200 \pm 3 \times 14.665$ = 86.595MHz and 1.395MHz

$n = m = 4$; $4 \times 14.200 \pm 4 \times 14.665$ = 115.460MHz and 1.860MHz

$n = m = 5$; $5 \times 14.200 \pm 5 \times 14.665$ = 144.325MHz and 2.325MHz, etc.

Some of these frequencies are, arithmetically, negative numbers. Ignore the negative signs, the frequencies are just as real! Don't believe it? Try using 14.665MHz for F1 and 14.200MHz for F2; there won't be any negative signs in the answers then, but the figures will be exactly the same!

Also for $n = 1$, $m = 2$; $1 \times 14.200 \pm 2 \times 14.665$ = 43.530MHz and 15.130MHz

$n = 2$, $m = 1$; $2 \times 14.200 \pm 1 \times 14.665$ = 43.065MHz and 13.735MHz, etc.

Again, ignore any negative signs.

The name given to these beats is "intermodulation distortion". For only **two** input signals there can be an **infinite** number of extraneous signals produced! Fortunately only the low order beats (where n and m are very low numbers) have much in the way of amplitude, so above the 5th order, where $n+m = 5$, they can usually be ignored. In this case, we are interested in only **one** of all these possible beats, and that one is usually the difference frequency, where $n = m = 1$. That is, it's simply the **difference** in frequency between the two signals.

This signal then becomes the i.f. (or intermediate frequency) which remains constant so long as the frequency of the variable oscillator "tracks" the signal frequency tuning. "Tracks" means to maintain a constant frequency difference between the two signals.

It is much easier to obtain high amplification at a fixed frequency rather than having to maintain tuning of many tuned circuits over a wide frequency range where the gain will probably drop off as the received frequency increases. This is the most important function of a superhet, as the i.f. amplifier is used to produce a very high gain over a very small bandwidth dependent only upon the mode of the signal to be demodulated. So how do we change the frequency of the received signal to that of the i.f.? This is achieved by the use of a "frequency changer" which these days is usually called a "mixer". The name mixer is derived from its use, because in this device the r.f. signals are "mixed" with an oscillator signal (sometimes called the "local oscillator" because it is produced within the receiver — "locally"). This mixer happens to be a very non-linear device, and so produces many of those beats we've been talking about. The next problem is to sort out the one beat we do want from all those other unwanted signals that the mixer produces. This is done by using tuned circuits or other types of frequency selective circuits, called filters. They are inserted between amplifying stages and the whole section becomes the i.f. amplifier.

The rest of the superhet will be described under the various stage headings.

r.f. stage: This is the same as for the t.r.f. receiver, see Fig. 6. and the associated text in Part 6.

mixer: A suitable simple mixer is shown in Fig. 7.4. The signal at received frequency is tuned by L1 and C1 and applied to gate 1 of the mixer which is a dual gate field effect transistor Tr1. The signal from the oscillator section is connected to gate 2 via C5, which is there to isolate d.c. levels on either side of it whilst allowing the oscillator signal through. So we have the two input signals.

Tuned circuit L3 and C3 is tuned to the i.f. Remember? It's the difference frequency beat between the two input signals. Inductor L4 is coupled to L3 to pass on the i.f. signals to the following i.f. amplifiers stage. Actually, it's only one way of connecting the two stages together, but let's not complicate the issue by describing **all** the possibilities!

Components R1, R2 and C2 are just to provide the correct d.c. conditions for operating the stage. To prevent our previously described common impedance problems, (see the a.f. amplifier description at the beginning of this Part), R3, C4 and C6 form a sort of filter to isolate the power supply from the mixer, and provide a short-circuit across the power supply at the frequencies being amplified. The "earthy" end of L3 is connected for r.f. signals to the earth line, and so to the earthy end of C3, by C4 which is large enough to be effectively a dead short at high frequencies. Thus L3 is in parallel with C3 forming a tuned circuit.

Any mixer circuit can be identified by looking for the two input signals and the one output signal. Mixers appear again in single sideband (s.s.b.) transmitters, although then their name changes to "modulators", so you haven't seen the last of them!

In Part 8, we'll continue our look at the parts that make up a superheterodyne receiver.

Dayton Revisited

The end of April means it's Hamvention time again in Dayton, Ohio. Vic Copley-May G3AAG crossed "the pond" once more, and sent us this report on the 1988 show.

A total of 33 733 tickets were sold for the 37th annual Dayton Hamvention. That does not mean that there were 33 733 attendees, since quite a few amateurs will buy tickets in the hope of winning major prizes even if they will not be attending. Nonetheless, your scribe is prepared to believe an attendance in excess of 30 000. The $10 ticket, valid for three days, might have won you a complete station—a TS-940S with linear amplifier TL-922A and all the accessories which go with it. Alternatively, you could win a complete Icom station, IC-761 and IC-2KL linear, and there were lots of other major prizes from Kenwood, Icom and Yaesu. More than 100 exhibitors donated prizes to the draw.

Bill McNabb WD8SAY, ably assisted by Ed Hillman N8ALN, was there as the General Chairman to welcome visitors. They were, in turn, assisted by 31 members of the organising committee. And needless to say, once again the bash ran like clockwork.

Awards

That grand old man of amateur radio, Bill Bennett W7PHO, who founded the "Family Hour" net which has enabled many QRP stations to work exotic DX, was posthumously awarded the Amateur of the Year Award, a much-deserved honour. Sadly, Bill became a silent key on December 23 last year, whilst operating his station.

Fred Hammond VE3HC taught the Chinese amateurs how to operate their stations properly. This and many other outstanding efforts and donations towards the furtherance of amateur radio earned Fred the Special Achievement Award presented on this, his 28th visit to the Hamvention.

No radio amateur worth his salt has not heard of Lew McCoy W1ICP. Lew has penned innumerable articles for *QST* over close on 40 years, and now writes for *CQ*. All of us, at one time or another, have profited from Lew's sound advice, particularly in the area of cures for TVI. Lew received the Technical Excellence Award.

Familiar Faces

It was a delight to bump into Ian VK3MO once again. Together with John W4XJ, an Honour Roll DXer, we did the tour of the hospitality suites. Ian is remarkable, apart from giving us VK's big signal. I discovered that he can socialise until 3.30am and still be up at 6 to make sure he is one of the first at the Hamvention! There were many other happy encounters. I came across Toshi JA8RUZ loaded down with wide-spaced variables and enormous roller-coasters. Even the Japanese have to go to the Dayton flea market to find such goodies.

Dimitri SV1RL and Stavros SV0FM helped to establish the international character of this stupendous event, whilst the HB9s were there in force, having chartered their own plane and flown 200 callsigns into Dayton.

Six rooms are set aside at Dayton for the 47 forums held over the three days, covering every facet of our hobby.

Your scribe managed only to attend the AMSAT session and part of the four hour DX forum. Martti Lane OH2BH described in some detail the Western Sahara Operation, our latest new country, DXCC Number 319. For my money, Al Slater G3FXB must be given credit for the most interesting talk, illustrated with excellent slides and describing his own experiences whilst visiting radio amateurs at several locations in the USSR.

Trade Stands

There were some 212 trade exhibitors, many representing several manufacturers. Time and space limitations prevent a review of them all.

In view of the recent series of articles in both *QST* and *CQ* covering the Ten-Tec model 585 Paragon transceiver (now available in the UK through KW Electronics), I was particularly inter-

ested to find out if it really was as good as the makers claimed. Reports suggested that whilst the blocking dynamic range of the receiver was excellent at 136dB, criticism had been levelled at the phase noise. Phase noise, the bugbear of all receivers tuned to a weak signal in the presence of an adjacent strong signal, is the limiting factor of all synthesised receivers. The review published in *QST* was based on set serial number 084, tested by Mark AA2Z. Since then, later and modified versions have been reviewed and it does appear that Ten-Tec have tackled the phase-noise problem with considerable success. Quite by chance I ran into Dick Frye K4XU, an accomplished contester who used to work for Ten-Tec, and who was in at the early stages of the design of the Paragon. He told me that current production models revealed an excellent phase-noise figure. There are still a few minor niggles, but all in all the American Paragon transceiver at an amateur nett price just short of $2000 must have the Japanese wearing ice packs.

Whilst the QRP Amateur Radio Club International were exhibitors I saw no sign of the British group who so much impressed all their visitors last year. Maybe they were represented. Robert Kent, of R. A. Kent (Engineers) in Preston, Lancs, was doing a roaring trade with his beautifully engineered and all British made Morse keys, and remarked that at $180 for the three-day exhibition stand, it was well worth his while to attend, and cheaper than exhibiting at the NEC. Take more stock next year, Robert, and you won't be sold out before the show finishes! Hank K4FU told me that he was really impressed with the keys, a considerable compliment coming as it does from one of the best c.w. operators on the bands. Hank also said that there is a need for a single paddle keyer, and he should know.

Another British exhibitor was Spectrum Communications of Dorchester in Dorset, showing just 10 items out of their range of 110 products. G4CFY remarked, and I quote with his permission: "English rallies are better, these guys don't understand". He claimed that this, his first visit, had not been worth the trip. He has an excellent range of products, and if I may be permitted to give him a piece of advice I would point out that Dayton is vast. It is quite impossible to cover every product. Like me, many of the dedicated attendees study the advertisements and advance publicity for the event weeks in advance. We prepare an agenda and go straight to the stands where we know there will be products in which we already have an interest. Advance publicity is essential. If you have any time left over and your legs have not crumpled beneath you, you then go walkabout.

Advance publicity is well proven by the excellent article in May 1988 *PW*, by Chris Page G4BUE, covering the SuperSCAF audio filter. Last year, Bill N4AR had told me that in his estimation the SuperSCAF was as good an invention for the DXer as sliced bread had been for the general public. Joe Fikes KB4KVE of AFtronics Inc. was on the stand to demonstrate the filter to a host of visitors, many of them British radio amateurs. As a user I can say without equivocation that this filter is one of the best accessories I have ever invested in. Clearly, it will be of more interest to c.w./RTTY Packet operators, but don't underestimate its usefulness on s.s.b.

New at Dayton from Yaesu was the FT-747GX h.f. all-mode 100W p.e.p. transceiver, with an impressive specification. It clocks in at just 3.3kg (7.25lb) and has only some 18 front panel controls. It should do well. Also new was the FT-70F/G, a very compact portable h.f. transceiver. If one can get used to tuning by means of a set of six digital switches plus clarifier, and one is keen on portable and mobile operation, this c.w./s.s.b./a.m. rig designed for rugged field operation should be of considerable interest.

There was also a new range of v.h.f./u.h.f. synthesised transceivers designated the FT-212RH and FT-712RH which will run an output of 43 and 35 watts respectively. A novel feature in these full featured rigs which I have not seen before is the automatic control of the display brightness according to the ambient light.

New from Icom was their range of IC-32 handhelds. These are dual band (144/430MHz) and fill a long-felt need. The European version is without the d.t.m.f. keyboard. When are we going to be allowed to access repeaters for phone patching? Also new was Icom's IC-228 range, 2m f.m. transceivers with 45 watts output in the high position. Less than 140mm wide and only 50mm high, they will fit in almost anywhere. By the way, they all have 20 memories. I tackled one of their technical representatives as to why the new IC-781 h.f. all-band transceiver with built-in oscilloscope did not have a facility whereby the 'scope could be used for a two-tone test of one's own transmission besides all the other things it will do. It was quickly pointed out to me by this representative, who had obviously faced the same question before, that they were building a top-line h.f. transceiver and not a measuring instrument!

Icom produce a series of leaflets entitled *Tech Talk from Icom*, an interesting innovation this year and well worth collecting. Their IC-1500 automatic linear amplifier, already announced, was on display. What a good idea to have a linear amplifier which can be parked under the operating table with a small control head on the desk. If you feel so disposed, you can run the linear up to 76m away from the shack.

As a long-time Kenwood user, I was sorry that time would not allow me to visit their stand. They, like Icom, took up six stand places and deserved some attention. Passing over the Kenwood TM-3530A full-featured mobile transceiver and the TH-321A handheld, unfortunately of little interest to UK amateurs who do not have the 220MHz band, it must be mentioned that they also produce a dual-band 144/430MHz f.m. rig, the TM-721A, the suffix "A" denoting the American version with standard d.t.m.f. buttons on the microphone. This little goody has 30 memory channels with full duplex operation and dual-watch function, allowing both bands to be monitored simultaneously.

John W4XJ, my host and an avid c.w. contester with an enviable record of successes, couldn't wait to visit the Cire Electronics stand to see their new TH-1 CompuKeyer. This remarkable device, no bigger than a cigarbox, is not just a keyer but also a logging computer and storage system. It contains two independent keyers, one for stored messages and one for real-time messages from the paddle. An array of c.m.o.s. static RAM provides non-volatile storage of the log. When fully expanded, the memory will store in excess of 8000 contacts. The keyers can run simultaneously. I can just hear

John pressing a button to send QSL QRZ de W4XJ whilst with the manual paddle he is entering the received report into the resident log. It checks for duplicates automatically. Contest over, plug the TH-1 via its RS-232 serial port into your printer and a finished, dupe-checked log is instantly printed. They seem to have thought of everything including multi-operator contesting. John paid some $380 for Serial No. 4, the first one sold outside the company. If you are not into c.w. contesting, they make a TH-1V voice-keyer for 'phone operators.

Ehrhorn Technological Operations Inc. were there with their Alpha 86 and 87 linears. At 1.5kW p.e.p. up to 100 per cent duty cycle, these are of limited interest to the UK market with our 400W p.e.p. limitation. If you are rich and need 1 millisecond switching time, want bandpass no-tune-up facilities, you can drive the 87 with about 12 watts to get your UK legal limit output!

Talking of Linears, Dennis K8KXK, President of Amp Supply Co., showed me his brand-new (updated QSK 85/90w.p.m.) LK450-NT no-tune-up version of the LK450. This amplifier uses a single 3–500Z tube. The US price is $899.50. Dennis told me he had just signed a deal at the show with George Beasley of HRS Electronics Ltd in Birmingham to act as an importer for the UK. British amateurs will surely be interested in this beautifully engineered amplifier.

Mosley announced a new four-element 10–15–20m Yagi, to which may be added 12 and 40 or 30m. All four elements are active on 10–15–20m. The boom length is 6.4m and the turning circle 5.4m. The weight is only 26.3kg (58lb). Look out for the TA–34–M.

Also spotted was lots of interesting amateur radio related software for the IBM PC and others. There was much more, but space is limited. Sorry, I never made it to the ten acre flea market.

What's Wrong with Dayton?

Not much, except that due to a local ordinance only soft drinks were allowed this year. We had to carry our own beer.

One exhibitor remarked to me: "Sales are down, we do better at smaller and local Hamfests. This show has got so big that we don't get time to sales-talk people into buying".

Be that as it may, if you want it, whatever it is, Dayton has it. ***PW***

Doppler Shift on Satellites Part 1

This article by Dave Tyler G1PEF, AMSAT UK 3742, delves into some of the idiosyncrasies of Doppler shift and will hopefully enable amateur satellite users to overcome some of the problems associated with this effect.

We have all heard of the problems associated with amateur satellite operation, and some find these very difficult to overcome. After reading this article it is hoped you will have a greater awareness of Doppler shift, and find satellite operation just that little bit easier.

All this was inspired by various radio amateurs' comments of having their QSO ruined by other users not allowing for Doppler shift and "tuning up" unwittingly on their frequency.

The following illustration takes three stations using one satellite during a typical pass, i.e. OSCAR-10 on the 28 May 1987.

Station 1, Cornwall, UK
Station 2, Portugal
Station 3, Uruguay

I have used these three locations to show the difference in their Up/Down frequencies, while all are in QSO with each other as a group.

All figures quoted were extracted from a computer tracking program relevant for that station. Please note this is a hypothetical problem, therefore operation times may not be valid due to satellite restrictions.

The most common factor associated with these three stations is, each will receive the satellite at the same time UTC or GMT, and its General Beacon.

Continually Shifting

If we check the OSCAR-10 technical notes, the General Beacon is transmitted on 145.809MHz, at the satellite, but a "pound to a penny" it is more likely it will not be received at this frequency (except at the apogee or perigee of the orbit, and then only for a few moments). Its real frequency from the ground station point of view will be above or below this frequency, and is continually shifting; let's see why, as this is the Doppler effect.

We will take our three stations in turn; listed in Table 1 are the predictable results.

The crux of Doppler shift is the relative velocity of an object to the observer. In our case we are the stationary observer and the satellite moves in an orbit relative to us.

We can calculate the relative velocity of the satellite to us, the observers, by taking two consecutive prediction times, in our case 15 minutes apart, and the calculated slant range at those times. Subtract the earlier distance from the later distance and divide by the time, to obtain the relative velocity in kilometres per second.

Table 1

	UTC	AZ	EL	Slant Range km
Station 1	0545	177	−3	16863
	0600	169	3	18947
Station 2	0545	173	10	15451
	0600	164	16	17620
Station 3	0545	91	22	14340
	0600	91	16	17679

Station 1

$$\frac{18947 - 16863}{15 \times 60} = \frac{2084}{900} = 2.315$$

Station 2

$$\frac{17620 - 15451}{15 \times 60} = \frac{2169}{900} = 2.41$$

Station 3

$$\frac{17679 - 14340}{15 \times 60} = \frac{3339}{900} = 3.71$$

Please be aware that these figures show an increasing distance between the observer and the satellite and each station shows a fast apparent speed. It can also be a negative value when the satellite is moving towards the observer. It is necessary to understand the conventions. **an increasing distance shows a positive velocity and a decreasing distance shows a negative velocity.**

Doppler Shift Formula

Unfortunately, we must now have a look at the Doppler shift formula.

$$\text{Gnd. RX f} = \text{Sat. TX f} \pm \left(\frac{\text{Relative Velocity}}{\text{Speed of Light}} \times \text{Sat. TX f}\right)$$

where:
Relative Velocity and Speed of Light are in metres per second and TX and RX frequencies are in Hz.

The plus or minus bit (±) is another convention to grasp: when the distance between satellite and observer is decreasing, then use + (Gnd. RX f> Sat. TX f). When it is increasing then use − (Gnd. RX f < Sat. TX f).

Our example shows we have an increasing distance between satellite and observer, so we will use the minus (−) sign. The formula is:

$$\text{Gnd. RX f} = \text{Sat. TX f} - \left(\frac{\text{Relative Velocity}}{\text{Speed of Light}} \times \text{Sat. TX f}\right)$$

Armed with this information we can calculate the expected ground receive frequency in hertz (Gnd. RX fHz) of the satellite beacon transmitted on 145.809MHz.

Station 1

$$145\,807\,875 = 145\,809\,000 - \left(\frac{2.315 \times 1000}{300\,000\,000} \times 145\,809\,000\right)$$

(difference of −1125Hz)

Station 2

$$145\,807\,829 = 145\,809\,000 - \left(\frac{2.41 \times 1000}{300\,000\,000} \times 145\,809\,000\right)$$

(difference of −1171Hz)

Station 3

$$145\,807\,197 = 145\,809\,000 - \left(\frac{3.71 \times 1000}{300\,000\,000} \times 145\,809\,000\right)$$

(difference of −1803Hz)

You can readily see that the received beacon frequencies at 0600UTC at all stations are different, particularly at Station 3. This example markedly shows the Doppler effect.

Stable Beacon Frequency

Do not get mixed up at this stage, this is the effect of the satellite speed

on that station, NOT the satellite beacon frequency changing. Remember the beacon frequency was used as an example because of its constant and stable nature.

The minus sign (–) in front of the difference frequency figures indicate that the satellite is moving away from the station, which is what we would expect by the previously mentioned conventions.

It would be reasonable to assume that at each station the whole of the transponder band has been "shifted", so to speak, by the difference amounts (see Fig. 1). We can check that, of course, by calculating the other beacon frequency (no longer functional, but as this is only hypothetical, it will serve for our purpose) at the other end of the transponder band to see if our theory stands.

Looking at the technical notes, the frequency of the other beacon is 145.987MHz.

Station 1
145 985 874 =

$$145\,987\,000 - \left(\frac{2.315 \times 1000}{300\,000\,000} \times 145\,987\,000\right)$$

(difference of –1126Hz)

Station 2
145 985 828 =

$$145\,987\,000 - \left(\frac{2.41 \times 1000}{300\,000\,000} \times 145\,987\,000\right)$$

(difference of –1172Hz)

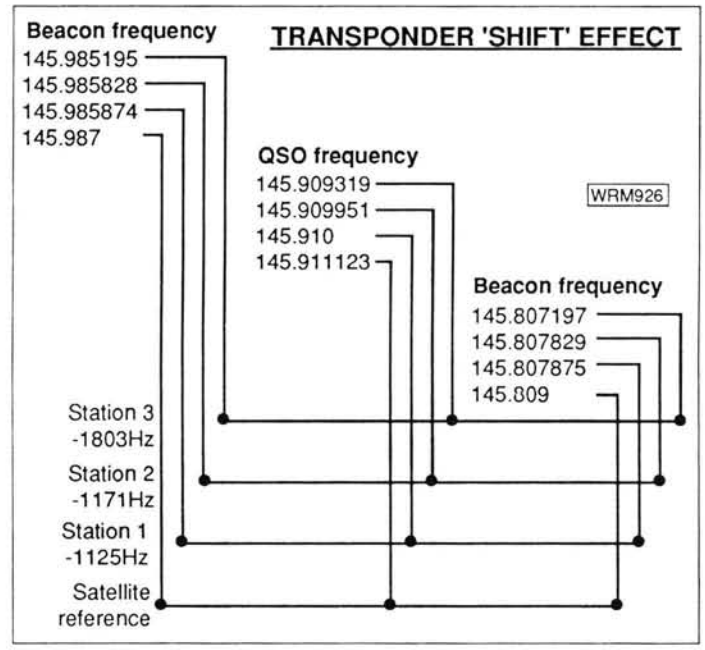
Station 3
145 985 195 =

$$145\,987\,000 - \left(\frac{3.71 \times 1000}{300\,000\,000} \times 145\,987\,000\right)$$

(difference of –1805Hz)

All be it for 1 to 2 hertz difference spread across the transponder band we can safely say the whole transponder has apparently "shifted" by those difference amounts indicated for each station.

