MAY 1988 £1·20

ISSN 0141-0857

Practical Wireless

The Radio Magazine

FREE INSIDE PW Datacard

REVIEWS
Kenwood TS-680S HF/50MHz Transceiver

and
AFtronics SuperSCAF Audio Filter

Plus
Build the 'Eightypole' Portable 3·5MHz Antenna

HF performance you can have a real field day with.

With Yaesu's FT-757GX/II, you can enjoy full-featured HF performance just about anywhere.

On vacation. During field day. On the road. Or in your shack.

Because the FT-757GX/II packs all its HF performance into one highly compact, action-ready case. A case so small, it even fits under airplane seats.

Of course, you've probably noticed a similarity to its predecessor, the FT-757GX. That's purely intentional. And now its performance is even better.

With new features like memory storage of operating mode. Slow/fast tuning selection. Automatic step-change according to mode. IF notch-filter. 10 memories. And VFO to VFO scan.

Plus you get an iambic electronic keyer. Woodpecker noise blanker. 600-Hz CW filter. AM and FM modes. AF speech processor. And 25-kHz marker generator. All at no extra cost.

Three microprocessors. Dual VFOs. Single-button VFO/memory swap. Receive coverage from 500 kHz to 30 MHz. Transmit coverage from 10 to 160 metres, including WARC bands. All-mode coverage (LSB, USB, CW, AM and FM). 100-watt RF output.

QSK operation. Massive heatsink and duct-flow cooling system for continuous RTTY operation for up to 30 minutes.

Computer Aided Transceiver (CAT) System for computer control via optional interface.

Of course, the FT-757GX/II offers the kind of options you'd expect from Yaesu, too. Including standard and heavy-duty power supplies, automatic antenna tuner, hand and desk microphones.

So no matter where you work the DX, take along Yaesu's FT-757GX/II. The full-featured HF rig you'll have a real field day with.

YAESU

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

Prices and specifications subject to change without notice.

Practical Wireless
The Radio Magazine

MAY 1988 (ON SALE 14 APRIL 1988) VOL. 64 NO. 5 ISSUE 974

THIS MONTH

NEXT MONTH

PW REVIEW of the Yaesu FT-736R VHF/UHF/ Microwave Transceiver

PW 144MHz QRP Contest Rules

"Valved Comms Receivers" The RCA AR-77

and All the usual features

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

On sale May 12

Contents subject to last-minute revision

★ FREE INSIDE THIS ISSUE ★
PW Datacard
UK VHF/UHF/Microwave Amateur Beacons

Regular Features

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)
Prestel 202671191

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

The TR-751E from Kenwood

Now for something completely different – or how I found 2 metres and discovered the true secret of life.

Kenwood have always tried to give the radio amateur a sensibly thought out range of equipment, and the TR-751E occupies that particular place devoted to the all purpose, go-anywhere, high performance 2 metre multi-mode transceiver. Many of you will remember what an impact the TR-9000 had on 2 metre operation when it was introduced, and with other manufacturers scrambling to keep up, the success was repeated by the TR-9130. The TR751E follows and improves upon those earlier successes, and it's no wonder, when you consider what is contained in this tiny package.

The TR-751E does not simply give you high performance; it presents it in such a way as to be easily used, logical in operation, and a lasting source of satisfaction. Is it any wonder that Angus McKenzie said in his review (Amateur Radio):–

"Trio (Kenwood) have clearly though out the ergonomics very carefully and I found it one of the easiest mobile rigs to use, especially considering its comprehensive facilities." He also said, commenting on the actual performance of the receiver:–

"The receiver sounded alive, and seemed to be giving a performance very similar to that of the Icom IC271 with MuTek front end. I found this rather stunning, and it is clear that Trio have achieved a far better noise figure in the front end than ever before on a 2 metre rig."

Chris Lorek, in his review (Ham Radio Today) confirmed what had already been said:–

"The receiver appeared remarkably efficient at pulling weak signals in. When I connected in an external GaAsFET preamp at the aerial socket I noticed very little improvement."