Let us continue our scenario of a QSO between our three stations. We will take station 1, a clear frequency has been found at that station on 145.910MHz, which calls CQ on the uplink.



Uplink Frequency

Hold it you say, how do we know what uplink frequency to use? Looking again at the technical notes of the satellite, we see that the uplink frequencies range from 435.161MHz to 435.045MHz, we also note there is something called the translation frequency which is 581.004 7MHz. Translation frequencies are used as such. When using an inverted transponder such as those on OSCAR-10 and OSCAR-12 the Up/Down links are added together.

When using non-inverting transponders, such as those on the RS series, the down/up links are subtracted i.e. 29.430 – 145.930 = – 116.5.

We want an uplink frequency for a 145.910MHz downlink; by subtracting 145.910 from 581.004 7 we get 435.094 7MHz.

All very well, but if you transmit on this frequency you will not hear your own signal on 145.910MHz, but probably go over somebody else's QSO. As I have tried to show over the last few paragraphs the Doppler effect must be taken into account.

Station 1 wants to hear his own signal on 145.910MHz. This is back on the ground, not at the satellite. We have a rough estimate to go from a previous statement, that at station 1 the transponder frequency is "shifted" by 1126Hz, so the satellite frequency on transmit would be 1126Hz greater i.e. 145.911 126MHz.

Again it can be proved by our formula. It has to be changed though, as we do not know the satellite transmit frequency, only the ground receive frequency (Gnd. RX fHz) of 145.910MHz.

In the final part of this article we will look at the formula for obtaining the satellite's transmit frequency using the ground receive frequency. In addition there will be a computer listing and conversion chart which can act as a ready-reckoning guide to Doppler frequency shift.

ERRORS & UPDATES

PW Review May 1988 AFtronics SuperSCAF Audio Filter

The review suggested that a 250V Tandy transformer could be used to convert the standard 117V SuperSCAF to UK mains operation. Unfortunately, Tandy have now discontinued this component. However, a suitably sized 1A 6-0-6V is available from Cirkit Holdings plc, stock number 57-20601.

Practically Yours July 1988

The 4.7µF electrolytic capacitor in Fig. 2, should be marked C2 and not C4 as shown.

Getting to Know Your End-Fed λ/2 Antenna June 1988

Those gremlins got at the Errors and Updates on this article in our August issue. The multiplier 10.1 used in formula 1 and 2, should in fact be 1010.

Amateur Radio Stateside Part 2, August 1988

Our apologies to the American Radio Relay League and to the publishers of *CQ Magazine*, for confusing their publications. The official journal of the ARRL is, of course, *QST*.

On The Air
On The HF Bands

Reports to Paul Essery G3KFE
287 Heol-y-Coleg, Vaynor, Newtown, Powys SY16 1AR

Licence Proposals

Most readers by now will be aware of the proposals for a new class of licence announced at the NEC. I was at the meeting on June 25 when the RSGB's RLOs were presented with the demonstrable facts of falling youth interest in amateur radio, and rising average age among its practitioners. The evidence submitted indicates the problem is far more serious than most of us thought. Falling numbers on our side, rising pressures for our bands as satellites have been seen to be less reliable than expected, and the likelihood of the next WARC being as near as 1992 makes the problem urgent.

The RLOs who attended the six-hour meeting came from GM, GI, GD, GW, G, in fact the whole country. All, I suspect, started with severe doubts: all spoke, as far as I could tell, in the discussion and on a show of hands all were satisfied that the new proposals are, essentially, looking in the right direction. Those present all agreed to visit the clubs in their various areas and to pass on what they had learned. Readers are all asked to try to attend any local meetings at which the RSGB representatives (RLOs) for their areas will try to explain the details. Please listen and comment thoughtfully. RLOs are committed to passing any new points arising back to HQ.

The DTI have not formally been approached as yet, but unofficially I gather they like the idea. As for a name, RSGB called it a "student" licence, some at the meeting called it a "novice" licence. The subject of its name seemed to be the main point of controversy!

The proposals are that it is aimed mainly at the youngsters. It will be practically biased, blackboard stuff replaced by handling test meters, soldering irons and building up kits towards the station. The training course to be about 30 hours and pretty concentrated, plus 5 w.p.m. Morse, plus "homework" in the form of practical listening and log-keeping, proven by demonstration.

The licence would be non-renewable and progression would be to a normal A or B licence. Old people or disabled entering through this form of licence to have some opportunity to renew at the level. B licensees passing the 5 w.p.m. test would be permitted the student's h.f. privileges.

It's intended the "new" licence would have: power at 4 watts d.c. input; bands —a bit at Top Band, a tiny bit in the c.w. part of 3.5MHz, centred on the QRP c.w. channel, bits at 21/28MHz to marry with the US novice segments, a bit at 50MHz, 432MHz, 1.3GHz and 10GHz; modes will depend on band—c.w., phone and data communications. No allocations on the "popular bands" such as 14 and 144MHz.

It takes in the best ideas for attracting the young observed in existing approaches from both sides of the Iron Curtain, and it should go some way towards solving the problem. It isn't perfect—nothing human ever is—but it is a sincere effort. Personally, I think it's the way we should have gone forty years ago. If, when this one is buttoned up, we can go to the other end and bring up an "advanced" licence, marvellous! Meantime, go and hear, offer comments and try not to pass on false rumours about it.

The 28MHz Band

How nice to hear again from **Angela G0HGA** (Stevenage). Angie has been looking at 28MHz, but alas there is a TVI problem, so she only opens fire on this band when the viewers go to bed. The ten watts Angie has on the band resulted in QSOs, on c.w. to TX9IPA/MAR, UA6HPK, I5CFK, EA4KR, 4Z4YX, 4Z4OI, 4X4JU, 4X4FR, HB9RE, EA4CUD, I4YEK, NA1N, SP4DIR, DL2OBF, DL1PM, HA5AWT, EA6ZY, EA1ETF, I2CZQ, DF0ABG/P, DK9ZQ, G4CRC/P, GM4GRC/P, GM3VEY/P, OH9RJ, G4OJW/A, DK4JA, DL7MAL, DH4MAC, SP9AWT, YU3GL (QRP both ways), F6HNX, HB9RE and W3FX.

Turning to **G3NOF** (Yeovil), Don found the first couple of weeks in June quite good, with short path signals from 0700–0900 from BY, VK, ZL, YB/YC and Asia; US stations were noted between 2200 and 2400Z, mostly from the east coast, and on a few evenings the ZLs were noted. Africans were heard in the mornings and afternoons, with some South Americans in the evenings. Contacts using s.s.b. were made with BY5RT, HI8FHD, J28DN, KG4DM, NP2CM, OE1RUA/YK, PY0FC, TI2LCR, TU2QQ, V44KI, assorted Ws, ZB2IQ, ZY0TK (Trindade Is.), 5T5NU, 9N1MC and 9X5AA.

Conditions must have been SUPER on 28MHz for **G2HKU** to show a nose on the band . . . Ted used his key to work 4X0V, 4X1IF, PY2OU, 9J2AL, PY2UJJ, 5H1HK, 4M7A, CE3DNP, ZY5ZBA, 9J0A, LU8DQ, PY1AJK, PY5BVL, AY4F, VP2EMA, HC1BI, 9Q5DA and W2KVA/VP2M. Amid this welter of QSOs, Ted found time to do tests, switching between his Butternut vertical and the G5RV. He comments how often the resulting change in received signal did not equate to the change in transmitted signal!

A new contributor from France is **Jean-Yves Camus** (Creteil) who has an FRG-7700 and FRA-7700. Jean-Yves has noticed openings since mid-May, including such EDX as ZB2IQ, TK/DJ2GM in Corsica, GU4GNS, GB75WLG, EI9GP, GI0JPR, GW, GM and Scandinavians, plus 4N7MM, NP2CM from the US Virgin Is and 8P6SS.

Next **G8NT** (Leiston). Dick is 79 now, and was able to come back with his pre-war call after years as BRS 31879. G8NT-post war got back on in March 87 and has been loving every minute of it. So far the score on 28MHz is some 48 countries, using an FT-902DM plus FC-902 a.t.u. Struggle it may be, but with VK, ZL, ZS, JA, KL7, VS6, FT2XE, FP, YB, YN, YV, KH6, F2DX/FJ and such-like worked, the struggle has been great fun. Long may it continue.

Next **GM4ELV** (Glasgow). David doesn't say what band his offerings are, with one exception so I must make an educated guess and say 28MHz and QRP. Over the period April 3 to June 2, there was TA2AO, UM8MO, 4Z4OI, CE7INQ, ZD8MAC, SV9ABG, 5T5NU, 9J2BD, OD5PL, ZS6AJX, ZC4EE, J28EV, RI8AK, UL7OB, SV9ANK, TA1AZ, LU8MBX, PP5II and PP5IL OM and YL respectively, ZS3BI, ZC4AB, OD5VT, S0RASD, EL2DK and EL2WK YL and OM respectively, Z22OM, HB0HTA, PT2ZDR, TA3D, CT3DL, LU2CC, LU1HZM, CN8EL, 5Z4LL and the usual crop of gotaways.

Now we turn to the report from **G0JBA** (Sittingbourne) who says he has found the band quite interesting. VK6NKG was missed from Cocos-Keeling but was snaffled when he moved to Christmas Is. The phone signals out were aided by a ten-metre home-brew beam and the QSOs added to AX9NKG, DL7ABA (West Berlin and a 1hr 25 min QSO!), EA6VQ, FD1LJZ, FY0EK (French Guiana), GI0BFO, EI7GL, HA3GJ, IN3VZE, KA2YCJ, KB2FIO, K3QAM, LA5SGA, LA4BFZ on f.m., NA1N, OE6HOG, OK1KZ, OZ4BO (again an f.m. contact), SM4MKF/M, SP2ZF, TI2LCR, UC1AWZ, UQ2GQC, VO7FG, WD0EGD, YU2CTG, Y59UJ and ZB2IQ.

G4AGQ (Farnham), thanks to work, often finds that by the time he can get into the shack the band is dead. However a couple of sessions on Brighton Racecourse, with the f.m. and s.s.b. in the car yielded CE4JZS on s.s.b.; Friday June 3 was quite spectacular from the same site when DK9LO/M was worked for 30 minutes, followed by PB0ANZ, although the latter escaped as his signal dropped from 59+ to inaudibility during Patrick's quick call. Later G4AGQ was called by ZP5LOY who reckoned the band was full of S1 Europeans but just one readable signal. G4AGQ didn't complain! An interesting trip between Colchester and home resulted in a QSO with an SM coming to a grinding halt upon reaching the Kent side of the Dartford Tunnel — this is the second time the difference in apparent conditions on either side of the river has been observed.

The 3.5 and 1.8MHz Bands

G0HGA managed to put between 50 and 100 watts up the spout on this band and so raised quite a gaggle of stations on c.w.; G4KKZ (Cornwall), HA5KF, SM0COK, DL6KCR, DF5DR, UB5ZFO, G0FDA (Durham), G0CUK (Lancs), OK1FTM, OK3CGI, LA1IE, LA3X, SM0KY, OK2HMW who was QRP, G0IPX, HB9CUB, HA9KR, OK2BWJ, a T46ACO with a QTH copied as "Lemshi" through QRM and QSB (was that a TV6ACO, we wonder?) SP6PLH, LA5AG, ON4CW and of course lots of DL/PA/ON/F/OZ/LA and Y stations.

The next three deadlines are: July 27, Aug 31 and Sept 21

Dick G8NT notes that he has managed some 44 countries on 3.5MHz but doesn't mention any particular ones.

A cynical comment about these two bands from Jean-Yves Camus, who comments shortly, "Have to move to a quieter spot during the holidays to dig something out of the QRM!"

Here & There

The main reason for G8NT's letter was to answer the query about a QSL address in the column a couple of outings back. Dick sent a Xerox of his own QSL from 5A0A, from which we glean that Bert's address is: SP6BZ, Wieslaw Ziolkowski, Post Office Box 253, 50–950 Wroclaw 2, Poland.

As usual, this bit of the column is thanks to W1WY's *Contest Calendar DX News Sheet, The DX Bulletin,* CARF's *The Canadian Amateur* and various readers' ears.

August 13/14 for c.w. and September 10/11 for phone are the dates for the European DX Contest. This one has the "QTC" feature, whereby non-EU stations get extra points for reporting an earlier completed QSO back to a European entrant. The general idea is you work a string of EUs, and then report them back to a European entrant for an extra point for each station so reported. Such a QSO can be reported only once and not back to the chap you had a QSO with. Mailing deadline September 15 for c.w., October 15 for phone to WAEDC Contest Committee, PO Box 1328, D-8950, Kaufbieren, Federal Rep. of Germany. Otherwise it's fairly standard.

DXNS says the situation as far as the EPs are concerned is obscure: DXCC Desk won't give credit for any currently active EP stations, but EP2DA appeared in the June *QST* DXCC listings as a new member in the phone listings. Furthermore, EP2FM says he is the only legally active EP station in the last twenty years.

The JY8XY and JY8KS activity by OH6XY and VO1KS were, says the Secretary of the Royal Jordanian RAS, illegal operations. Managers of all the major awards programmes have been notified to this effect, so don't bother to submit these QSLs.

Talking of bootleggers there have been plenty around the 4W0EA, but at the time the real expedition hadn't even set off . . . Doubtless the Real McCoy will have come and gone by the time you get this!

DXCC cards now acceptable for credit include AI4AA-B-C, and TY0LC. ET3JIN cards are also reported to be acceptable.

The 14MHz Band

G2HKU (Sheppey) had his regular s.s.b. sked with ZL3FV; otherwise it was c.w. to N5RZ, KC1Q, JA1YFG, AA4U, W9SU, VO8AC, N2AA, VP2VCW, VE3KP, YN3EO, K4EFZ, JA2JW, TW6A, BY6A, W8VSK, 9H1MRL, K0KES, TX9IPA/MAR, W2LZX, W9GW, W7BYG, F2DX/PJ6, N6QMT, K9UIY, K6NL, N4UB/3, F2DX/PJ5, UL7NR, VE6AMR, KB0AUK, K4KQ, VK2QL, SV1LV, N6QR, UZ9AWH, CO5HL, K2OZ and W6WQX.

Jean-Yves Camus notes hearing (s.s.b.) TF5BW, JW0B, IK3HAQ/IL3 (QSL via IK3IBY), CO8GB, PZ2AC, I88ITU (QSL via I8MPO), TV6OLE which counts for IOTA as EU32 (QSL via F6AUS), CV0PJP (Uruguay special for visit of the Pope), plus good signals from VK in the mornings.

Don G3NOF (Yeovil) reports s.s.b. contacts opening around 0500Z, with contacts over the N. Pole from the Pacific, KL7, KH6, ZL up to about 0900Z; the long path to VK/ZL was open 0700–1000, Asians by short path 1400–1700. QSOs were made with AL7HX, C31SD, CE0ICD, CU3AA, FK0KAB/P, FO4NP, FO5LU, EL2BG, J37AH, HC2DZ, HC2RG, HK0EFU, JW0B, KL7XD, KH6FKG, KP4JM, TF5BM, UA0QO, UA0KB, OE2AWN/5B4, TF5BW, TG9NX, VE7CDB, many VKs including VK9XT and VR6TC, WA4ZEL/JW, WY5L/KH3, XE1ALH, XE2KAC, XT2AT, ZB2AZ, ZK1DD, 5R8JD, 5N0SKO, 5V7WD and 8Q7MT.

For G0HGA, VE1AEY (Prince Edward Is) was worked, but ZL4AK working in the G/VK/ZL net with G3FPK Got Away.

Going back to G8NT, Dick notes he has made 101 countries on this band, though none are specified.

The 21MHz Band

G0JBA (Sittingbourne) put up a wire dipole between the tower and the house chimney, with which 20 watts of c.w. raised UA1OFQ, and 50 watts s.s.b. got to N2DRM.

As for G2HKU he stuck to c.w. and raised N6EA and W5GEL.

Jean-Yves Camus stayed on s.s.b. and pulled out HC5EA, OA0PAX (QSL via OA4OS), PJ2WOL, A92BE, and CE0ICD, the latter at 1920Z on June 19 on 21.232MHz.

G3NOF noted short path openings to JA sometimes from 0700–midnight, North Americans 1100–2400. Contacts using s.s.b. were made to A4XRS, BY4SZ, BY5NC, CE0FFD, CE0ICD, CE1LGD, CP1PR, DU1CJC, FP/KA3B, FY0EK, HI8VMA, HL1AIW, HL1XP, HL2INX, HL0Y, HZ1AB, J6LHG, J6LMV, J87CD, J79LC, many JAs, JT1T, K4SXT/DU3, KC6SI, KL7TC, NL7K, ON7IP/DU9, RL7FER, S79LB, UM9MCW, UA0BK, UH8AAX, UI8AGH, many YB/YCs, ZC4AB, ZK1XV, ZY0TK and 4F1FZ.

The 7MHz Band

First in is G2HKU; Ted mentions c.w. with W4PBC/MM, N4MQS, K4KQ, VK3MR, VP2EMA and VK3VJ.

Turning to the report from Jean-Yves Camus, 7MHz showed with TU4BR/5U7 in Niger, RS44 at 2125.

With some 70 watts of c.w. to her wire antenna, Angie G0HGA managed to raise all sorts of European and G stations during the daytime, plus GM3HGA/P—that must have confused any listeners!—and around midnight KM1H and N4WW. Going down to 3 watts, Angie worked G4XJS, DL1DQ and ON5AG all two-way QRP.

Now we turn to **PA3CWN** who has moved from Terschelling since last time and is now at Leeuwarden. Nevertheless Oene found time to operate on 7MHz c.w. to raise YN3EO, 7X2CR, ZL1TN, ZL1ATZ, ZL2NP, ZL3OE, ZL2BIF, ZL4BI, ZL3BJ, ZL1AFU, ZL2TI, ZM1BCC, VK2AXR, VK3VJ, VK2EOY, AX3XB, 9Y4/J6LAD, PZ1AV, TY9SI (via DJ6SI), Y88POL, PA2GFL/XE3, 9Q5DA, TR8JJC, C31YY, CE3ZW, CE6HIY, 9Y4VU, VE3DXI/4S7, CP3CN, HK4GGK, HK1KXA, LU1EPQ, LU5DLG, LU1RAI, LU0CJY, LU4FC, LU1XQH (Tierra del Fuego), T77G, FK0AW (via F6BFH), HI500RCD (via HI8RCD), V21WW, ZS1AAX, UW3HY/1, TK/DL7HZ and lots of W/VE/PY stations.

New Bands

Just a single report: G2HKU stuck to c.w. and raised VK2APD, W4QEJ, ZL2AKW, VK5BVM, VK5FE, WB3IJM, K4YPX, OK1JST/P and VK4KS.

The 50MHz Band

This is really one for the VHF-Up column, but **G4TLY** wrote with joy of the opening on June 6, which he operated using a *PW* Meon at 3 watts and a linear to ten watts, feeding a five-element Yagi. The opening started at 2000 and G4TLY finally set off for his pit around 0230, after hooking some 26 assorted W and VE stations using powers between 10 watts and 1 kilowatt, all with 59 reports. As Ted notes, when the band is well open, it doesn't seem to make a lot of difference what power you run. The corollary to that is that when the band is flat, the guys with beams can get through when dipole and verticals just don't produce the goods.

VHF Up

Reports to Norman Fitch G3FPK
40 Eskdale Gardens, Purley, Surrey CR2 1EZ.

The beginning of June saw some excellent E-layer propagation with a major opening to the USA on 50MHz on the 6th and some extensive Es on 144MHz on the 2nd, 4th, 5th and 7th. The Square Bashers Group's operation from Gibraltar was very successful on all v.h.f. bands.

Awards News

Another reader has joined the rather select 430MHz QTH Squares Century Club. He is **Norbert Graf DD3KF** from Aachen (DK21b) in West Germany who is already a member of the 144MHz QTHCC.

He started operating on the band in 1978 using an Icom IC-402 at 3W output to a 19-ele Yagi. Last year he changed to an IC-475E with 25W output. His QTH is 250m a.s.l. and the antenna is 16m a.g.l.

Norbert has 105 confirmed out of 108 squares worked by April 30 and his application was verified by Dr Roland Miller DL2OM, manager of the DL v.h.f. "Top-list." All QSOs were s.s.b on tropo. His membership number is seven and his certificate was dated June 17.

On 144MHz **John Hunter G3IMV** (ZL07h) was awarded his sticker for 400 squares on June 29, a truly remarkable achievement. He has worked 405 so his QSL return has been excellent. Some cards, in spite of aggressive QSLing, took several years to arrive and he enlisted the help of other amateurs in the various countries to get some of the cards.

The breakdown of the latest 25 is seven on s.s.b. and 18 on c.w. Five contacts were on tropo, four via Es, one by Aurora and 15 on m.s. The m.s. ones included such rarities as DL4EA/LA in CV and DW, DL4EBY/LA in FY and DF5GX/SM in HY and IZ.

It is worth repeating that the G3IMV station is a modest one—a single 4CX250B amplifier and a single Yagi. John's QTH is a very ordinary one in Bletchley with no advantage of a coastal site or high elevation in a quiet location.

Any reader wanting information on the QTHCC and VHFCC awards should send an s.a.e. to the Poole address. The actual certificates are processed from my home QTH. A reminder however that, although there is no charge for the certificates,

return postage must be included as I am not prepared to fund it from my own pocket.

The 50MHz Band

Now that so many British Isles amateurs are using 50MHz we are better able to understand the propagation aspects on a monthly basis. It is quite clear that, while on 144MHz Sporadic-E events in June may occur anything from once to ten times, on 50MHz openings to somewhere or other are much more frequent.

Band I TV watchers have appreciated this for years, of course. If pictures from Spain are strong, then the band will be open to EA and CT, for example.

A comment about unlicensed stations. As far as I can ascertain, no Spanish amateurs have permission from their licensing authority, the DCHA in Madrid, to transmit on the band.

In France the licensing authority is the DTRE to whom the original applications to operate were made. This was set out in the letter from the REF to its members dated January 12. My best information is that all applications were to be vetted individually, the final decision as to whether to issue a licence being made by the broadcasting authority, the CNCL.

In Sweden it seems that club stations might be getting permission to use 50MHz, according to a usually reliable source and some Finnish stations are now operating on the band under special permits. Other European countries where 50MHz operation is legal are CT, EI, LA, PA, SV, TF and 9H.

No doubt other countries will allow 50MHz operation in the future. As far as our tables are concerned only in-band QSOs with stations actually licensed to use the band will be recognised. So please do not include any cross-band contacts, or in-band ones with EA or DL.

Etienne Swart ZS6CE from Ranburg (KG34) has been using packet radio on 50.610MHz s.s.b. He has adopted the h.f. protocol, 170Hz shift and 300 baud rate. The hardware is a KAM/C-64/IC-505 set-up running 60W to a T.E.T. antenna 8.5m a.g.l.

The PBBS call is ZS6CE-1 and the antenna will be turned to Europe for the next t.e.p. season from the end of August. Etienne should be back on the air about the time this is published.

Dave Austen G1EHF (LDN) wrote to say he is QRV with a Meon transverter, 10W p.a. driven by an Icom IC-290H and 3-ele Yagi. He has made a lot of Es QSOs.

Tony Wayland G1HJW (ESX), on June 1, worked ZB2IQ (IM76HE) and also heard beacon ZD8VHF. Other early June QSOs included LA6QBA/P (JP61), CT1DTQ (IM58), CT4KQ (IN60) and 9H1ES (JM75).

A second letter covered the first opening to North America this year on June 6 when he worked W3XO (MD/FM19) at 1729, then W3WFM and WB2ISC (VA/FM27). At 1750 the conditions changed but the band opened up again at 2100.

The second spell brought stations in FM and FN fields in CT, DE, MD, NJ, NY, PA and VA plus FP/KA3B (GN16) on St. Pierre off Newfoundland. Tony reports the band going flat at 0150 on the 7th.

From 0655 he contacted a couple of LAs and northern GMs including GM4ISM/P (SLD) in IP90KD at 0843. Between 1045 and 1145 there were more North American QSOs with FN field including WA1AYS (MA) and KA1MVB (ME).

In reports of US States worked I will use the official US Post Office, two-letter abbreviations which are pretty obvious.

Annual v.h.f./u.h.f. table
January to December 1988

Station	50MHz		70MHz		144MHz		430MHz		1296MHz		Total Points
	Counties	Countries	Counties	Countries	Counties	Countries	Counties	Countries	Counties	Countries	
G1KDF	38	15	—	—	82	13	54	9	24	6	241
G1SWH	34	15	—	—	84	17	47	6	—	—	203
G6HKM	14	10	—	—	69	21	43	9	16	5	187
G4XEN	36	13	—	—	61	22	40	8	—	—	180
G8LHT	8	6	—	—	52	21	35	8	—	1	131
G1IMM	26	8	—	—	52	11	31	2	—	—	130
GM0EWX	53	12	—	—	49	13	—	—	—	—	127
GW6VZW	35	10	—	—	62	11	—	—	—	—	118
G1EZF	—	—	18	2	67	23	—	—	—	—	110
G4DEZ	26	5	—	—	24	8	24	5	12	5	109
G0IMG	28	9	16	1	40	8	6	1	—	—	109
G4YCD	—	—	—	—	83	23	—	—	—	—	106
G4VOZ	17	11	40	5	—	—	19	6	—	—	98
GM0HBK	26	8	—	—	46	15	—	—	—	—	95
G6MGL	19	10	—	—	49	10	—	—	4	2	94
GW4FRX	—	—	—	—	67	26	—	—	—	—	93
G3FPK	—	—	—	—	72	18	—	—	—	—	90
G6MXL	15	7	8	3	31	9	11	2	1	1	88
G4ARI	—	—	16	2	58	9	—	—	—	—	85
G8PYP	13	9	2	1	38	12	6	2	—	—	83
G1DOX	16	2	19	2	22	5	5	2	2	1	76
GW4HBK	20	16	32	4	—	—	—	—	—	—	72
GI4OWA	12	14	—	—	35	9	—	—	—	—	70
G4AGQ	—	—	9	1	34	7	11	1	—	—	63
G2DHV	5	1	12	1	28	6	7	1	—	—	61
ON1CDQ	—	—	—	—	46	15	—	—	—	—	61
ON1CAK	—	—	—	—	44	13	—	—	—	—	57
GJ6TMM	8	9	—	—	27	9	2	1	—	—	56
G8XTJ	—	—	—	—	47	6	—	—	—	—	53
G3EKP	12	3	16	4	7	4	5	1	—	—	52
G4WHZ	3	2	—	—	31	12	—	—	—	—	48
GM0JOL	—	—	—	—	30	10	—	—	—	—	40
G1SMD	12	3	—	—	20	4	—	—	—	—	39
G4ZVS	—	—	—	—	34	5	—	—	—	—	39
G0HDZ	—	—	—	—	30	5	—	—	—	—	35
G0HGA	—	—	—	—	30	5	—	—	—	—	35
G8PNN	—	—	20	3	—	—	—	—	—	—	23
GU4HUY	—	—	—	—	18	3	—	—	—	—	21
GM1ZVJ	—	—	—	—	12	5	—	—	—	—	17

Adrian Gee G1IMM (CBE) added LA, CT, ZB2 and F to his country tally in June, but missed the American openings due to being at work. I have included France in countries claims as it seems some French stations recently have been insisting they have received their permits.

Bob Nixon G1KDF (LNH) has been working the usual Es contacts to LA and 9H including LA8KV/M in Oslo on May 23 and the Athens University station SZ2DH (KM18UA) on May 27. He caught the transatlantic opening on June 6/7 the main part from 2218 to 0110.

June 19 brought EI8EF (Donegal), GI4OWA (LDR) and GI0GDP (ATM) and at 1330 CT4KQ. Bob found CT1WW at 1630 on the 21st and on the 25th, OH1ZAA (KP01) and OH3TR/1 (KP11) were new.

New counties in June for **Gerry Schoof G1SWH** (MCH) included GI4OWA, GM4ISM/P, EI8EF and EI9Q (Waterford). New countries were CT1DTQ, FP/KA3B. W3WFM, VE1YX and ZB2IQ, plus Shetland which we count as additional to Scotland/Orkney as per Worked All Europe rules.

Welcome to **Howard Phillips G1MUM** (WLT) who uses a Yaesu FT-690R Mk 2 and 4-ele Jaybeam Yagi on a d.i.y. portable stand. He worked his first Es event on June 5 at 0701 with LA6QBA/P (JP61BJ) which was his first QSO outside England. At this time, his antenna was in the garage pointing at a metal door. At 1031 he contacted LA1K (JP53EK).

Another new contributor is **Mike Devereux G3SED** (HPH) who lists many in-band and cross-band QSOs in the period May 30 through June 7 into Europe when there was intense Es almost continuously.

He worked the regular LA, CT and 9H stations, heard beacon 5B4CY on May 30, June 1, 4 and 7 and got his 50MHz signals to 4X1IF (KM72KD) at 1950 on the 3rd. At 2020 SZ2DH was the first in-band Greek station.

Mike lists a whole pageful of W/VE stations heard or worked between 1710 on June 6 and 0015 the next day, most in the FM and FN fields. At 2250 he notes K9LCR (IL/EN62) and at 0012 WA4NJP (EM84).

Also in his letter some interesting DX news that at 0820 on June 7, GM6VXB (IO97AQ) worked 9J2CR in Zambia as did G8FUO (BRK) and probably others. It seems that 9J2CR did not know his locator, nor is he listed in the latest International Call Book.

Paul Turner G4IJE (ESX) worked KP4EIT in Puerto Rico at 1137 on June 7. This could probably be a G/KP4 "first" unless another reader has knowledge of a prior QSO.

Ken Osborne G4IGO (SOM) sent in his usual detailed account of openings to the various directions. The first few days in June brought QSOs with CT1DTQ, LA6QBA/P, SZ2DH, ZB2IQ and 9H1CG.

At 1348 on the 3rd the Potters Bar beacon GB3NHQ was copied at an azimuth of 180° for an hour. The next day, for a couple of hours from 0945 with the beam at 150° another back scatter event brought QSOs with Gs in AL, XK, XL, YL, YM, YN and ZL squares plus a GI in WP and a GM in YP.

On the 5th GB3NHQ was again copied at 180° from 1213 to 1302 with GB3SIX in Anglesey coming in at 300° in the same period. Between 1548 and 1722, GB3NHQ and GB3RMK (XR) were copied at 160° and Ken worked a GI at 1555.

On the 6th he worked some Ws between 1519 and 1741 in FM and FN fields and the band opened again from 2057 in which period he also mentions FP/KA3B and K9LCR.

Reg Ward & Co. Ltd.

1 Western Parade, West Street, Axminster, Devon, EX13 5NY.
Telephone: Axminster (0297) 34918

Yaesu

FT767	HF Transceiver	1550.00	(—)
FEX767(2)	2m Module (767)	169.00	(3.00)
FEX767(70)	70cm Module (767)	215.00	(3.00)
FEX767(6)	6m Module (767)	169.00	(3.00)
SP767	Speaker	69.95	(2.50)
FT290	Mkll New Super 290	429.00	(—)
FT690	Mkll 6m M/Mode 2·5W	399.00	(2.00)
MMB11	Mobile Bracket SPECIAL	PRICE	(2.00)
NC11C	Charger	10.50	(2.00)
CSC1A	Carrying Case	6.50	(2.00)
YHA15	2m Helical	7.50	(2.00)
YHA44D	70cm 12wave	12.50	(2.00)
YM49	Speaker Mike	23.00	(2.00)
MMB15	Mobile Bracket	14.55	(2.00)
FT23R	2m Mini H/H	223.50	(3.00)
FT73R	70cm Mini H/H	243.50	(3.00)
FNB9	Nicad Battery Pack (23/73)	27.60	(2.00)
FNB10	Nicad Battery Pack (23/73)	32.60	(2.00)
FNB11	Nicad Battery Pack (23/73)	50.60	(2.00)
NC 18C	Charger (23/73)	12.35	(2.00)
SMC28	Charger (23/73) 13A Plug	15.40	(2.00)
NC 28	Charger (23/73)	17.71	(2.00)
NC 29	Base Charger (23/73)	57.50	(3.00)
PA6	Car Adap/Charger (23/73)	18.40	(2.00)
MH12A2B	Speaker Mic	29.75	(2.00)
MH18A2B	Speaker Mic Miniature (23/73/727)	27.00	(2.00)
FT727R	2m/70cm H/H	425.00	(3.00)
FNB3	Spare Battery Pack	41.00	(2.00)
FNB4	Spare Battery Pack	46.00	(2.00)
FNB5	Empty Cell Case	10.00	(2.00)
FRG9600M	60-950MHz Scanning RX	509.00	(—)
PA4C	Power Supply for 9600	21.00	(2.00)
MMB10	Mobile Bracket	10.00	(2.00)
NC9C	Charger	11.50	(2.00)
PA3	Car Adaptor/Charger	21.85	(2.00)
YM24A	Speaker Mike	21.05	(2.00)
FRG8800	HF Receiver	639.00	(—)
FRV8800	Converter 118-175 for above	100.00	(2.50)
FRT7700	RX ATU	59.00	(2.50)
MH1B8	Hand 600 8pin mic	21.00	(2.00)
MD1B8	Desk 600 8pin mic	79.00	(2.00)
MF1A3B	Boom mobile mic	25.00	(2.00)
YH77	Lightweight phones	19.99	(2.00)
YH55	Padded phones	19.99	(2.00)
YH1	Liveweight Mobile H/set-Boom mic	19.99	(2.00)
SB1	PTT Switch Box 208/708	22.00	(2.00)
SB2	PTT Switch Box 290/790	22.00	(2.00)
SB10	PTT Switch Box 270/2700	22.00	(2.00)
FT736 **NEW**	2/70cm 25W Base Stn.	1,450.00	(—)
FT747GX	160-10 All mode TX Gen. Cov.	659.00	(—)
FT2311R	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	Multi-mode audio filter	89.70	(2.50)
FL3	Audio filter for receivers	129.00	(2.50)
ASP/B	r.f. speech clipper for Trio	82.80	(2.50)
ASP/A	r.f. speech clipper for Yaesu	82.80	(2.50)
ASP	As 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)
AD370-MPU	Active dipole with mains p.s.u.	69.00	(2.50)
DC144/28	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)

ICOM

IC761	New Super HF Transceiver	P.O.A.	(—)
IC751A	HF Transceiver	1465.00	(—)
IC735	New HF Transceiver	949.00	(—)
AT100	100W ATU (751/745)	365.00	(3.50)
AT150	150W ATA (735)	315.00	(3.50)
PS55	Ext PSU (735)	185.00	(3.00)
IC505	50MHz multi-mode portable	495.00	(—)
IC290D	2m 25W M/Mode	542.00	(—)
IC28E	25W FM	359.00	(—)
IC28H	2m 45W FM	399.00	(3.00)
IC Micro	2E New Mini H/H	239.00	(3.00)
IC2E	2m The Original H/H	225.00	(3.00)
IC02E	2m H/H	269.00	(3.00)
IC275E	New 2m 25W Base Stn	1039.00	(—)
IC4E	70cm H/H	285.00	(3.00)
IC04E	70cm H/H	299.00	(3.00)
IC48E	70cm 25W FM Mobile	449.00	(3.00)
IC490	70cm 10W M/Mode	617.00	(—)
IC3200	2m/70 Dual Band FM Mobile	556.00	(—)
IC12E	23cm H/H	428.00	(3.00)
ICR71	Gen Cov RX	825.00	(—)
IC7000	VHF/UHF Scanner	957.00	(—)
AH7000	25-1300MHz Discone	82.00	(3.00)
SP3	Ext Speaker	61.00	(2.50)
CK70	DC Cable (R70/R71)	7.00	(2.00)
EX257	FM Board (R70/R71)	41.00	(2.00)
GC5	World Clock	43.00	(2.50)
AG12	Waterproof Bag all Icom H/H	14.38	(2.00)
BC35	Desk Charger	70.15	(2.50)
BP3	Battery Pack 8.4V (2/4E/02/04E)	29.90	(2.00)
BP4	Empty Battery Case (2/4E/02/04E)	9.20	(2.00)
BP5	Battery Pack 10.8V	60.95	(2.50)
BP7	Battery Pack 13.2V (02/04E only)	74.75	(2.50)
BP8	Battery Pack 8.4V	71.30	(2.50)
CP1	12V Charge Lead BP3/7/8	6.90	(2.00)
DC1	DC/DC converter operate from 12V	17.25	(2.00)
FA2	2m Helical BNC	9.20	(2.00)
FA3	70cm Flexible 1/4 wave Antenna (BNC)	9.20	(2.00)
HM9	Speaker/Mic	21.85	(2.50)
HS10	Head set Boom Mike	20.70	(2.00)
HS10SA	Vox Unit HS10 (02/04E only)	25.30	(2.00)
HS10SB	PTT SW Box HS10	20.70	(2.00)
LC1	Leatherette Case 2E/4E + BP5	6.90	(2.00)
LC3	Leatherette Case 2E/4E + BP3	6.90	(2.00)
LC11	Leatherette Case 02E/04E + BP3	9.20	(2.00)
LC14	Leatherette Case 02E/04E + BP5/7/8	9.20	(2.00)
SS1	Shoulder Strap	10.35	(2.00)
SM6	600ohm 8P Base Mic	46.00	(2.50)
SM8	1.3kΩ/600Ω 8P Base Mic	82.00	(2.50)
SM10	Comp/Graphic Mike	116.00	(3.00)

CW Keyers

VIBROPLEX			
Iambic Standard		63.33	(3.00)
Iambic Deluxe		78.09	(3.00)
Vibrokeyer Standard		63.98	(3.00)
Vibrokeyer 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			
Kenpro	Electronic Keyer Unit (No Paddle)	54.70	(3.00)
Kenpro	Electronic Memory Keyer (No Paddle)	95.00	(3.00)

KENWOOD

TS940S	9 Band TX General Cov RX	1995.00	(—)
AT940	Auto/ATU	244.88	(3.00)
SP940	Ext Speaker	87.55	(3.00)
TS930S	9 Band TX General Cov RX	1695.00	(—)
AT930	Auto/ATU	206.03	(3.00)
SP930	Ext Speaker	86.23	(3.00)
TS440	9 Band TX General Cov RX	1138.81	(—)
AT440	Auto/ATU	144.82	(3.00)
PS50	H/Duty PSU	222.49	(3.00)
AT230	All Band ATU/Power Meter	208.67	(3.00)
SP230	External Speaker Unit	66.49	(3.00)
PS430	Matching Power Supply	173.78	(3.50)
SP430	Matching Speaker	40.81	(3.00)
SM220	Station Monitor	343.62	(3.50)
BS8	Band Scope Unit (830/940)	77.00	(2.50)
TL922	10/160 2kW Linear	1495.00	(7.00)
TH21	2M Mini H/H	189.00	(3.00)
TH41	70cm Mini H/H	218.00	(3.00)
TH205	2M H/H	215.26	(3.00)
TH215	2M H/H Keyboard	252.13	(3.00)
TR751	2M 25W M/M Mobile	599.00	(—)
TS711	2M 25W Base Stn **(New Low Price)**	898.00	(—)
TS811	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)
R5000	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	25.00	(2.00)
EB2	Ext. Battery Case TH21/41	6.77	(2.00)
HMC1	Headset with Vox TH21/41	32.91	(2.00)
PB21	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 TH21/4/2600	28.31	(2.00)
MC50	4P Desk Mic	46.08	(3.00)
MC60A	8P Desk Mic	88.22	(3.00)
MC80	Electric Desk Mic	53.98	(3.00)
MC85	Desk Mic Audio Level Comp	99.00	(3.00)
MC43	8P Fist Mic	22.22	(2.00)
MC35	4P Fist Mic	21.72	(2.00)
MC55	Mobile Mic (6p.o. 8p)	52.67	(3.00)
LF30	HF Low Pass Filter	32.26	(2.50)
HS6	Lightweight H/phones	24.36	(2.50)
HS5	Deluxe H/phones	37.54	(2.50)
TS140	HF 9 Band Gen. Cov. TX/RX	862.00	(—)
TW4100	2/70cm FM Dual band model **SPECIAL**	499.00	(5.00)
RZ1	500-950MHz AM/FM Scanner	465.00	(6.00)

SWR/PWR Meters

WELZ			
SP225	1.8-200MHz PWR/SWR/PEP	99.95	(3.00)
SP420	140-525MHz PWR/SWR/PEP	59.95	(3.00)
SP425	140-525MHz PWR/SWR/PEP	119.95	(3.00)
SP825	1.8-200-430-800-1240MHz	169.95	(3.00)
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' Skts Switch	23.50	(2.50)
Kenpro KP21N	2 way Switch 'n' Socket Deluxe	27.00	(2.50)
T30	30W Dummy Load	10.29	(2.50)
T100	100W Dummy load	45.00	(3.00)
T200	200W Dummy load	65.00	(3.00)
WAI	Wavemeter 120-450MHz	24.95	(2.00)
PK232	Packet/RTTY Terminal	269.95	(3.00)

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

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

STOCK ITEMS USUALLY DESPATCHED WITHIN 48 HRS.

DELIVERY/INSURANCE PRICES IN BRACKETS

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 × 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 × 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

AIRCASTLE PRODUCTS
P.O. BOX 78
BOURNEMOUTH
BH1 4SP
(0202) 666233

PLEASE STATE WHICH RX YOU HAVE

VALVES

*High Quality **Very High Quality
Prices correct as at 9/5/1988 but may fluctuate 15% VAT incl

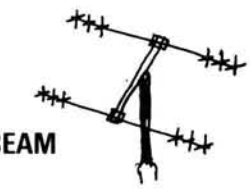
A1065	1.40	EBF89	0.80	EF89	1.60	EY81	1.10	PFL200*	2.80	UCC84	0.85
AZ293	7.00	EC52	0.65	EF91	1.60	EY86/87	0.75	PL36	1.60	UCC85	0.70
AZ900	12.75	EC91	4.80	EF92	2.15	EY88	0.65	PL81	1.30	UCH42	2.50
AR8	1.15	EC92	1.85	EF95	1.90	EZ80	0.80	PL82	0.70	UCH81	0.75
ARP3	1.15	ECC81	1.25	EF96	0.60	EZ81	0.80	PL83	0.90	UCL82	1.60
ARP35	1.15	ECC82	0.95	EF183	0.75	GM4	8.90	PL84	0.90	UF41	1.85
ATP4	0.90	ECC83	1.10	EF184	0.75	GN4	6.30	PL504	1.25	UF80	1.60
B12H	6.90	ECC84	0.60	EF812	0.75	GY501	1.50	PL506	2.00	UF85	1.45
CY31	2.40	ECC85	0.75	EFL200	1.85	GZ32	1.90	PL509	5.85	UL84	1.50
DAF70	1.75	ECC88	1.10	EH90	0.85	GZ33	4.20	PL519	5.85	UM80	1.80
DAF96	0.90	ECC189	1.20	EL32	0.85	GZ34	2.45	PL802SE	3.45	UM80*	2.30
DET22	32.80	ECC804	0.65	EL34	3.25	GZ34*	4.40	PY80	0.70	UM84	0.95
DF92	0.65	ECF80	1.25	EL34*	5.95	GZ37	3.95	PY81/800	0.85	UY82	0.70
DF96	1.15	ECF82	1.15	EL82	0.70	KT77**	14.00	PY82	0.75	UY85	0.85
DH76	1.15	ECF802	1.80	EL84	1.35	KT88**	25.00	PY88	0.60	VR105/30	2.45
DL92	1.45	ECH42	1.65	EL86	1.45	ML4	3.20	PY500A	2.10	VR150/30	2.45
DY86/87	0.65	ECH81	1.25	EL90	1.75	ML6	3.20	QQV03/10	5.95	X61M	1.70
DY802	0.70	ECH84	0.90	EL91	6.50	MX120/01	29.50	QQV03/10*	7.50	X66	4.95
E92CC	2.80	ECL80	0.65	EL95	1.80	N78	9.90	QQV03/20A	27.50	Z749	0.75
E180CC	11.50	ECL82	0.75	EL504	2.70	OB2	1.80	QQV06/40A	28.50	Z759	19.90
E1148	0.75	ECL86	1.10	EL509	5.85	OD3/12	5.75	QQV06/40A*	54.10	Z800U	3.45
EA76	1.60	EF9	3.50	EL519	7.70	PCL82	0.95	SP61	2.50	Z801U	3.75
EB34	1.15	EF22	3.90	EL821	8.05	PCL84	0.85	TT21	45.00	Z803U	21.15
EB91	0.60	EF37A	2.15	EL822	9.95	PCL86	0.80	TT22	45.00	Z900T	4.30
EBC33	2.20	EF39	1.10	ELL80SE	4.50	PCL805/85	0.95	UABC80	0.75	1A3	3.80
EBC90	0.90	EF80	0.65	EM80	1.35	PD500/510	4.30	UBF80	0.70	1L4	0.65
EBC91	0.90	EF83	3.90	EM87	3.00	PFL200	1.10	UBF89	0.70	1R5	1.00
EBF80	0.95	EF85	0.90	EY51	0.90					1S4	1.00

VALVES AND TRANSISTORS Telephone enquiries for valves, transistors, etc. Retail 749 3934, trade and export 743 0899
POSTAGE: £1-£3 55p; £3-£5 65p; £5-£10 85p; £10-£15 £1.05; £15-£20 £1.60. Minimum order £1.00. Delivery by return

COLOMOR (ELECTRONICS LTD.) 170 Goldhawk Rd, London W12 8HN
Tel: 01-743 0899 or 01-749 3934. **Open Monday to Friday 9 a.m.-5.30 p.m.**

J & M (Amateur Radio) G4GKU

36, WESTGATE, ELLAND,
W. YORKS HX5 0BB.
PHONE: (0422) 78485
Ask for John G4GKU



NOW A TRI-BAND MINI BEAM AT A SENSIBLE PRICE

£69.95 10m, 15m, 20m

(TRADE ENQUIRIES WELCOME)

Direct from the manufacturer at a money saving **£69.95** complete. Or in kit form or as spare parts. Ask for a quote.

Do you have a Camera/Hi-Fi/Radio/Binoculars or any technical item that you would like to part exchange for this antenna? If so just call and we will consider it.

At 1932 on the 7th, beacon FY7VHF was heard for half an hour up to S7 and at 2138 some weak signals from the west were heard. On the 9th, 9Hs were heard working Ws between 2015 and 2040.

Ken heard GB3NHQ and GB3SIX on QTEs between 230° and 260° in the afternoons of June 12, 13 and 19. On the 19th, beacon CT0WW was heard direct from 1706 to 1820 and also at 230° from 1719 to 1748 with Portuguese TV seen on this heading. At 2006 to 2022, FY7VHF was up to S9 but with little or nothing on 28MHz.

Terry Hackwill G4MUT (BRK) has reported working 16 Ws in the June 6/7 opening. He was QRV from 2203 till 2400 and got twelve new squares in eight states, best DX being W4TZC in Tennessee.

On the 7th, he opted to look to the west instead of the southeast when Italians were coming through on 144MHz. This proved wise as he worked KP4EIT. At other times in June, Terry found the usual Europeans and on the 21st he worked OH2TI for the first Finnish QSO in-band.

Martyn Jones G4TIF (WKS) reports back scatter QSOs at 140° on June 4 with GI8YDZ (WP), GM8COX (YP) and G4IGO, and later GM3ZBE (YR). He worked 31 Ws in the opening on June 6/7 in 16 squares, best DX were K4CKS (GA/EM74) and FP/KA3B.

Via Es on the 24th he worked OH1ZAA and OH3TR/1. The next day, in another W opening, he worked twelve stations in ten squares, best DX being KB4CSE (SC/EM94).

John Palfrey G4XEN (NHM) worked his first ZB2 on June 2, PA on the 4th via Es back scatter and GD on the 15th. He made seven QSOs in the W opening on the 6th to CT, MD, NY, PA and VA. On the 5th, F5QT (JN03) was the first in-band French QSO.

Mike Johnson G6AJE (LEC) now has a home—and mortgage—in ". . . the most abysmal spot in Leicester for the v.h.f. enthusiast . . ." so has started on 50MHz using his Meon transverter and a borrowed FT-290R. A few local QSOs have been made on about half a watt and an indoor quad loop antenna.

Listening has brought in ZB2IQ, 9H1FL, 9H1E and he even worked F6ACU (JN38) on June 4. CT and LA have been heard, together with quite a few Ws in the June 6/7 event.

Keith Hewitt G6DER (YSS) reports working ZB2IQ on June 1 and SV0FE on the 3rd. He could not make his signal heard in the W opening on the 6th but did contact K2SMN getting an RST419 report eventually.

PA0OOS and PA0RDY were contacted on tropo on the 10th and Keith has now worked the latter on all bands from 50MHz to 3.4GHz. He worked 'RDY on m.s. on the 25th, too.

Ela Martyr G6HKM (ESX) was using just 2W from her FT-690R Mk 2 to a dipole when she worked ZB2IQ on June 1 on her first call. CT4KQ (JN60) was the first CT on the 3rd.

On the 6th she added the matching amplifier to the transceiver and worked W3WFM at 1746 for another new country. On the 21st, her husband, Roy,

The next three deadlines are: July 27, Aug 31 and Sept 21

Annual c.w. ladder

Station	Band (MHz) 50	70	144	430	Points
G4ZEC	—	—	422	—	422
G4OUT	—	—	191	—	191
G0HGA	—	—	176	—	176
G0HLT	13	—	161	—	174
G4WHZ	6	—	106	—	112
G4ARI	—	10	80	—	90
G4ZVS	—	—	80	—	80
G0HEE	—	—	79	—	79
G0DJA	11	—	64	—	75
G4VOZ	22	37	—	11	70
G3FPK	—	—	62	—	62
G2DHV	10	23	22	—	55
G4AGO	—	11	38	3	52
G0GKN	—	—	52	—	52
GW4HBK	18	15	—	—	33
G1SMD	8	—	13	—	21
GU4HUY	—	—	21	—	21
G1DOX	3	5	—	—	8

Number of different stations worked since January 1.

heard and worked OH2TI and OH2HK on their first evening on the band. Ela then also worked OH2TI.

By the 19th, the main mast had been adorned with a 5-ele home made Yagi which will certainly improve the station. So seven new countries in all for June and a dozen more counties.

Paul Johnson G6MEN (SPE) sent in a copy of his log pages for early June which shows a considerable amount of cross-band activity. QSOs were made with HB, LX, D, I, OE, OZ and YO stations by this means. In-band contacts included ZB2IQ, LA6QBA/P, SV1DO and a few Fs, plus CT4KQ. Paul worked a few Ws in the late evening phase of the opening on June 6.

Colin Redwood G6MXL (DOR) has also worked some cross-band stations in D, F, HB, I and EA but contacted F6ACU, ZB2IQ and GM8MBP in-band. **Ian Harwood G8LHT** (YSS) reports assorted cross-band operation. In-band QSOs included ZB2IQ, and FP/KA3B plus CT and F. Thirty North Americans were heard in the first opening but 5W e.r.p. made no impression on any of them. However a 4-ele Yagi is probably available by now.

Steve Damon G8PYP (DOR) has been busy on the band, his successes including CT1DTQ, various LAs, 9H1EL and ZB2IQ. He heard some Ws and VE1YX in the early evening of June 6 and again from 2255. Several were called but he just could not get through. Between June 9 and 22, very little Es activity was heard with only a few short TV openings.

Gerard Elliott GI4OWA (LDR) mentions one W running 1500W to a 32-ele array. He sent copies of five log pages covering the period May 27 through June 19. New countries were CT1WW, GJ4ICD, GU4IUW, 9H1FL, SV0FE, PA3DDY, LA6QBA/P and in the North American opening FP/KA3B and several Ws including N9QX (EN61).

Simon Lewis GM4PLM (SCD) found 28MHz full of beacons on June 25/26 so listened on 50MHz. Lots of cross-band activity but no GMs being worked. So he used his FT-690R with its quarter-wave whip antenna and, from the garden, worked FD1FVP (IN95WB) who was using a 5-ele Yagi and 150W. From September Simon will be operating from a new QTH in IO76 using 3W to two 6-ele Yagis with a small amplifier.

Calum Macpherson GM0EWX (HLD) added CT, FP, GU, W and 9H to his countries tally on the band in June and took part in the opening on June 6/7 from 2120 and 0140. He collected 14 new squares out of about 20 stations worked. In addition to FM and FN fields, he worked into EM74, EM84, EM88 and FK41.

Finally to Wales and **Dave Lewis GW4HBK** (GWT) who worked ZB2IQ on May 31. On June 4 9H1FL answered his CQ call at 0937, this was followed by back scatter QSOs with GI8YDZ and GM3ZBE. More back scatter contacts the next day with four GMs and LA worked.

Dave worked seven Ws in the June 6/7 event after which it was rather uneventful till the 24th when he contacted OH5LK, OH1AWN and OH3TR/1. The ZB2 beacon was heard at 1835 that day.

Paul Baker GW6VZW (GWT) worked LA, CT, 9H and ZB2IQ in the end-of-May beginning-of-June period, also F6ACU on June 6, ". . who swore that he had a permit." Four LAs were worked and Paul heard the two Stateside openings in which at least 50 stations were heard. Unfortunately nothing was worked.

In the period June 20-26 there were major solar flare events plus a proton event, magnetic alerts and several sudden ionospheric disturbances—s.i.d.s. On the 25th there was another opening to VE and W and at 2142 G3JVL (HPH) worked WA4VCC, a reported QRB of 6450km.

The 70MHz Band

G1EHF uses an Icom IC-290H, Meon transverter plus 10W p.a. on the band with a simple rotatable dipole in the loft. Dave worked cross-band on June 4 with DJ2LF and EA4CGN with S1 and S3 reports respectively.

John Jennings G4VOZ (LEC) rightly concluded that the talking point of the month was ZB2IQ. He worked them on s.s.b. on June 2. Their appearance brought a lot of stations onto the band not heard before or for a long time. John mentions QSOs with G3NKS (GLR), G4NFU/A (WKS) with QRP to an indoor antenna and GW4LWL (GNS) all on s.s.b. on May 31; G1HTL (NOT) on s.s.b. on June 3; G4ZTR (ESX) on c.w. on the 4th and G3RPD (DVN) on s.s.b. on the 14th and who promises regular activity.

The only worthwhile QSO made by G6DER recently was to ZB2IQ on June 4. Through heavy BC station QRM, G6MXL worked ZB2IQ on June 7 at 1333.

Ron Reynolds' G4WEM (ESX) letter covers a fair amount of 70MHz activity. On June 2 it took him 15 minutes to work ZB2IQ after which the callers from the north had vanished. He concludes that a lot of people are QRV on the band yet rarely use it.

On the 17th he made a multi-way QSO with G1DOX (AVN), G3NAQ (BRK) and G3ZJY (HPH) on s.s.b. He is very pleased with his Meon transverter and again asks me to remind readers that Tuesday night is supposed to be activity night on 70MHz.

G8LHT is QRV with 0.5W to a dipole but had not worked anyone up to the time he wrote. GW4HBK worked ZB2IQ at 1647 on June 1 and also on the following three days. On the 3rd and 4th Dave made cross-band QSOs with EA4CGN, DK1PZ, DL4RU, DL9RM and DJ2LF. On the 5th DL9RM still copied him when he was using just 0.2W. SK0CT was contacted at 1613 on the 6th.

The 144MHz Band

First, welcome to **Andrew Salt G0HEE** (YSS) whose maximum power has never exceeded 2.5W from an FT-290R. His

antenna is a QDX, a double-quad device reputed to have a gain of 12dBd. He enters the c.w. ladder and has worked 73 squares since he was licensed at the beginning of 1986.

He caught the big Es opening to Italy on June 4 in which he worked his best DX to I8WY. Others contacted were I0WWJ, I0LYL and IC8EGJ. Within the next few days EA, EA6, IS, IT and 9H stations were heard.

On the 10th tropo brought QSOs to DL, PA and OZ. Around 2350 on the 11th, GB3ANG was very strong and Andrew found GM0ILB (SLD). Many GMs were worked in the *PW* Contest on the 12th followed by OZ2ST (EP), OZ7RD (FQ), OZ1KQG (FP) and later SM6LIF (GR) and SM6PIS (GS).

Angela Sitton G0HGA (HFD) bemoans the lack of activity on c.w. lately, until there is a lift. Even so, her total of 176 in the c.w. ladder is probably about par for the course for her present e.r.p. and transceiver. Any major improvement would require a little more TX power, a better antenna and a masthead pre-amp to extend the range.

G1KDF worked EI4CI/P (Leitrim) and EI9FH (Donegal) on June 12, EI4AQB (Galway) on the 14th, EI3CAB (Wexford) on the 18th and GI4KIS/P (FMH) on the 19th. G1SWH also netted some of these plus EI3VVN/P (Longford) on June 4, EI9FY/P (Louth) who was running 2W in the QRP Contest on the 12th, GU2FRO (SRK) on the 15th and GU3EJL (ALD) on the 17th.

In the Es on the 4th Gerry worked five new countries, EA6, EA, I, IT9 and 9H. G1IMM lists seven Italians worked in the same event including IT9BLB/P (GY), IC8EGJ (HA) and IK0FEC (GD).

G3IMV had a major amplifier failure when a 100µF capacitor exploded. This seems to have been caused by the failure of a 470kΩ equalising resistor. A couple of circuit boards were ruined and John had to make new ones.

Peter Atkins G4DOL (DOR) worked EA7AHS (WX) via Es on June 2 and heard ZB2IQ. A couple of EA3s were copied at 1100 on the 4th, the major event starting at 1450. In the next three hours 18 assorted Italians and 4N2D (JC) were worked. Other new squares were FD, HC and IB.

In another event the next day from 1313 to 1425 seven EA7s were heard and EA2LY/4 (YA) was worked.

G4IGO worked ZB2IQ via Es on June 2 at 1759 and heard EA7DZI (WW). On the 4th Ken worked many Italians between 1538 and 1743 including IA and IB squares and 4N2D. Three EA7S were contacted the following afternoon in YX square.

On June 4 G4TIF had incomplete Es exchanges with EA6FB (AY) and EA5ZMM (ZZ) around 1100 but the afternoon event brought four 9H, an IT9 and eleven Italian QSOs between 1455 and 1743. The next day Martyn got ZB2IQ.

He struggled somewhat on the 7th with a couple of incomplete IS0 contacts between 1107 and 1259 but later managed EA7DZI and EA5EMM (ZZ). Tropo on the 16th brought a QSO with LA8AK (DS) and more Es on the 27th resulted in a QSO with OE6LOG (HG), while YU2DG was heard.

G4XEN with G4OIG were operating from JO03BF for a mini c.w. m.s. stint on June 4 when the Es propagation occurred. They worked to IT9, I0, I5 and I8, best DX being 9H1GB at 2232km from about 1500.

From home next day, John worked ZB2IQ at 1321 and at the end of the opening, around 1400, he thinks he heard snippets from a CN8. June 7 saw the longest Es opening since he was licensed in 1982 which started at 0843 with 9H1GB then worked its way westwards to EA5 and EA7. This brought QSOs with EA5, IS0, IT9 and 9H with two EA6s in Menorca heard and EA6FB on Ibiza.

The last station worked was EA5GEL at 1327 but in the evening John heard PA stations working into YO and UO5. Yes, at 1510 there was a short opening for about 25 mins to UO50B, UO50X and UO50IW with YO4BZC worked by a few stations around London. They were in OF and OG squares.

A tropo opening on the 14th in the early morning rewarded G4XEN with SP6HEI (JO81) and SM7JUQ (JO65). On the 16th, more tropo contacts with EI4CI and EI9ED (Meath), LA8AK and GU3EJL.

Martin Lowe G4YCD (AVN) telephoned a report saying he worked two each IS0 and IT9 stations on June 7, EA3CRR and 9H1BT. There was tropo to OZ on the 14th and on the 16th LA8AK was very loud with just 3W. In the *PW* Contest his prize catch was GI4KIS/P.

G6HKM worked EI3VVN/P (VP) for a new square and county on June 2. Ela worked to 9H, IT9, I0 and IC8 on the 4th and in the big event on the 7th she contacted eight 9Hs, four IT9s in GX and GY and IK8IOO (IY). On the 18th she worked SM6CMU and shortly after LX1QR/P in a local contest.

G6MEN caught the Es event on June 5 and from 1332 to 1347 Paul worked EA7BHO, EA7ETE, EA7AJ and EA7GTF all in YX and EA2LY/4 and EA4CD both in YA. The June 4 Es brought six Italians for G6MXL between 1556 and 1722. On the 7th Colin worked IS0RHF (EZ), IW9AQS (GX), 9H1BT (HV) and IS0AGP (GX).

On June 4 G6WEM got EA5EMM at 1105, IT9BCC (GW) at 1540 and IW0AKA (GB) at 1646. On the 5th, Ron's prize was ZB2IQ at 1258. Some tropo QSOs to D and OZ on the 10th with huge signal strengths while on the 16th there were many LAs who were working to EI/GI. SM6CMU was worked at 0908 on the 18th. He had been copying GB3CTC since 0600 and called CQ for ages with no replies.

G8LHT mentions EA5, EA6, 9H, IT9, I0, I5 and I8 worked via Es on June 4; ZB2IQ on the 5th plus EA5 and EA7; EA2, EA5 and EA6 on the 7th. On the 12th SM6LIF (JO67) and Ian's first SM on the band while the 14th yielded SP6HEI and Y24BO (JO62).

In a six minute Es opening on June 2 G8PYP worked 9H1GB and EA7AHS at 1756. On the 4th, starting at 1550 Steve reports a two hour event to I0, I6, I7 and I8 areas. The 7th June event lasted about three hours to IS0 and IT9 from Dorset.

GI4OWA worked EA6IF (CZ), EA3DUY (BC), EA3ADW (BB) and EA3CHN between 1155 and 1211 on June 4. EA5BQB (ZY) was contacted at 1425 on the 5th in a very short opening. Another brief affair on the 7th yielded EA6MR (CZ) at 1403. Tropo on the 12th brought LA6HL (CS) at 1110.

For GM0EWX the June 4 Es brought ten new squares and Calum had QSOs with EA, EA6, F and I stations between 1633 and 1940. He worked about 40 stations. I am puzzled by his QSO with EA1DWM on June 12 as he gave the locator as WB63b which is in Portugal.

Welcome now to Frank Holland GI0AIQ (ARM) who had his first taste of Es DX on June 5 to Spain from 1330. He made contact with EA5BQB, EA6FB, EA3BTZ and EA3BEW/P in AB and EA3AQJ (BB). On the 7th from 1335 he worked EB3CNX and EA3s IH, AQJ and PA all in the Barcelona area. Frank runs about 80W to two stacked 9-ele Yagis from Tonna.

Mervyn Rodgers GM0GDL (CTR) says the June 4 Es event was the first this year in his region. From 1710 he worked EA6QB, EA3LL/P (AB), IW5BML (FC), IC8EGJ, EA3DZG (AB), FC1ADT/P (AD), EA5FAC (ZZ) and EA3EEY and EA3RCH in BB. Yes, OM, EA6 is a separate country from EA.

On June 12 he was out -/P for the *PW* Contest on the top of Ben Vorlich (TYS) and worked a number of LA, OZ and SM stations and some EI portables. He reports more good tropo to D and OZ on the 13th, 2100-2200.

Another new contributor is **John Hilton GM1ZVJ** (LTH) who enters the tables. He uses an FT-290R with 2.5W to a 10-ele lightweight Jaybeam Yagi. In the *PW* Contest he worked 15 stations. Countries worked in June were G, GM, LA, PA and EA3DBJ on June 4.

GW6VZW's TX was still sick so he used a borrowed FT-480R and amplifier to participate in the WAB Contest on June 19. This brought G7ANV/P (NLD) and GU3EJL plus SXE and NHM counties, all new this year.

The 430MHz Band

G1KDF's list shows German contacts on June 10. On the 15th Bob worked EI4AEB (Meath) and EI8EQ (Kildare). The 24th brought GU2FRO (SRK) who was only running 10W. G1SWH added new counties ARM, NLD, Wicklow, Longford, Meath and Donegal in June to bring his 1988 tally to 47 while G1IMM added CWD, PWS and CNL.

G4XEN worked OZ1KYM (JO45) on June 10 and G6DER also operated in this opening. Keith managed a couple of SM4s on the 12th and some PA and D stations on the 13th and 14th, but nothing new.

On the 10th G6HKM worked Germans in EN, FM and FN. Ela took part in the f.m. contest on the 12th and found MSY and SXW QSOs. She made 29 contacts with 16 multipliers. Howard Staddon G6STI (LDN) worked some new squares in D and OZ on the 10th. The 16th brought LA9RAA (CS), GU3EJL, LA8AK and OZ1BUR (EQ).

G8LHT worked D and PA on June 10 and on the 12th SM4KYN (HT) and SM6AFH (GQ). The 14th brought QSOs with Y24BO and DL4OX (FM). On the 19th nine Germans were contacted from 0750 to 0825.

The Microwave Bands

G0DJA was out -/P on Walton Hill, Gwent on June 19 for the 10GHz Cumulatives and worked eleven stations, five of whom were 55km away on Clee Hill. Others worked were on the Malvern Hills at 38km, Brown Clee at 36km, Barr Beacon at 21km and Burton Dassett at 53km. With a couple of half-point QSOs Dave's points total was 427.

On 1.3GHz G1KDF suggests EI9ED/P (Leitrim) in VO square on June 12 could be a first G to VO. On the 14th Bob contacted him from home in Meath. On the 15th G8PNN (NLD) in ZP was another new square. He reports EI9ED as using up to 2W to a 15-over-15 slot Yagi at home.

John Tye G4BYV (NOR) worked PA0ASH (CM) on 5.76GHz s.s.b. on June

10, and DB1BX (DM) on 3.456GHz. On the 13th he contacted DG4BB (EN) on 3.456GHz. He suggests the 70cm calling frequency of 432.200MHz is a must for setting up microwave skeds.

On 1.3GHz G6DER worked PA0OOS (DN), DB1BX and PE1ACB (DM), DG4BB (EN) and DK2NH (FN) on June 10. On the 13th PA3BBA (CM), DG6EAE (DL) and DG9YN (EL), the latter again on the 19th plus DC5JM (DL).

On 2.32GHz during May, Keith added new squares ER and FN. He operated on 3.456GHz on June 10 when DB1BX (DM) was a new square as was DG4BB (EN).

G6HKM worked nothing new on June 10 but DK1KR (FN) at 721km was Ela's best DX to date on 1.3GHz. DF7DJ (DL) was worked at 0632 the next morning and PEs were worked on the 13th and 14th.

Contest Notes

A reminder about the 1.3/2.3GHz Trophy Contest on Aug 14—see the August VHF Up. The last leg of the 10GHz Cumulatives is on Sept 11 0900-2100UTC.

The Sept 3/4 weekend, 1400-1400 is the RSGB 144MHz Trophy event date coinciding with the IARU contest. On Sept 18 there is the 70MHz Trophy Contest and maybe the rules for that will be published in time for the next issue.

Irish DXpedition Results

G1KDF's trip to the Irish Republic was very enjoyable apart from the dreadful weather on the Muckish Mountain in the Donegal Hills. Bob's first operation was on May 28 from IO63NK in Kildare from which seven contacts were made on 144MHz and a couple on 432MHz.

2.3GHz all time table

Station	Counties	Countries	Squares	Points
G3JXN	29	11	39	79
G6DER	31	10	33	74
G8TFI	26	7	32	65
G3XDY	18	8	25	51
G8PNN	17	7	26	50
G6YLO	8	4	8	20
G8GRT	3	3	5	11
G6OYL	1	1	1	3

Later that day till the 31st he was in IO44XE in Co. Mayo from where 96 QSOs were made on 144MHz and nine on 432MHz. On June 1 and 2 he was in Donegal (IO55XB) and had 97 QSOs on 144MHz and ten on 432MHz.

On the 3rd a short stop in Roscommon (IO54XE) produced 20 contacts on 144MHz. The next day he activated Longford (WN12j) making 29 and eight QSOs on 144 and 432MHz respectively, ending up in Kildare again operating from the QTH of EI8EQ.

Best DX from UO square on 144MHz was G4YCD at 583km and on 432MHz G8XVJ at 499km. From VP G4SWX at 699km was longest QRB on 144MHz and G4CBW at 435km the best on 432MHz.

From the EI8EQ location on June 4, he caught the Es opening working five Fs in CD square plus IC8EGJ.

On 144MHz the station comprised a Trio TR-9130 and BNOS 160W amplifier, a 17 or 9-ele Tonna Yagi and masthead pre-amp. The 432MHz set-up was a TR-9500 and BNOS 100W amplifier with one or two 19-ele Tonna Yagis and again a masthead pre-amp. The results on this band were a little disappointing.

Bob would like to record his thanks to James O'Hara EI8EV from whose home the UO operation took place. To Eamonn Gilmartin EI8EF and GI4OWA for help and advice on the way. To EI8EQ and EI7BJB for their hospitality and to EI6AS, EI9ED, EI4CI and Father Paddy EI5CC.

On behalf of all contributors, thanks for a good effort Bob and I, for one, was delighted to contact you in VP square for a new one at 673km. I am sure our QSO was aircraft assisted by a flight on Blue One over Anglesey.

Sign Off

Sorry there is no room for the Squares Table this time. Thanks to Geoff Brown GJ4ICD who sent a four page printout of June happenings but which arrived moments before I had finished this piece.

The next three deadlines are: July 27, Aug 31 and Sept 21

RTTY

Reports to Mike Richards G4WNC
200 Christchurch Road, Ringwood, Hants BH24 3AS

Readers' Letters

It seems that I've got it wrong again! **J. Srinivasan VU2JX** has written pointing out an error I made in the March issue. In that issue I listed VU4GDG/JX as having been operational from Jan Mayen Island. Apparently VU4GDG/JX was actually operated using RTTY only by VU2JX during the DXpedition to the Andaman Islands in October 1987 so I stand corrected. In his letter he also asks if anyone heard the KH5 operation from Kingmans Reef and Palmyra as they were a complete wash out in India.

While on the subject of DXpeditions, etc., if you hear of any expeditions or other interesting events, please drop me a line as I can only report items if I have been informed. That applies most of all if you are staging a DXpedition.

Frank Hastings GW0BPV has recently acquired an interest in RTTY, mainly to expand his operating skills. Frank uses a Icom IC-735 transceiver running about 50 watts via a home-brew a.t.u. into a 14MHz collinear at 6m a.g.l. The RTTY gear comprises a BBC B computer running the GW4WRD disk-based program, an ST5MC terminal unit and a converted TV black and white monitor. Frank is finding that the biggest problem is his two finger typing, but I'm sure that will soon improve.

Included in his letter was a list of stations recently worked on 14MHz and judging by the results, his equipment is working very well. Probably one of the most interesting stations heard was TU4CQ (Ivory Coast) which was involved in a pile-up and hence very difficult to contact. My thanks to Frank for taking the trouble to write.

Computer Support

This month I have received several letters from people/groups offering help with a variety of computers.

The first letter came from **Jim Dunnett G4RGA**[1] who has software available for the *Amstrad CPC* range of computers. On offer is a library of four disks full of amateur radio and public domain software. All the programs are documented with the text stored on disk. There is even a print routine on the disk for those of you who do not have a suitable word processor. Anyone interested should send four disks together with return postage to Jim's address which is listed at the end of this column. If you do not have disk drives then Jim asks that you should write first, including an s.a.e. for the reply.

If you are a *Scarab* user, Jim can also offer, free, a facility to allow the QSO files to be dumped to the printer which is very useful.

My next letter has winged its way from Belgium and concerns a user group for the *Atari ST* range of computers. The group is known as ASTUR (Atari ST Users on Radio group) and is based in Belgium. It was the Chairman **Michel Geeraert**[2] who contacted me with details of how the group operates. As the name suggests the accent is very much on radio related software and there certainly seems to be a good range available. The membership fee is two single sided disks and two IRCs or three IRCs if you live outside Europe. For this you get one disk returned with a free copy of a QSL sort program and a list of all the available software. The second disk is kept by the user group to cover the administration costs, which seems fair enough.

In addition to free software, the group offers a newsletter which is published as and when there is something to say and also a technical hotline which is available every Thursday evening.

The final support group for this month is the newly formed CRUG (Commodore Radio Users Group) which deals with all *Commodore* computers from the PET to the Amiga. The accent is of course on radio related applications and in addition to software they are expecting to be able to supply interfaces for virtually all Commodore computers. A newsletter is also being produced which should be published four times per year. Membership costs £8 per year and further details can be obtained from **Simon Lewis GM4PLM**[3]. If you are sending a cheque then it should be made payable to Commodore Radio Users Group.

Now for a plea for help! Does anyone know of or would like to start a user group for the Amstrad PCW series of computers? If so then please drop me a line, as I have had several enquiries regarding this computer.

One final important point, remember that all these support groups and offers of help rely on volunteers so always include s.a.e. when asking for information and be patient when waiting for a reply. My thanks to everyone who has offered help.

ANARTS Contest

John Barber G4SKA has supplied a comprehensive report giving his impression of this contest. It was held over the weekend of June 11/12. John usually operates in the single operator section of most contests, but for the ANARTS he decided to seek some company in the

The next three deadlines are: July 27, Aug 31 and Sept 21

form of a couple of colleagues. I'm sure it made a pleasant change to be able to share some of the boring early hours of the day.

The conditions for the contest were actually very good, which makes for a pleasant change as the bands usually close at contest time! John and team managed to work several new countries as follows: KG4 (Guantanamo Bay), 5B4 (Cyprus), 7X (Algeria) and 5W (Western Samoa). Some of the more interesting stations worked were, on 14MHz: VU2SJV (India), CE2CQZ (Chile), HP1AC) (Panama), V85GA (Brunei), CO2BB (Cuba), C31AB (Andorra) and on 21MHz: VU2JX (India), YB5QZ (Indonesia), TR8CA (Gabon) and 6T2MG (Sudan).

In addition to his contest report, John's latest batch of QSL cards make quite interesting reading: HD8CQ (Galapagos), 9Q5FF (Zaire), UO5OK (Moldavia), V85GA (Brunei) and FG5VQ/FS (St. Martin). My thanks to John for this report, and don't forget to send in your comments/reports on contest activity.

Awards Book

I have just received details of the latest awards book from **Sue Squibb G1TZU**. The book was originally published in 1986 and has been distributed to 23 countries which is pretty impressive. The latest, second, edition has just been published and runs to some 90 pages with details of over 350 amateur radio awards. Of course, the book covers all types of award including the data modes and should prove very useful to both the licensed amateur and the short wave listener. The cost is £5.00, $10 or 23 IRCs, which should be sent to Sue Squibb[4].

FAX Update

This mode seems to be continuing at a steady pace with most of the activity being centred on the continent. For those of you who are wondering where to find FAX stations then the following details from the Swiss Amateur Radio Teleprinter Group may prove useful. The h.f. FAX activity day is every Wednesday evening on 3.605MHz, this takes the form of a FAX net at 1900UTC followed by an s.s.b. net at 2015UTC.

If you're looking for FAX news, then try the FAX round table which is operational on the 2nd, 3rd and 4th weekends of the month. The schedule is Saturday at 1700UTC using 3.602MHz and Sunday at 1200 UTC using 14.102MHz. The format used is the normal amateur standard of 120 r.p.m. and an i.o.c. of 288.

NETROM/TheNet Instructions

Things on the packet repeater network scene seems to have settled down nicely these days. It seems there are now only two different networking systems in common use, these are TheNet and NETROM. No doubt this situation will change as new software becomes available. In the meantime it is probably appropriate to summarise the commands. Fortunately, the commands for both systems are very similar.

CONNECT (same in TheNet and NETROM): This command allows you to connect to another station using the node.

CQ (TheNet): This enables you to put out a CQ call with your callsign and any text you wish to be included.

INFO (TheNet) called IDENT (NETROM): This gives information which is supplied by the owner or sysop. This usually comprises site height, locator and equipment in use.

NODES (same for TheNet and NETROM): This will show which other nodes the node you are connected to has seen.

ROUTES (same for TheNet and NETROM): This gives a list of known routes to the node.

USERS (same for TheNet and NETROM): This shows who is using the node at the present time apart from yourself.

PARMS (NETROM): This lists the current settings of the node's existing parameters.

To connect to a packet switch (repeater) you simply type "CONNECT" followed by the repeater's callsign just as you would for an ordinary contact. Disconnecting is just as easy, type "DISCONNECT" when in command mode on your TNC. The NETROM and TheNet software sorts out all the packet handling between nodes and also ensures that all nodes are disconnected when the contact is complete.

Thanks should go to G8IMB, G3VPF and G4YYA for supplying this information.

CQ World wide RTTY Contest BARTG

This contest starts at 0000UTC on September 24 and finishes at 2400UTC September 24. Single operator stations can only work 30 of the 48 hours, the breaks can be taken any time as long as they are at least 3 hours. These rest periods must be clearly documented.

The classes are: (A) single op, either all bands or single band; (B) multi-op single transmitter, all bands.

The modes allowed are: Baudot, AMTOR (FEC/ARQ), ASCII and AX.25, but no digipeated QSOs allowed.

The bands are 3.5, 7, 14, 21 and 28MHz. Suggested frequencies being: 3.575–3.625MHz, 7.075–7.100MHz (VE above 7.100MHz), with RTTY DX on 7.035–7.040MHz, 14.075–14.100MHz, 21.075–21.100MHz and 28.075–28.100MHz.

A station may be contacted only once per band. Stations within the 48 US states and the 13 Canadian areas must transmit RST, state or VE area and CQ Zone number. All other stations must transmit RST and CQ zone number.

You score 1 point for contacts in your own country, 2 points for those outside your own country but within your continent and 3 points for contacts outside your continent. Multipliers are each US state (a possible 48) and each Canadian area (a possible 13) on each band, as well as one multiplier point for each country in the ARRL DXCC and WAE list on each band.

The final score is your number of points times the total multipliers. All entries must include a separate log for each band and a duplicate of the log if there are more than 50 contacts on that band. You must also include a multiplier check list for each band and an overall summary sheet. All logs must show the date, time in UTC, callsign of the station worked, RST exchanged, state or Canadian area if appropriate, CQ zone and points claimed.

All entries must be postmarked no later than December 1 and sent to the address shown [5]. I hope to hear that *Practical Wireless* readers do well. Many thanks to BARTG as I got the rules from the Summer 1988 edition of *Datacom*.

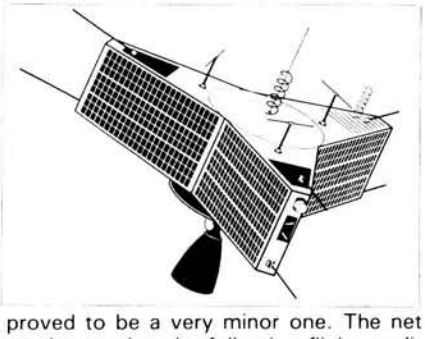
(1) Jim Dunnett, 5 Queens Road, Wellington, Somerset TA21 9AW.
(2) ASTUR, GEERAERT Michel, W. Elsschotlaan 21, B-8460 Koksijde, Belgium.
(3) Simon Lewis CRUG, 69 Irvine Drive, North Clippens, Linwood, Paisley, Renfrewshire PA3 TB.
(4) Sue Squibb, 36 Frognal Gardens, Teynham, Sittingbourne, Kent ME9 9HU.
(5) CQ RTTY Contest, Roy Gould KT1N, PO Box DX, Stow, MA 01775, USA.

Amateur Satellites

Reports to Pat Gowen G3IOR
17 Heath Crescent, Hellesdon, Norwich, Norfolk NR6 6XD

AMSAT-OSCAR-13 . . . The story so far . . .

After a series of delays, a virtually completely successful launch of the AMSAT Phase III-c satellite by the latest *Ariane-IV* ESA launch vehicle finally took place from Kourou, the French Guiana ESA launch site, at 1119:04.3 on Wednesday 15 June 1988. The launch was originally due to take place at 1112 on June 10, but this had to be postponed for a few more days to overcome an interface problem on the Ariane flight computer. The ESA engineering team worked over the weekend of June 11 to find the problem and attempt to get things right, hoping that a new computer would not have to be flown in from Paris and that a consequent further postponement to July would not be necessary. Fortunately, the problem discovered



proved to be a very minor one. The net result was that the following flight readiness review outcome, reported by FY0EK, the launch site club station on 21.280MHz, stated that all systems were ready to go. The *Ariane-IV* tanks were then filled ready for launch on Wednesday June 15, the eve of OSCAR-10's fifth birthday, and the countdown recommenced.

This mission, the first test-launch of the new *Ariane-IV* vehicle, carried a total payload of 3513kg, just 83 per cent of its full capability of 4200kg. The passengers for the low cost flight were Meteosat, Panamsat and our own Phase III-c in its special insulated "Sylda" container.

Commencing one hour before launch, the full AMSAT Launch Information Network broadcast the countdown and lift off. It continued to the time of the OSCAR-13 satellite ejection on all amateur radio bands around the world, to at least a quarter of a million nail biting listeners following the event. It was put out on live TV from the Galaxy-3 (transponder 24) satellite, in geostationary orbit at 93.5 degrees west. Arianespace broadcast the launch via Spacenet-1, transponder 1, and AMSAT too used their own amateur radio space facility to broadcast the launch via the OSCAR-10 satellite on 145.958MHz.

Murphy's law predicted that propagation on 14 and 21MHz, which had been excellent prior to the launch day, dropped to poor conditions. Even the 3.780MHz live coverage transmission net from G3RWL of AMSAT-UK as GB0AUK was not perfect copy due to intense "E" layer absorption, but elder brother OSCAR-10, being independent of solar anomalies, came up trumps, and gave a superb signal covering all of North America and Europe.

As the launch window of 1113UTC approached, a further hold in the countdown occurred, but only of six minutes duration (although it seemed like a week to those listening!) At 1119 and 4.33 seconds, the long awaited mission carrying the third Phase III satellite left earth, and many a breath was held around our earth by those who had followed the first and second attempts at a fully successful Phase III elliptical orbiter by AMSAT.

Old hands will recall how AMSAT's first attempt Phase III-a suffered a serious launch malfunction, and the mission had to be destroyed by the range safety officer. The satellite ended up deep in the sea off the coast of French Guiana, and could not be recovered due to the potential danger of the probably damaged onboard kick motor. The satellite was not insured, as all of AMSAT's capital was used up in building and testing that satellite. Supporters in the form of AMSAT members world wide and many international amateur radio societies came to the rescue of AMSAT, and Phase III-b was built thanks to the generosity of many.

When the second attempt was made with Phase III-b, now OSCAR-10, and it was placed into orbit by the Ariane on 16 July 1983 Murphy's law struck again, as the Ariane third stage, in jetting off its excess oxygen as required by the "space laws" to prevent later detonation, was propelled into the satellite it had just launched. It damaged the triple beam antenna system at the end of the arms, reversed the spin direction, and knocked the newly emerged OSCAR-10 into the very worst possible sun-angle. This meant the solar panels were positioned edge on to the sun and no battery charge was possible, thus the commanded magnotorquers could not be deployed to steer the satellite in earth's perigee field to the correct sun angle. All at first appeared to be lost, but as the sun-angle slowly changed, a little life came back into the batteries, and command and telemetry became possible after many weeks of patient observation.

The next problem came when the apogee kick motor was fired to lift the perigee to 1500km and also to take the satellite to a higher inclination of some 56 degrees. Instead of firing for the period intended, the motor burned all of its fuel in one big thrust, with the result that OSCAR-10 finished up with an inclination of only 26 degrees to the equator. With its perigee at some 3000km, it was the worst possible place for ionising damage to the solid state circuitry of the housekeeping onboard computer. It dictated that the computer prematurely failed due to the intense radiation encountered due to its passage through the lower edge of the inner Van-Allen belt. As the inclination of the satellite drifted between 26 degrees north and 26 degrees south, the in-between times that it spent close to earth's equator where the belt is thicker were the worst of all. It also meant that with this drift, a compromise between a good sun-angle to charge the battery and good earth pointing of the

AMSAT AMS-81 TRACKING SYSTEM
ACCESS SKED FROM: 13AUG88 000000
>>G3IOR VIA OSCAR 13 <<

DAY	AOS	LOS	MAX	DX/EL	AZ
12AUG	2328	0102	0040	18113	271
13AUG	0238	0618	0238	17943*	295
13AUG	1258	1711	1258	18090*	079
13AUG	2030	0508	2331	17212	258
14AUG	1238	1558	1238	17993*	068
14AUG	1857	0357	2222	16393	244
15AUG	1218	1445	1218	17805*	057
15AUG	1741	0246	2113	15618	227
16AUG	1159	1331	1159	17443*	043
16AUG	1633	0134	2004	14999	208
17AUG	1132	1218	1132	16853*	026
17AUG	1534	0022	1855	14687	186
18AUG	1447	2310	1746	14782	163
19AUG	0951	1017	0951	15753*	353
19AUG	1404	2158	1637	15251	143
20AUG	0832	0926	0832	16139*	348

antennas was necessary, and that both simultaneously were rarely possible. The net result was a satellite that had to have its transponder off for much of the time when it was either in eclipse from earth's shadow, or the sun angle on the solar cells was insufficient to permit good battery charging. When it was on, the signal was often weak as it was not beaming at earth, and signals were subject to "spin modulation" brought about by a combination of the damaged antenna system and bad earth pointing. It also meant loss of command, loss of telemetry, and inability to further steer the satellite by ground command. All of these problems are evidenced, and are well known to those who use the current OSCAR-10 satellite.

With Phase III-c, things went a whole lot better! The launch was virtually perfect, and the fairings were successfully ejected 4 minutes 50 seconds later. The first passenger satellite to emerge was Meteosat, 19 minutes and 56 seconds after launch. Then, four seconds later, at T0 + 1200 seconds (20 minutes later at 1139:04.3UTC) out came our satellite, placing OSCAR-13, still in its "Sylda" insulated container into almost the exact transfer orbit as planned. After one hour of temperature and vacuum adjustment, it emerged with the correct spin rate, and within 5 degrees of the required sun angle needed to give optimum battery charge from the solar illuminated panels when it was popped out at 80 minutes after launch. It was then below the European horizon, but **Ian Ashley ZL1AOX,** who had the satellite in view, reported the first 145.812MHz telemetry signals when the general beacon first came on. Ian was closely followed by 4X1AS, JA1ANG and ZS6AKV. Many thousands of receivers were tuned to that frequency when it came above the European and American users' horizons later, all anxious to hear their first signals from what promises to be the best amateur radio satellite yet.

The general beacon format plan, unless a special manoeuvre is in progress, is to have a short 8 w.p.m. Morse code bulletin at the hour and the half hour, a short 50 baud (use u.s.b. to receive) RTTY bulletin at the 15 and 45 minutes points after the hour, and the rest of the time a Bi-Phase Shift Keying transmission that can be read with a suitable demodulator, designed by G3RUH and available from AMSAT-UK, G3AAJ, QTHR. The bulletins will be regularly updated, so that all enthusiasts will be able to learn the latest news and status from the bulletins uplinked to the computer memory by the AMSAT-DL team in Marburg. The frequency to listen to is 145.812MHz, currently up to plus or minus 2.2kHz of Doppler shift.

From time to time, the engineering beacon will come on at 145.985MHz. Later, we shall be hearing the Mode "L" beacons on 435.651 and 435.677MHz, the general beacon and engineering beacon frequencies respectively. Despite the limitations of the −2dB omni-directional antenna in use and low power, the signals can readily be heard by a station with simple receiving antennas especially at around perigee when it is closest to earth. When the beam antennas are deployed and earth pointing, signals will generally be much stronger than those from apogee at present.

OSCAR-13 was placed into a highly elliptical orbit which took it up to an apogee of 35 000 kilometres, and down to only 222 kilometres at perigee. The first pre-burn perigee was actually some 50 kilometres closer to earth than intended. That meant, especially with our expanding earth atmosphere due to the now rapidly increasing solar flux, each perigee pass imparted a little braking to the satellite velocity, bringing it down a little and losing vital forward motion. For this reason, the first job of the command stations at AMSAT-DL was to gently manoeuvre the spacecraft to a carefully calculated pointing position, then spin up the revolution rate to some 30 r.p.m. by pulsing current to the end of the arm coils in earth's perigee positioned magnetic field where the flux density is greater. It works exactly the same way as the coils in an electric motor, moving the rotor round and imparting the spin needed. The spacecraft then gets sufficiently gyro-stabilised to the point at which to give a short firing of the onboard controllable rocket motor at apogee. This both raises the perigee up out of the worst of the drag, and brings the inclination to a higher angle to the equator. **Dr. Karl Meinzer DJ4ZC** reports that a few problems were encountered at this stage, as although the added perigee drag discovered meant as early a firing as possible, the turbulence discovered because of the high drag situation itself meant that several days had to be spent in adjusting the satellite to the exact angle required for initiating the first burn. It was also not known for sure which satellite was which from the Radar given Keplerian elements, as the Ariane 3rd stage, Meteosat, OSCAR-13, the top of the "Sylda" and Panamsat were all in a tight little bunch, and thus even the highly accurate Laser Radar was not able to differentiate the cargo.

Whilst both Meteostat and Panamsat fired their motors to get them to equatorial near geosynchronous orbit on the Friday, our satellite, intended for a very different Molniya type orbit, had to be delayed. That was until the magnetotorquing effected around Mean Anomaly 225 had turned the spacecraft through some 180 degrees, and then accurately manoeuvred it to a Bahn co-ordinate of +90 degrees longi-

tude and –60 degrees latitude. It also had to be spun up to some 28 r.p.m. with the same magnetotorquers to attain stability and ensure that the fuel for the onboard kick motor was at the feed end of the tank before the signal for firing was given. It had reached apogee and the correct parameters by 1857UTC on June 22, when a 50 second burn command was given, using just 10 per cent of the fuel available.

The projected new orbit was calculated to take OSCAR-13 to a mean motion of 2.2050733 orbits per day, with an inclination of 13.80 degrees and a perigee raised to 856km. Whilst observers, including your scribe, watched the event and reported to other AMSAT groups out of audibility of the satellite that all appeared to go well, the next day it became clear that the expected acquisition and loss of signal times were very different from those pre-calculated. The tracking stations "lost" the satellite temporarily, as it was not where they were looking. It became very evident that the burn efficiency was some 15 per cent greater than anticipated, and when a Doppler curve/AOS/LOS fit was made by **Phil Karn KA9Q,** to give a working set of Keplerian elements, the inclination, perigee and revolutions of earth per day were all far greater than expected.

Dr. Karl Meinzer DJ4ZC considered that the reason for this was probably due to the change of viscosity of the fuel, which varies considerably according to temperature. During the exhaustive fuel flow tests, iso-propyl-alcohol had been used as a substitute for the toxic UDMH, hence the actual flow rate had been somewhat greater than thought. This is not bad news, and may in fact be telling us that we have a little more power than reckoned. This will help the spacecraft to attain a good high northerly declination, plus a boosted perigee to boot, this latter pleasing the operators in the Southern Hemisphere as they get more access time.

By July 6, the spacecraft had been magnetically manoeuvred and re-orientated to –59 degrees latitude and –71 degrees longitude in Bahn co-ordinates, pointing into the line of fire at perigee 0.0 and apogee direction 180.0 degrees. To give both adequate gyro-stabilisation and also to ensure that the "sludgy" fuel was all spun by centrifugal force to the base of the fuel tank to assure full delivery, OSCAR-13 had been spun up to exactly 60 r.p.m. It was exactly at mean anomaly 128, e.g. at apogee when the ground command signal was given at 2105:18 to use all the rest of the fuel for one big thrust to push the satellite to its final orbit and high inclination.

A velocity of 1250 metres per second was earlier theorised, based on the original tests, which would give the final satellite parameters as the current apogee, a 2045km perigee, and a 55.83 degree inclination. However, Karl, basing it on the past burn findings, believed that 1300 metres per second was possible, giving the spacecraft the same apogee, a 2347km perigee, and an inclination of 57.3 degrees to the equator. These estimates were based upon a 5.5 minute burn, which was in turn based upon the consumption rate of the probable fuel remaining after the initial burn.

From the actual burn duration that resulted which continued to 2110:56, giving a velocity of some 5200 feet per second, **Phil Karn KA9Q** rapidly fitted a computed set of Keplerian elements that matched the new velocity, and gave it out over the specially convened 14.282MHz AMSAT International net that had continuous reporting of the event by observation of the telemetry by DK1YQ. Early observation of the new acquisition and loss of signal times plus Doppler curves show that this was a close match, and can be used for approximate pass calculations until such time as we have a set of RADAR findings.

Some pass times for the UK, printed out from the AMS-81 program, that will approximate those when we may hear the new satellite are shown in Fig. 2. The columns read from left to right as date, time of acquisition of signal, time of loss of signal, maximum DX time (normally apogee), and the bearing of that time in degrees azimuth.

The KA9Q calculated set used reads:

Epoch Year:	88
Epoch Day/ decimal day:	188.87986111
Inclination:	58.6739
Right Ascension of Ascending Node:	248.2969
Eccentricity:	0.6568540
Argument of Perigee:	187.2597
Mean Anomaly:	165.7208
Mean Motion:	2.10074916
Drag/Decay:	0
Orbit/Rev. Number:	47
Semi-Major Axis:	25752.188km
Reference Perigee:	3839.6607318

This gives us a perigee height of 2459km which is excellent news for those in the southern hemisphere, as it provides them with far more access time too.

Over the course of the burn and the consequent loss of fuel mass, the spin rate went from 60 to 80 r.p.m., a good indicator of one of the basic principles of physics, and as demonstrated by the spin rate of ice-dancers as they bring their arms inward.

At the time of writing this column on the day following placing OSCAR-13 into its correct orbit, the satellite was arriving slightly later than the times calculated from the KA9Q provisional set, indicating a slightly higher perigee, inclination, and orbital period.

It was still spinning at a rate of 72 r.p.m., but will be reduced to 30 r.p.m., then manoeuvred by ground command pulsing of the magnotorquers to give the final position of re-angulation providing optimum sun angle and earth pointing. Then will follow the full systems tests to check out all the satellite functions.

As for through satellite communications, it is hoped to have the transponders on for two way QSOs by August 1, after all manoeuvres, tests, etc., have been completed to satisfaction. Initially, only the low gain omni-directional antennas may be deployed, with the beams due to come on after all tests are complete. Not only will we be able to see the satellite high points in our own hemisphere, but those on the opposite side of earth also, with the result that it will be possible to work DX in all continents on a daily basis for up to some 14 hours a day at least, and this quite independent of the abnormal propagational conditions that can adversely effect h.f. communications.

The full details of the frequencies, bandwidths, modes, powers, sensitivities, antennas required, etc., have already been given in the pages of the last few issues of this column in *Practical Wireless,* in our "Amateur Satellites" column. The frequencies earlier measured may be found to have shifted slightly when subject to the new conditions found in the satellite environment. More details can now be added to these, although the fine and found data will only evolve after the full system test. It may be safely assumed that the usual bandplan will be expected, with u.s.b. on the upper third of the downlinks (resulting from l.s.b. in the lower third of the uplink passband), c.w. on the lower third of the downlink, with mixed modes in the centre third of the passband. The edge of the passband special service channels nominated for OSCAR-10 have not been given for OSCAR-13.

Mode "B" will need only 21.5dBW of right hand circular polarisation, that is 10 watts at 435MHz to a 12dB gain r.h.c.p. antenna to give a good signal to a reasonable low noise (n.f. 5dB) receiver using a 10dB gain r.h.c.p. 145MHz receiving antenna.

Mode "JL" will need a 25dBW (10 watts to a 15dB gain at 1269MHz or 20W to a 12dB gain r.h.c.p. antenna uplink at 144MHz) to give good signals using a 435MHz r.h.c.p. 13dB gain r.h.c.p. antenna. Remember that the narrow 144.425 to 144.475MHz uplink into the Mode "JL" 435.990 to 435.940MHz downlink section is provided for those countries who do not have an allocation at 1269MHz, and is not in the IARU Region 1 bandplan expected for European amateurs, so should not be used by those who can use the equivalent 1269MHz uplink.

Mode "S" with its 435.601 to 435.636MHz uplink to give the 2400.711 to 2400.747MHz downlink needs only 27dBW e.i.r.p. of uplink. For example 25 watts to a 13dB gain right hand circular antenna to give an adequate signal using a r.h.c.p. 28dB gain receiving antenna, such as a 50 per cent feed efficient 1.4m dish.

The "RUDAK" needs a slightly superior signal to noise ratio, and would like 26dBW, e.g. 400W e.i.r.p. or 8 watts to a 17dB gain r.h.c.p. antenna with a 10dB gain r.h.c.p. antenna at the receiver.

As the new perigee has finished up much higher than earlier thought, two new factors arise. The first is that our earlier theoretical final orbit is not quite the same, and there is no point in placing in these pages that which may only be conjecture. The second point is that having heard the unpleasant things that affect satellites close to the inner Van Allen belt, many of you will be concerned at the longevity of OSCAR-13. Fear not, as the AMSAT team have looked long and hard at the consequences of this very matter, and have carefully calculated both the proton and electron bombardment that the satellite will be subjected to. Remember that the perigee will not be anywhere near the equator, but in the same number of degrees south as the apogee will be north, viz some 57 degrees. It has special radiation resistant memories, which are cover plated as well. It should be good for at least eight years, and last for as long as the battery and solar cell efficiency. And yet . . . already two memory holes have appeared due to the intense solar flares of June 25 and 26, the first of which had wiped out our 14.280MHz AMSAT net in LA, SM, OH, DL, CT, F, I, LZ, UA, PA and G simultaneously for four minutes with an S9 plus noise level from 1140UTC.

As we close for this month on OSCAR-13, our new satellite is showing excellent condition, with ideal temperatures ranging between 6 and 19 degrees celsius, and it would so far appear that we have the ideal Phase III spacecraft at last!

The operating mode schedule has yet to be set, as it will be "played by ear" according to the use shown. At first Mode "B" may predominate, and gradually in-

crease toward more Mode "JL" time as activity on this highly effective mode increases. More next month, by when all systems should be functioning.

Othersats . . .

Finally, just so as to show you that in our enthusiasm of filling most of our column space with the new, we have not forgotten our other amateur satellites, here are some short topical news items.

The RS3A team report that Mode "T" (21MHz up, 145MHz down) is unlikely in the immediate future whilst the 21MHz band is so heavily used for DX. K9CIS reports hearing the OSCAR-13 engineering beacon on 435.802MHz ± 5kHz, by listening to it being transponded via the Fuji-OSCAR-12 satellite when the transponder is under light use.

Leonid Labutin UA3CR, back home in Moscow from the highly successful transpolar ski-trek from UA0 to VE8, reports that RS-12 will fly next year. It is to be fundamentally the same as its RS-10 and 11 predecessors, but both the telemetry and the bulletin board system will have modifications. Leo also reports that work is now going on with RS-13, to be launched in three years time. It will carry a Mode "B" transponder, a Mode "J" transponder and other modes also.

The next three deadlines are: July 27, Aug 31 and Sept 21

Propagation

Reports to Ron Ham
Faraday, Greythars, Storrington, West Sussex R20 4HE

Previously, I have given my reasons for needing a solar radio telescope and have already shown how the dedicated antenna and receiver were designed and built. Therefore, the time has come to talk about the results and believe me they were way beyond my wildest expectations.

The completed instrument began its daily observations of the midday sun in May 1968. The early work proved that solar radio noise could be logged under two headings, **the individual burst** Fig. 1, and **the continuous noise storm** Fig. 2. The former can last up to 10 minutes and the latter may continue for several days, depending on the size and life-span of the area of the sun where the radio-waves are generated. The 4in length of chart in Fig. 1 represents 8 minutes of recording time and clearly shows the burst length of 1.5 minutes. The system switched on automatically as the sun entered the antenna beam and Fig. 2 shows this start, plus an 8-minute recording of a noise storm. Now take a close look at the bottom left of the chart and you will see the level of receiver background noise when I checked the system some 3 hours beforehand. Compare this with the fantastic increase when the sun, with a noise storm in progress, entered the antenna beam.

Although solar activity is generally random and complex there are many similarities between events. The advent of an active sunspot usually produces a few small bursts which increase and decrease in numbers as the spot crosses the central meridian and disappears round the opposite limb. This takes about 13 days because the apparent movement of the spot across the sun's disc is due to the approximate 27-day rotation of the sun on its axis. A noise storm is often recorded while the spot is in mid-travel.

I recorded my first small burst and a

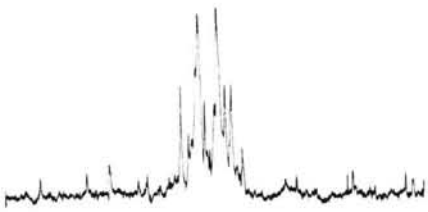


Fig. 1

single day noise storm on May 7 and 22 respectively and my first long burst, of 9 minutes duration, on August 13. This was followed by a minor noise which started on the 18th and lasted 3 more days. However, the sort of event that I was really looking for began on October 26, with a slightly noisy trace, and ended on November 3 with individual bursts. Many such bursts were recorded each day but on October 29, 30 and November 1, the sun was very noisy throughout each observation. Around 1930 on the 1st an aurora manifested and by 2000 auroral reflected signals from amateur stations in Ireland and Yorkshire on the 70MHz band and Wales on the 144MHz band were in the log. This was my first experience of a direct connection between the active sun and an atmospheric disturbance. Not only did I like it, but I knew then that all the work put into the telescope was well worthwhile.

Towards the end of 1969, solar activity was rising and I recorded radio noise on 16 days in October and on 27 days in November.

A major solar storm began on 1 March 1970 with high-amplitude individual bursts inside a slight noise storm. It ended on the 8th with a period of gigantic bursts. Meanwhile, the storm was slight on days 2 and

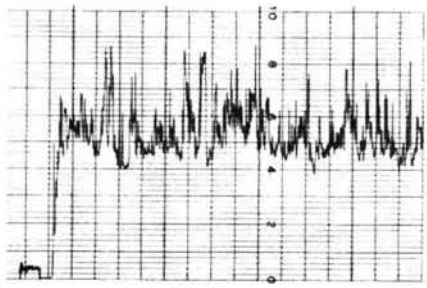


Fig. 2

5 and intense on the 4th, with various sized bursts being recorded on the other days. With all this activity on the sun it was no surprise when an aurora manifested on the 8th. This was a big one, because, during its lifetime (1600-2200) auroral reflected signals were received at my home in Sussex from the Polish broadcast transmitter at Gdansk and a south-coast amateur on the 70MHz band, amateur transmissions from Denmark, the Midlands, the north of England, Holland, Ireland, Scotland and Wales on the 144MHz band IBA (then ITA) television pictures from their Band III stations in London and the Isle of Wight.

In both cases the solar storms warned me that the sun was ejecting particles and that an aurora could appear at anytime. Auroral displays (northern-lights) are rarely visible from southern England, but the strange effect that it has on v.h.f. radio signals (known simply as tone-A) is enough to confirm its presence. Back now to 1988 and readers' reports.

Solar

First, our congratulations to **Patrick Moore** (Selsey) on his well earned award of the CBE. We cannot begin to estimate the value of his contribution to the world of

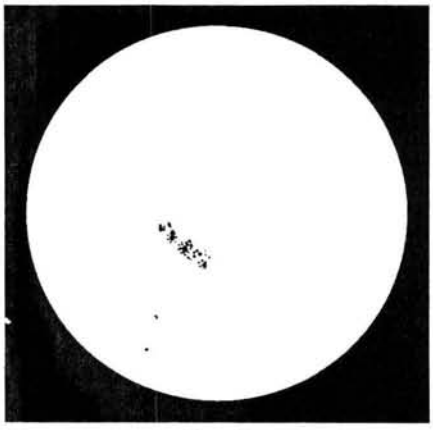


Fig. 3

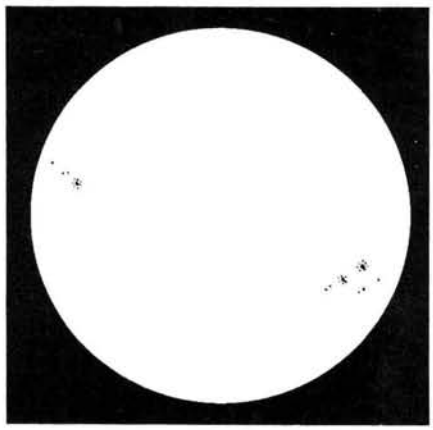


Fig. 4

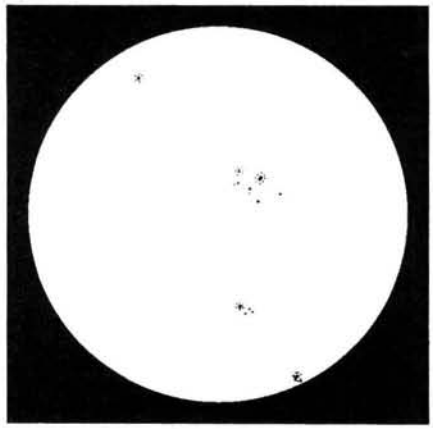


Fig. 5

astronomy and the work he has done to swell the ranks of amateur astronomers. Although very busy, Patrick takes every opportunity to observe and this time I have his drawings of the sunspot group seen at 0830 on May 27 (Fig. 3) and the scattering of spots which he saw early on June 1 and 5 (Figs. 4 and 5).

Cmdr Henry Hatfield's report showing the numbers of sunspots and associated filaments that he located in June with his spectrohelioscope are listed in Fig. 6. Henry also recorded individual bursts of solar noise at 136MHz on June 6, 19, 21, 24 and general noise increases on days 6, 17, 20, 21 and 22.

At his observatory in Bristol, **Ted Waring** counted 32 sunspots on June 4 and 18 on the 12th. In Edinburgh, **Ron Livesey** identified active areas on the sun on May 7, 9, 10, 11, 13, 15, 16, 24, 25, 26, 27 and 30.

"The monthly mean sunspot number for May was 59.7," wrote **Neil Clarke G0CAS** (Ferrybridge). He enclosed his computer print out, Fig. 7, showing the variation in solar flux units throughout the month.

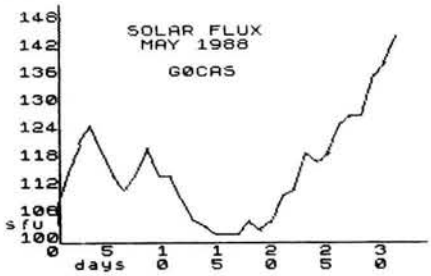


Fig. 7

Magnetic

"May was unsettled with a stormy period on the 6th and the Ap Index reached 125," said Neil Clarke and pointed out that there were no quiet days below 10. The magnetometer used by Karl Lewis in Saltash showed that a magnetic storm began at 2335 on May 5 and continued for most of the 6th. The instrument was unsettled after 0500 and recorded a storm from 0900 to 1600 on the 17th.

Aurora

Ron Livesey received visual reports of "glows and arcs" seen overnight on May 6/7, "active storm" on 7/8 and "glow" on 8/9 and 11/12, from observers in Orkney, northern Scotland and a weathership. He is the auroral co-ordinator for the British Astronomical Association. In Knutsford, **Dave Coggins** checks the BBC transmission on 18.080MHz twice daily and he noted a slight auroral tone at noon on June 19.

Sporadic-E

During the presence of Sporadic-E, strong f.m. signals are often heard in the UK from eastern European stations who broadcast between 66 and 73MHz. I counted about 20 of these stations during the disturbance on May 25, 26, June 3, 4 and 25; more than 30 at 1430 on the 21st and 1230 on the 24th and over 40 at 1730 on the 27th. Italian, Spanish and East European voices were audible in Band II at the peak of the events on days 4, 5 and 21. I also received TV pictures and sound on Ch. R3 (77.25MHz/83.75MHz) at 1010 on June 5, 1706 on the 24th and around 1800 on the 27th.

Dave Coggins logged signals on the 50MHz band from amateur stations in Malta on May 22; Portugal and Malta on June 3; France on the 4th; many from Scotland at incredible strength on the 5th; Norway, Scotland and the USA on the 6th and Portugal on the 19th. "Scottish CB fans were received here, on June 5, at excellent strength," said Dave.

Date	Time	Spots	Groups	Flares	Filaments
6.6.88	0912	1	1 double spot 1 of 7 spots 2 of 3 spots 1 of 6 spots		12
13.6.88	1350	1	1 of 6 spots		8
14.6.88	1450	2	1 of 5 spots		8
15.6.88	1137	3	1 of 5 spots		8
19.6.88	1512	2	1 of 6 spots		7
21.6.88	1445	2	1 double spot 1 of 7 spots		12
22.6.88	1430	3	1 double spot 1 of 9 spots		7
23.6.88		3	1 double spot 1 of 9 spots		

Fig. 6 ▶

Observations from Sevenoaks by Cdr A. R. Hatfield

The 28MHz Band

From his QTH in Schoten, **Patrick Wagemakers** ON4ARJ, using a Kenwood TS120V and a 4 band dipole, worked stations mostly with c.w. in Faroes, Iceland, Italy, Norway and the USSR during May plus I88ITU on the 20th, 4N7N on the 25th and AY4F on the 29th.

In Bransgore **John Levesley G0HJL** received signals from Brazil, Europe, Scandinavia and Scotland with lots of fading on May 26, South America and Scandinavia on the 28th as well as Portugal and Spain on the 31st. June began with England, France and Israel on f.m. on the 1st, followed by near Europe, Scandinavia and Scotland (6th); Norway, Scotland and Switzerland on f.m. (7th); South America and Israel (11th); Europe and Scandinavia (16th); Brazil, Portugal and Spain, amid noise and fading, on the 17th; Brazil, Italy and Spain (19th); Sweden (21st); Europe (22nd) and local Gs, Germany and Yugoslavia on the 24th. In addition, John worked IO9SAZ/P on the 5th , DL2AAY on the 6th, SP8KBM on the 22nd and EA5FCJ on the 24th.

Propagation Beacons

First, thanks to **Chris van den Berg** (The Hague), Dave Coggins, **John Coulter** (Winchester), Henry Hatfield, **Don Hodgkinson G0EZL** (Hanworth), John Levesley, **Greg Lovelock G3III** (Shipston-on-Stour), **Ted Owen** (Maldon), **Fred Pallant G3RNM** (Storrington), Patrick Wagemakers and Ted Waring, for their 28MHz beacon logs from which I compiled the chart in Fig. 8.

Don Hodgkinson heard WA4DJS on June 4 and first timers W8FKL/4 (28.208MHz) on the 4th, EI5FK (28.230MHz) and PI7ETE on the 7th and LU1DZ (28.216MHz) on the 13th.

During the first half of 1988, Ted Owen's logs show a marked increase in the number of beacon signals he received each month compared with the same period last year. The following figures show the 1988 numbers with the 1987 comparison in brackets: Jan 26 (15), Feb 20 (7), Mar 56 (2), Apr 96 (14), May 101 (26) and Jun 102 (79). Ted also heard "IK6BAK/BEACON" on 24.91MHz around 1100 on June 22, 25 and 26.

Dave Coggins can just about hear the 50MHz beacons at Angelsey (GB3SIX-50.020MHz) and Potters Bar (GB3NHQ-50.050MHz) each day but the latter was up in strength on May 28 and June 8 and 17. He logged the beacons in Cyprus (5B4CY-50.498MHz) and Malta (9H1SIX) on June 3, Portugal (CT0WW) on days 3, 8, 17 and 19 and Scotland (GB3RMK-50.060MHz) on the 4th and 5th.

In addition to a weak daily signal from the 144MHz beacons in Angus (GB3ANG-144.975MHz) and Wrotham (GB3VHF-144.925MHz), Dave logged Wrotham around S9 on May 16 and 17 and heard the beacons in Cornwall (GB3CTC-144.915MHz) on June 10 and 17 and Eire (EI2WRB) on the 16th and 17th.

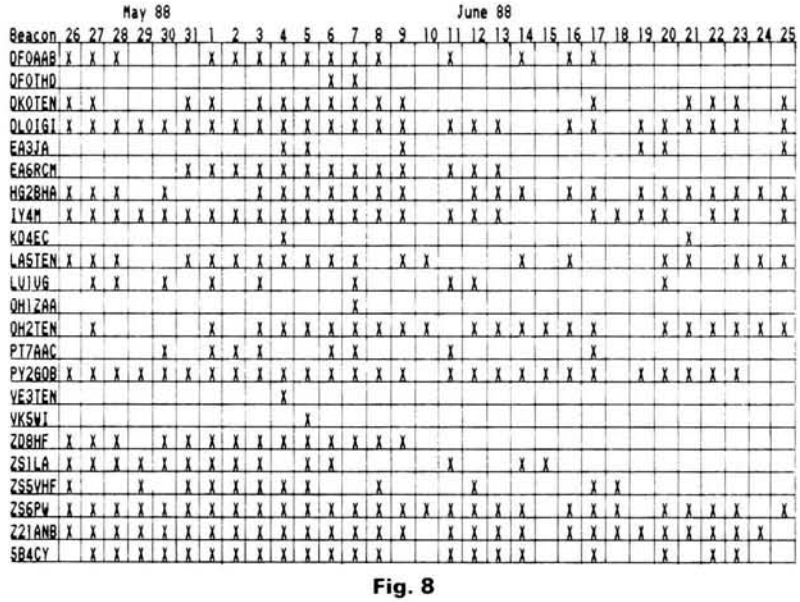


Fig. 8

Tropospheric

First, congratulations to **G6HKM** (Essex) and **G0HAS/P** (Wilts), then **G1NUS/P** (Staffs) and **G4RLF/P** (Wilts), on taking first and second places respectively in the full power and low power sections of the Derby and District Amateur Radio Society's 144MHz contest held on March 13. **G1DRG/P** from Humberside was the leading single operator entry in the latter section. "Thanks to all who took part and especially those who submitted station and/or county check lists which makes adjudication so much easier," said **Mike Sharp**, Contest Sub-committee Chairman.

When conditions are right, **Simon Hamer** (New Radnor) checks the 144MHz band with a Daiwa SRX-9 receiver and HB9CV antenna. During the past year, he has heard signals through 42 UK repeaters.

The slightly rounded variations in atmospheric pressure for this period, recorded at my home in Sussex, can be seen on the chart in Fig. 9.

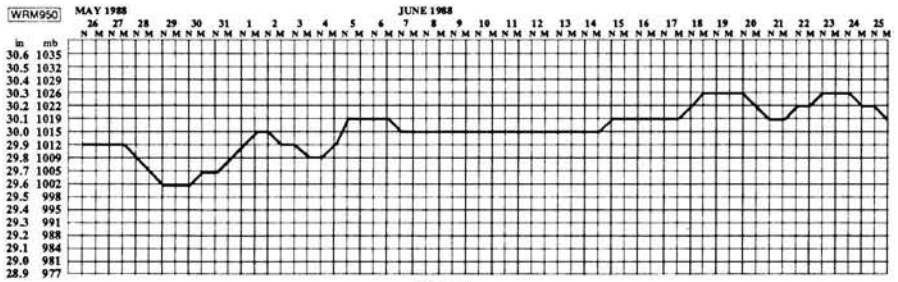


Fig. 9

934MHz

At 2145 on May 12, Ralph Rowlett GR-587 (Upper-Caldecote) made contact with stations in Leicestershire. At 2150 on the 13th, Bill Ellis WE-641 (Houghton-Regis) worked into Doncaster and Wisbech.

"The pressure reading at noon, on June 10, at my QTH was 1019mb, by early evening this was seen to drop off to 1018mb. Having seen European TV coming in with my local BBC picture, I had a look at the 934MHz band," wrote **John Raleigh DW-04** (Bedford). John is the secretary of The Four County 32cm Club and from 2130 to 2359 he heard stations from Birmingham, Humberside, Kings Lynn, Leicester and Yorkshire.

At 2030 on June 20, Les Jenkins GB-37, using a Delta One transceiver, collinear antenna and mast head pre-amplifier, made contacts in Hadleigh with UK-968, Middlestoke (UK-33) and Sittingbourne (UK-938) from his caravan in Deal. At 2100 on the 28th, he worked UK-1329 who was maritime mobile in the Thames Estuary near Sheerness.

John Levesley UK-627, exchanged words with stations in Guernsey on May 22, June 2, 6, 13 and 20 from his home in Bransgore. "Following my visit to the Channel Is. in May, conditions have coincidentally been quite good between the Dorset coast and south-west Hants over to the Islands," said John. He also contacted JY-797 in Jersey and frequently heard activity from Guernsey between May 23 and June 21. He heard a mobile station near Hungerford, a difficult path, on June 2 in addition to his regular contacts with fixed and mobile stations in rural Dorset, Portsmouth and Yeovil.

The next three deadlines are: July 27, Aug 31 and Sept 21

Broadcast Round-up

Peter Shore

As we move into high summer here in the northern hemisphere, the sun has been misbehaving, with solar storms and flares resulting in sudden ionospheric disturbances at the end of June and somewhat peculiar listening conditions on the h.f. bands.

News from around the globe includes an interesting item from the Soviet Union which has admitted to the existence of pirate radio stations, generally of the pop music format, operating in the 1.8MHz amateur band. When caught, according to the answer to a question put by a Radio Moscow listener, the operators are fined between 100 and 250 Roubles (around £100 to £250), and the equipment is generally confiscated.

Radio Caroline's 558kHz transmitter may soon switch to Dutch language programming, in order to finance a new mast for the English service, which presumably will operate on a different frequency.

The Voice of Ethiopia surprised the world during June when it announced test transmissions in English beamed to East and West Europe. Programmes were announced as being on 9.595MHz between 1800 and 1900, Monday to Thursday, and on 7.2MHz Friday to Sunday. The signals were all but inaudible in the United Kingdom, with a trace of the station heard on the 31 metre band frequency during mid June. The station asked for reception reports to be sent to the station at PO Box 654 in Addis Ababa. It is unclear whether the station intends to launch a fully-fledged European service.

In an unusual departure, Radio Polonia journalists have put forward the idea of holding a meeting with their opposite numbers from Radio Free Europe, in order to enable an exchange of views between the two organisations . . !

On August 1 Radio Japan will begin a transmitter relay exchange with Radio France International for four and half hours a day. Whilst frequencies had not at the time of writing been announced, the times are for Japanese programmes from the RFI French Guiana site—2200–2300 in Japanese to South America, 0200–0300 to South and Central America, and between 0330 and 0400 in Spanish to South America. RFI programmes will go out from NHK's Tokyo Yamata site at 0930–1130 with French to Northern Asia, 1000–1100 to SE Asia and 2300–0300 again to SE Asia.

Radio Canada International is in negotiation with Radio Beijing for relays of Beijing via Sackville and for RCI programmes to be carried on transmitters in the Peoples' Republic. Details are still being worked out, but watch for further information in this column.

In Scandinavia, Finland announced the scrapping of its radio licence for domestic receivers during June.

Australia's new Brandon short wave transmitting site in Queensland, which replaces the Lyndhurst site, was due to be in operation by the beginning of July, using three old 10kW transmitters, to be replaced in time by 100kW and curtain antennas.

Europe

All times UTC (=GMT)

Finland has been noted with s.s.b. transmissions on 15.325MHz at 1000. USSR feeders continue to be heard and to provide a useful source of listening material: 16.33MHz l.s.b. includes Moscow World Service at 0800. RAI in Rome has English to Europe:

0425–0440 on 7.275 & 6.165MHz
1935–1955 on 11.8, 9.71 & 7.275MHz
2025–2045 on 11.8, 9.575 & 7.275MHz

Africa

Radio Cairo has English to Asia at 1300 on 17.595MHz and to Europe at 2115 on 9.9MHz.

Any reports for Broadcast Round-up should be sent to the PW offices

Middle East

Radio Baghdad transmits in English at 2000 on 9.77 and 15.23MHz and at 0000 on 11.775 and 11.81MHz.

Asia and the Pacific

Afghanistan Home Service is heard from around 0130 through the night on 15.225MHz, whilst English can be heard at 0900 on 9.635, 15.255 and 17.655MHz, with French at 1930 on 9.665MHz.

The Deutsche Welle relay station at Trincomalee in Sri Lanka is now testing irregularly on the medium wave channel on 1.548MHz and on h.f. at 6.17MHz.

Bhutan is using 9.615MHz at present in place of 6.035MHz, and is due to increase power during the coming months following a complete renovation of its facilities.

Ulan Bator from Mongolia is on at 1445 until 1520 on 15.305MHz. A new interval signal and broadcasts in Hindi from Radio Veritas Asia can be heard at 0300 on 17.77MHz and at 1600 on 11.76MHz. In Indonesia, RRI Ambon is heard on 4.845 ex 4.835MHz

The Pacific DX Magazine over KTWR Guam is now heard on Saturday at 1000 on 11.805MHz and on Sunday at 0845 on the same channel. China's CPBS 2 station on 5.075MHz puts in a good signal during our morning, and includes the American Music Hour programme at 1030 on Thursday with a Sunday repeat.

The VNG Time Signal in Australia is to be reactivated in August and will use 4.5, 7.5 and 12MHz. Staying with Australia, George Hewlett has written to me from Torquay in Devon. George is a monitor for Telecom Australia (the body which runs Radio Australia's transmitters) and has monitored broadcasts from down under for around 20 years on a mainly daily basis. George sent a list of broadcasts which I reprint here:

11.91MHz	0400 434N improving to 444N by 0600
11.945MHz	0600 African Service 433Co-channel, N 322A3 mainly from BBC
15.315MHz	0507 French 433N 0600 (English) 433N, some s.s.b. from 15.32
15.24MHz	0400 434N improving to 444N (Berlin may cause QRM after 0630)
15.16MHz	0400 434N falling to 322 A3 N when co-channel station heard after 0530
15.32MHz	0400 322N T (rapid code txmn) improving to 433N
17.795MHz	0400 434N off the air 0600
17.75MHz	0400 434N occasionally falling to 322N and lost from 0600
17.715MHz	0400 434N variable, but holds reasonably good for this band until close 0910. Occasionally down to 322 A3 N
15.395MHz	0500 433N falling to 322N Q (s.s.b. from 15.39MHz, splatter)
9.655MHz	0700 434N improves to 444N but may fall to 322 by 1025
9.58MHz	0800 Variable 433N Q (from 9.575MHz) to 322N Q
9.77MHz	1000 At best 434N but BBC on 9.76MHz may cause slight to severe interference
15.415MHz	0900 Audible but generally unusable due to co-channel QRM

N = Noise

North and South America

Radio for Peace is heard on 13.67MHz from Costa Rica at 2100 until 2400 and announces 7.375MHz for 0000-0400. The address is PO Box 88, Santa Ana, Costa Rica. R. Huanta 2000 from Peru is now heard on 4.755MHz.

KUSW in the USA operates on out-of-band 15.69MHz with reasonable reception between 1900 and 2000. Disaster struck WHRI when their studio complex burnt to the ground, and the station is making use of temporary facilities in Indianapolis. WMLK is heard on 9.465MHz between 0400 and 0700.

That's all for this time round, but thanks go to George Hewlett for his observations on Radio Australia. All other contributions will be gratefully received – write to the Editorial Office in Poole.

Any reports for Broadcast Round-up should be sent to the PW offices

SWAP SPOT

Have AR88D receiver, immaculate, Hallicrafters S27 receiver, 27.8 to 143MHz. KW Vanguard transmitter with Top Band. SEM Transmatch. Thandar frequency counter. Advance signal generator. all in good condition and with manuals. Would exchange for 144MHz mobile, w.h.y? G4VNG. Tel: 0733 231639 (Peterborough). *E466*

Have collectors item. Avo valve tester (circa 1944), wooden transit case, manuals and all leads, etc. Would exchange for PE HW7 or Shimizu 105S transceiver or similar. Tel: Tedburn St Mary 753. *E479*

Have Trio JR310 h.f. amateur bands receiver. Would exchange for FC-707 a.t.u. or CPC464 disc drive. Dave. Tel: 061-303 0409. *E505*

Have Acorn Electron with Plus One, lots of software, View, etc. Would exchange for 144MHz handheld or portable. Phill GW6YWM. Tel: 0993 811747 (after 6pm). *E486*

Have a S20R Hallicrafters Sky Champion receiver in good condition, also have No. 19 set variometer. Would exchange for any old Ex-Gov v.f.o., w.h.y? Tel: 0326 290711 (Helston). *E497*

Have Quad 22 stereo amplifier with control unit and RCA f.m. tuner, all in good condition. Also have cabinet. Would exchange for v.h.f./u.h.f. scanner or 28MHz mobile rig. Dave GW4TWU. Tel: 0970 817775. Or Wyn GW4TUD. Tel: 0970 617884 (evenings). *E508*

USE THIS SPACE

SMALL ADS

The prepaid rate for classified advertisements is 40 pence per word (minimum 12 words), box number 60p extra. Semi-display setting £13.24 per single column centimetre (minimum 2.5 cm). 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.

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.

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.

GOLLEDGE ELECTRONICS
Merriott, Somerset, TA16 5NS.
Tel: (0460) 73718.

TRANSFORMERS 240V in 12V out 10VA 50p each, postage £1.50 up to 30 transformers. P. FALLE, 2 Greystones, Gorey Village, Jersey.

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 1DI.

FREE SCANNER AERIAL with every Realistic PRO-2004 programmable scanner sold. 25-520MHz, 760-1300MHz, 300 memories, carriage free of charge. PRO-2004 £349.95 (Access and Visa). Link Electronics, 228 Lincoln Road, Peterborough. Tel. 0733 46770.

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 Recordiacall Service: 01-946 1102 quoting Dept. JX26.

Kits

KANGA PRODUCTS
Kits for the Constructor

40W Dummy Load Kit	£7.95
RF Sidetone Generator	£5.95
Marker Kit 10Hz-10Meg	£9.95
Our Ever Popular V.F.O. Kit	£9.95
Digital Dial/Frequency Counter	£19.95
Oner Transceiver (on 1" pcb s)	£25.00
Dual Band Receiver (20 & 80m)	£35.95
160M for the FT77 & FT707	£27.50
(some kits are supplied semi-complete)	Please add 85p P&P

PLUS MANY MORE INTERESTING KITS TO BUILD
Send your large SAE now to
KANGA PRODUCTS, 3, LIMES ROAD, FOLKESTONE CT19 4AU

KITS. Miniature v.h.f. transmitter with microphone, tuneable 70/146MHz. £5. Telephone transmitter £5.99. Automatic telephone monitor stops/starts recorder £6.99. Voice operated relay £9.99. Receiver preamplifier, 2M or 10M, 15dB gain, £6.99. Signal injector/tracer AF/RF £5.95. Piptone (Roger-bleep) £3.99. A.C.E. (PW), 99 Greenheath, Hednesford, Staffs WS12 4AU.

F.J.P. KITS & COMPONENTS
Kit Manufacturers – Amateur Radio Products
PROPRIETOR: F. POWELL
63 Princess Street, Chadsmoor, Cannock, Staffs WS11 2JT
Telephone (05435) 6487

PW MEON NOW 1½W RF OUT	Don't ADD vat
We are now offering a better service for 4 and 6 mtr users in the way of built kits and components Kits, all kits include box if specified. With full warranty for those not able to build there needs. Full range of components. Send A4 S.A.E. for lists. No stamp no lists	
P.W. Meon Built for 6-4 mtres 10mtre IF, 2mtre IF 6mtre only	£80.00
P.W. Meon for 4mtres using a 6mtre rig Built only	£80.00
All above are for multimode operation	
Matching 12db linear built 0.5 watts in	£35.00
Kit NO box including Heatsink. Up to 15w out plus	£28.00
2.5 watt linear for 4.6 mtre 0.200 mw in	£6.50
R.F. switching see previous ads	
P.W. R.F. voltmeter July 88 full kit inc box	£22.50
P.W. ORWELL Medium Wave DX Receiver Kit	£55.00
P.W. Westbury 450-480KHz basic Wobbulator inc box	£15.00
P.W. Meon Oct 85-Apr 86 Kit for 10m IF	£45.00
P.W. Meon 2mtre IF with additional PCB 6mtre only	£45.50

Terms CWO Cheq. PO. VISA. ACCESS. Order by phone, mail. Delvery Kits by return. Built Kits 7 days. 14 max all work guaranteed.
Payment to F.J.P. KITS-COMPONENTS to above address. Prices inc Postage.

Service Sheets

TECHNICAL INFO SERVICES (PW)
76 CHURCH STREET, LARKHALL, LANARKSHIRE ML9 1HE
Phone: 0698-884585 Mon.-Fri., 9-5, any other time: 0698-883334, for Fast Quotes
WORLD'S LARGEST COLLECTION SERVICE MANUALS – Most unobtainable elsewise.
Prices range from only £4.50 – large s.a.e. any quotation, no obligation to buy.
WORLD'S SOLE Suppliers of TV & Video Repair Manuals, etc. from TV TECHNIC also such publishers as Heinemann, Newnes, TV Technic, Thorn, etc.
Every published service sheet in stock, supplied full size, not bits and pieces.
CTV's or any combination £3.50 + l.s.a.e.; any other single item £2.50 + l.s.a.e.
Complete Circuit Sets for most Videorecorders only £7 set (No service sheets made).
L.S.A.E. for QUOTATIONS plus GIANT CATALOGUE – NEWSLETTERS – BARGAINS – FREE S/Sheet as available.

Comprehensive TV Repair Manual £9.50. Complete Radio Service and Repair Course £9.50.
Complete Repair & Service Manuals – Mono TV £12.50; CTV £17.00; Video £19.50.
Complete Repair Data with Circuit – Mono TV £ 9.50; CTV £12.50; Video £10.50.
£3.00 + L.S.A.E. BRINGS THE ONLY COMPREHENSIVE SERVICE SHEETS & MANUALS CATALOGUES plus FREE CHASSIS GUIDE and £4.00 OF VOUCHERS.

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. **£10.00** plus LSAE.
FREE Catalogue Unique Repair and Data Guides for LSAE
MAURITRON (PW),
8 Cherry Tree Road,
Chinnor, Oxon, OX9 4QY.

Software

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

'COMMODORE COMPUTERS (+4, C16, 64, 128). "MICROCOM" cw/rtty 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.

For Sale

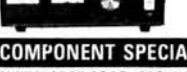
"GRUNDIG" INFRA-RED REMOTE CONTROL "VIF-K1" consists of Transmitter TPV355 & VIF-E1 brand new & boxed £4.99, P&P £2. Box of 10 VIF-E1 £9.99p P&P £3. VIDEO HEADS (GRUNDIG 2×4 Super) with head assembly £29 P&P £2. 2×4 SUPER panels – DTF, SERVO, VIDEO, CROMA, STEREO-TON, MOTOR-BOARD, MODULATOR & TUNER all £5.99 each P&P £1. VIDEO TAPES VCC360 £6.99, VCC480 £7.99 P&P £1. REMOTE CONTROLS suitable for use with FERGUSON, JVC, PHILIPS, SONY, GRUNDIG, ITT brand new boxed £19.95, P&P £1. GRUNDIG 2×4 SUPER STEREO £79 & £89 (callers only). SURPLUS STOCK WANTED. STAN WILLETTS, (PW), 37 High St., West Bromwich, West Midlands B70 6PB. 021 553 0186.

SELECTION P.W. MAGAZINES dating from 1956-1965 v.g.c. SAE: A. SINCLAIR, 1 Northfield Avenue, Wick, Caithness.

TEKTRONIK OSCILLOSCOPE, type 536, 10MHz, dual trace, good condition, £75.00. Tel. (01708) 855763 (S. Essex).

PRACTICAL WIRELESS 1949-1988 (5 missing) any offers, phone 066 33 2003.

RCS VARIABLE VOLTAGE D.C. BENCH POWER SUPPLY
0 to 20 volts up to 1.5 amps D.C. Fully stabilised. Twin panel meters for instant voltage and current readings. Overload protection. Fully variable. Operates from 240V A.C. Compact Unit: size 9×5½×3ins. **£36** + 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

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 .....

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

Company registered in England.
Registered No. 1980539.
Registered Office: Towngate House,
2 Parkstone Road, Poole, Dorset, BH15 2PJ. 9/88

Valves

HAVING DIFFICULTY OBTAINING AN OBSELETE VALVE/TRANSISTOR/I.C.?

We try harder to locate rare types! Delivery either ex stock (1-2) days or from our overseas sources (5-8 days).

WE ALSO STOCK ALL POPULAR TYPES - USUALLY THE LOWEST PRICES ANYWHERE

(compare our prices listed below!) we'll nearly always beat any written quote. Large discounts for wholesale quantities - phone/fax/telex for an immediate quote. Free advice re equivalents etc. (we've specialised in valves and transistors since 1982). New boxed guaranteed valves. Good quality brands (Mul.Bri.STC etc.)

Phone/fax/telex for immediate quote on any type not listed - ask for Martin Billington.

Please add 15% VAT to all prices and £1.15 p&p per order. Telephone your order quoting VISA, BARCLAYCARD (not ACCESS - sorry), or send cheque for prompt despatch by 1st Class Post. All parcels insured (at our expense) against damage in transit.

6L6GT	2.20	EL84	.95	QQV06-40A	24.00
6V6G	1.20	GZ34	2.40	UCH42	2.00
E88CC	3.00	GZ37 Mul	3.40	UF41	1.10
E88CC Mul	4.50	KT66/7581A		UL41	7.00
E810F	24.00	RCA	9.00	UY41	3.00
ECC81	.80	KT88 USA	10.75	4CX250B	
ECC82	.80	M8136 Mul	6.00	Eimac	58.00
ECC83	.93	M8137 Mul	7.00	5B/254M	14.00
ECC85 Mul	1.00	M8162 Mul	5.00	5B/255M	19.00
EF86	2.10	OA2	1.40	6CH6 Brimar	6.90
EF91	1.40	OB2	1.40	6BA6	1.00
EF92	1.65	PCL82	.60	6B33STC	9.00
EF95	.80	PCL805	.80	12E1	17.00
EL34	2.80	PL509 19	4.45	5763	7.00
EL41	2.70	QQV03-20A	23.00		

Phone, fax or telex for our valve catalogue or a quote on your requirements.

BILLINGTON VALVES

GOOD QUALITY-LOW PRICE-RARITIES A SPECIALITY

39 Highlands Road, Horsham, Sussex RH13 5LS (Callers welcome but by appointment only).

Phone 0403 210729 Fax 0403 210108 Telex 87271.

Office hours Mon - Fri 9 a.m. - 6.30 p.m.

Magnetrons, Klystrons, trav-wave tubes also stocked. (Answerphone, telex and fax left on overnight and weekends)

G3LLL's SPECIALS Toshiba 2SC2290 (outputs for FT707, 107 & 77) £49.90 pair, Black Star 600MHz counters £139.99, also new 2GHZS version S.A.E. leaflet. FT101E/B/ZD Bits. FM units for FT101ZD Mk3 £45 p.p. AT LAST! C.W. Filters FT101ZD/707/E/B? Phone. Double balanced mixer FT101E/B Mk1 £19. WARC Kits (all 3 new bands) FT101 Mk1, Mk2 B & E only £19.50. 6JS6C NEC pair £38 p.p. NEC 12BY7A each £17 p.p. 6146B G.E. pair £27 p.p. Hols. late Sept/early Oct. phone. B/Card, Access. G3LLL HOLDINGS/AMATEUR ELECTRONICS, 45 Johnston Street, Blackburn, BB2 1EF. (0254) 59595.

Q.S.L. Cards

QSL CARDS New 1988 Impact Designs. Single and multi-colours, personal designs and with American style raised print. For the best value around send s.a.e. to: CONTACT CARDS, 11 Winchcombe Road, Bispham, Blackpool FY5 3HJ.

Miscellaneous

HEATHKIT U.K. Spares and Service Centre. CEDAR ELECTRONICS, Unit 12, Station Drive, Bredon, Tewkesbury, Glos. Tel. (0684) 73127.

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

F. G. Rylands, 39 Parkside Avenue, Millbrook, Southampton SO1 9AF Tel. (0703) 775064

MICROWAVE TRANSISTORS and Devices for Industrial use. Quotation sent on request. TSUTOM YOSHIHARA, C1-105, Deguchi-cho 34, Suita-shi, Osaka 564, Japan.

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

Racal MA 211 Aerial Tuning Unit	**£145.00 ea.**
Racal MS 61 Line Prog. Unit	**£35.00 ea.**
Vernier Dial 0:100 25mm with Brake	**£3.75 ea.**
8R 50W. W/W. V/contol ¼" D.shaft	**£1.75 ea.**

HIGH VOLTAGE ELECTROLYTICS

1/360V A.C. Wkg	**35p.**	15/160V D.C. Wkg	**60p.**
2/360V A.C. Wkg	**40p.**	47/160V D.C. Wkg	**£1.50**
4.5/280V A.C. Wkg	**40p.**	4/440V D.C. Wkg	**£1.25**
6/360V A.C. Wkg	**75p.**		

CO-AXIAL CABLES

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

ALL PRICES INCLUSIVE VAT + P&P

ELECTRONIC EQUIPMENT CO (LONDON) LTD.
SPRINGFIELD HOUSE, TYSSEN ST., LONDON E8 2ND.
Telephone: 01-248 5217 Allow 10 days delivery

CALIBRATION

Need not cost a fortune. For a free quote on your D.M.M., oscilloscope or frequency counter. Send type of instrument, Make and Model details to:-

Calibration Dept.
Blueharrow Limited,
Brookside Cottage,
Main Road,
Brighstone. I.O.W. PO30 4DJ

3½ DIGIT D.M.M. FROM £5.00 (calibrator to BS5750)

THE SCIENTIFIC WIRE COMPANY
811 Forest Road, London E17. Telephone 01-531 1568

ENAMELLED COPPER WIRE

SWG	1 lb	8 oz	4 oz	2 oz
8 to 34	3.63	2.09	1.10	0.88
35 to 39	3.82	2.31	1.27	0.93
40 to 43	6.00	3.20	2.25	1.61
44 to 47	8.67	5.80	3.49	2.75
48	15.96	9.58	6.38	3.69

SILVER PLATED COPPER WIRE

14 to 30	10.10	5.20	2.93	1.97

TINNED COPPER WIRE

14 to 30	3.97	2.41	1.39	0.94
Fluxcore Solder	5.90	3.25	1.82	0.94

Post free, please add VAT @ 15%. Orders under £3.00 add 50p. SAE for list of copper and resistance wire. Dealer enquiries welcome.

B.A.R.T.G. RALLY

SUNDAY AUGUST 28th

at

Sandown Exhibition Centre Esher, Surrey

★★★★★★★★★★★★★★★★★★
★★ CAR BOOT SALE ★★
★★ ON-SITE CATERING ★★
★★ EASY ACCESS BY CAR ★★
★★ TALK-IN S22 & SU22 ★★
★★ MANY TRADE & ★★
★★ DISPLAY STANDS ★★
★★★★★★★★★★★★★★★★★★

OPEN 10.30 to 17.00

★★★★★★★★★★★★★★★★★★★★★★★★★★
★ THE NUMBER ONE RALLY OF THE YEAR ★
★ FOR DATA COMMUNICATIONS ★
★★★★★★★★★★★★★★★★★★★★★★★★★★

Further details available from:
PETER NICOL G8VXY
38 Mitten Avenue, Rubery, Rednal, Birmingham B45 0JB
Telephone: 021 453 2676

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.

INDEX TO ADVERTISERS

SHORT WAVE MAGAZINE READERS

DUE TO A TYPESETTING ERROR, THE HOLIDAY PERIOD OF **JOHNSONS SHORTWAVE RADIO** IN THE AUGUST ISSUE OF SWM WAS INCORRECT. THE ACTUAL DATES WHEN THEY ARE CLOSED FOR ANNUAL HOLIDAYS ARE **20th AUGUST – 3rd SEPTEMBER.**

YOUR LOCAL DEALERS

TO FILL THIS SPACE CALL: 0202 676033

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

LONDON
AMCOMM OF LONDON
Approved dealer for Yaesu and Icom
373 Uxbridge Road, London W3 9RN
Tel: 01-992 5765
(Mail order a speciality)

PLEASE MENTION PRACTICAL WIRELESS WHEN REPLYING TO ADVERTISEMENTS

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, Oxton, Birkenhead, L43 2HZ.
Tel: 051 653 3437
(Callers by appointment 9 am-9 pm, Mon-Sat)

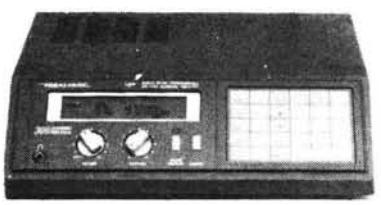
SOUTH WALES MAIL ORDER RETAIL
A.C.S. SYSTEMS
PACKET RADIO: ST-PC-AMIGA COMPUTERS
AMATEUR SOFTWARE FOR MOST COMPUTERS
SATELLITE TELEVISION SYSTEMS
ICS DEALER FOR DATA COMMUNICATIONS
19, CILHAUL TERRACE, MOUNTAIN ASH, MID GLAMORGAN SOUTH WALES, CF45 3ND. TEL 0443 476040 SAE
CALLERS BY APPOINTMENT 9am-9pm Mon-Sat LIST

CHESHIRE
FLIGHTDECK
THE AIRBAND SHOP
Specialists in Airband and Shortwave receivers.
Official agents for Sony, Signal, AOR, Revco, Lowe and Kenwood (rec's only)
FAIRBOTHAM & Co. Ltd.
58-62, Lower Hill Gate, Stockport, SK1 3AN.
Tel: 061 480 8080
(closed 1.00-2.15 & all day Thursdays)

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

DO YOUR HORSE TRADING WITH RADIO SHACK

THE FINEST EVER SCANNER
PRO 2004



BUNDLED WITH A LOT OF EXTRAS ***£349.95*** *FROM RADIO SHACK*

DO YOU HAVE AMATEUR RADIO EQUIPMENT THAT YOU WOULD LIKE TO TRADE FOR COMPUTERS, PRINTERS, ETC?

— CALL US — FOR THE BEST DEAL.

FOR COMMUNICATIONS & COMPUTERS

YAESU
KENWOOD
ICOM

ICOM

TANDY
COMMODORE
AMSTRAD
— ETC —

DAISY, DOT AND LASER PRINTERS

PSION ORGANISERS

Access

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 Telephone: 01-624 7174

VISA

Published on the second Thursday of each month by PW Publishing Limited, Enefco House, The Quay, Poole, Dorset BH15 1PP. Printed in England by Benham & Co Limited, Colchester, Essex. Distributed by COMAG, Tavistock Road, West Drayton, Middlesex UB7 7QE, telephone West Drayton 444055, Telex 8813787. Sole Agents for Australia and New Zealand – Gordon and Gotch (Asia) Ltd.; South Africa – Central News Agency Ltd. Subscriptions INLAND £14 and OVERSEAS (by A.S.P.) £18.50, payable to PRACTICAL WIRELESS, Subscription Department, Competition House, Farndon Road, Market Harborough, Leicestershire LE16 9NR. PRACTICAL WIRELESS is sold subject to the following conditions, namely that it shall not, without the written consent of the Publishers first having been given, be lent, resold, hired out or otherwise disposed of by way of Trade at more than the recommended selling price shown on the cover, and that it shall not be lent, resold, hired out or otherwise disposed of in a mutilated condition or in any unauthorised cover by way of Trade, or affixed to or as part of any publication or advertising, literary or pictorial matter whatsoever.

ICOM

Count on us!

IC-761, HF Transceiver

- **Built-in AC power supply**
- **Built-in automatic antenna tuner**
- **SSB, CW, FM, AM, RTTY**
- **160-10M/general coverage receiver**
- **Direct keyboard entry**
- **Passband tuning plus IF shift**
- **QSK up to 60 wpm**
- **CI-V communications interface**

The ICOM IC-761 has many features included in a single unit and operates on all the HF bands with general coverage reception from 100kHz to 30MHz. A 105dB dynamic range receiver, high RF sensitivity and steep skirted IF selectivity makes the IC-761 ideal for Dx'ing, contesting and shortwave listening.

Additional features include 32 fully tunable memories, variable RF output power to 100 watts, passband tuning and IF shift plus tunable IF notch, RF speech processor, noise blanker, RF pre-amp and 20dB attentuator.

Direct frequency entry is via the front panel keypad or by the main smooth action tuning knob. For the CW operator a built-in electronic keyer, semi or full break-in operation up to 60 wpm is possible.

Accessories to complement this exciting new transceiver include the SM10 graphic equalised microphone. SP20 external loudspeaker with selectable filters, EX310 voice synthesizer and HP2 headphones.

For more information on the IC-761 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.

SINGLE-ACTION WIRE-STRIPPERS

Extremely quick and easy to use. Just place wire in jaws and squeeze handles. Wire is neatly stripped in one simple action. Also includes tension adjustment and cutter.

NEW LOW PRICE

£2.95 FT44X

YOU CAN'T BUY CHEAPER

Maplin

SUPPLY THE TOOLS! SO YOU CAN FINISH THE JOB WITH EASE!

☎ SALES 0702 554161

HOBBY VICE

Lever operated suction grip base holds tightly to smooth non-porous surfaces. Ideal for holding small components and assemblies. Metal faced jaws 37 x 11mm, open to 35mm. Base 60 x 60mm. Height 68mm.

UNBELIEVABLE PRICE ONLY £1.95 YP38R

HELPING HANDS

Remarkably low price on this most useful piece of equipment. Two fully adjustable crocodile clips hold pcb's etc. firmly and glass magnifier allows close inspection.

SUPERB VALUE

£4.95 YK53H

SOLDER by ADEPTO

INCREDIBLE LOW-PRICE TRIAL OFFER TO LAUNCH OUR NEW BRAND

½kg reel 18 swg

£6.89 YJ92A

(=£5.99+VAT) PER REEL

or in boxes of 20 reels (10kg)

£4.99

(=£4.34+VAT) PER REEL

(SC20W price £99.80).

Top quality standard flux-cored solder designed for hand and machine soldering of electronic components. Manufactured to BS219 Grade KP, BS441 Grade 2 and BS5625 Class 5a. The solder is a 60% tin, 40% lead alloy containing a non-corrosive flux. Solder starts to melt at 183°C and is fully molten at 188°C. Available on ½kg reels in 0.7mm dia. (22 swg) and 1.2mm dia. (18 swg). Perfect for use with all hand soldering irons including Antex, Weller etc.

UNBEATABLE TRIAL OFFER PRICE ON ADEPTO FINE QUALITY SOLDERS.

½kg reel 22 swg ONLY

£7.99 FY70M

(=£6.95+VAT) PER REEL

or in boxes of 20 reels (10kg)

£5.74

(=£4.99+VAT) PER REEL

(SC21X price £114.80).

"The finest soldering irons in the world." – Maplin recommend Antex.

Precision soldering irons that are a pleasure to use. Low leakage currents, ceramic element, shatterproof handle. It all adds up to the number one soldering equipment for the hobbyist. Use CS type for very fine work, XS for general use.

17W TYPE CS £7.25 FY62S

25W TYPE XS £7.45 FR12N

SOLDERING IRON STAND

Suitable for most soldering irons.

SUPER LOW PRICE

£2.95 FR20W

SOLDERING IRON KITS

CS or XS Iron complete with stand, solder and 'How To Solder' booklet.

IDEAL GIFT

CS KIT £9.95 FY68Y

XS KIT £10.15 FY69A

ALL ITEMS SUBJECT TO AVAILABILITY

ALL PRICES INCLUDE VAT. PLEASE ADD 50p TOWARDS POSTAGE. IF ORDER BELOW £5 PLEASE ADD 50p

DESOLDER PUMP

Powerful pump action and plunger guard.

INCREDIBLE LOW PRICE

NOW ONLY £2.95 FR26D

Maplin ELECTRONICS

P.O. Box 3, Rayleigh, Essex, SS6 8LR.

MANY MORE PRODUCTS INSIDE!

Pick up a copy of our giant 512 page catalogue from WH SMITH for just £1.60.

Shops at: ○ Sutton New Road, Erdington, **Birmingham.** ○ 302 Gloucester Road, **Bristol.** ○ 159-161 King Street, **Hammersmith,** London. ○ 8 Oxford Road, **Manchester.** ○ 46-48 Bevois Valley Road, **Southampton.** ○ 282-284 London Road, **Southend-on-Sea.**