This level of performance also extends to the transmitter, and Kenwood transceivers have always been noted for their high quality audio on the air. With 25 Watts of RF available, the signal has more than enough "punch" to get through, and all in all there is little one can find about the TR-751E which is less than ideal. So-what does it all do?

You know by now that I dislike quoting long specifications, particularly considering that one could describe both a Metro and a Porsche as having four wheels on the outside and one in front of the driver – doesn't really tell you a lot about the true differences does it? Well, I believe that the TR-751E gives you a most versatile 2 metre multi-mode station; small enough to use mobile or portable, but comprehensive enough to use as a full-spec. base station at home. In that respect, it's also attractive enough to be domestically acceptable, and discreet enough in styling to go anywhere in the house. The facilities provided are quite remarkable considering the size of the set, but as always easy to use, in Kenwood tradition.

Also in Kenwood tradition, a comprehensive colour brochure is available which describes the TR-751E in complete detail, together with the range of matching accessories (no, there isn't a matching handbag . . .) The information is free, but the Post Office demand payment for getting it to you. If you care to send a stamped addressed envelope we will fill it with the required information. If you want something weightier to read, send us £1 and will will fire back the complete full colour Kenwood catalogue and other interesting reading. If you want to have a moan, my name is:–

John Wilson
G3PCY/5N2AAC
73 (or for 2DYM, 73s) see you soon Richard . . .

TR-751E £599 inc. VAT

LOWE ELECTRONICS LIMITED

Chesterfield Road, Matlock, Derbyshire DE4 5LE
Telephone 0629 580800 (4 lines)

The TM-721E from Kenwood

What can I say? The transceivers get more interesting and the space in which to describe them gets smaller. Wilson's first law of advertising.

The TM-721E re-defines the concept of the 2 metre/70 cm dual band rig, because it not only puts two transceivers in the same mobile package, but allows cross connection between them in all sorts of ways.

Obviously the TM-721E will operate in full duplex, with either band transmitting or receiving simultaneously, but you can also monitor both bands at the same time, and the rig itself will make the band on which a signal is received first become the main band, with the other band assuming "sub band" status.

The operator is kept fully aware of all that is going on, by the comprehensive displays. You have separate frequency readout, separate squelch controls, even separate S meters for the two bands. As for the transmitters, you get 45 Watts on 2 metres and 35 Watts on 70 cm. so you will certainly be heard. The American ads. for the TM-721E are captioned "Double Vision", and whilst I normally dislike the snappy one-liners, in this case I think it's a good description.

Why not send for details right away, and find out the full story of the newest and certainly the best dual band rig yet to appear.

TM-721E £699 inc. VAT

NOTE: TW4100E STILL AVAILABLE AT SPECIAL PRICE OF £599 inc VAT

TS940S

Top of the range, the TS940S has everything the discerning HF operator requires. Amateur bands from 160 to 10 metres, together with a general coverage receiver tuning from 150 kHz to 30 MHz. Operating modes USB, LSB, CW, AM, FM, FSK. Forty memory channels, each effectively a separate VFO. Easy keyboard frequency entry. Leadership in the field. The TS940S is the transceiver everyone wants to own one day.
TS940S . . . £1995.00 (carr. £8)

TS140S

Kenwood common sense The TS-140S shows the way to go in balancing performance, operating features, and ease of use; all at an attractive price. All mode amateur band transmit with an excellent general coverage receiver. Full break in CW is provided for the real operators, but so is FM for idle chatting on ten metres (although why one would use FM in preference to SSB or CW I cannot imagine). Every TS-140S we can obtain is instantly sold. Ask around and you will find out why.
TS140S . . . £862.00 (carr. £8)

R5000

Virtually the receive section of a TS940S, the R5000 is probably the best HF receiver right now. Notice the family resemblance to the TS440S which gives it a clean, easy to operate look, and of course Kenwood have applied all their ergonomic skills to make you "at home" the moment you begin to use the R5000. All mode of course, and has an optional internal VHF converter which extends coverage to 108-174 MHz.
R5000 . . . £875.00 (carr. £8)

TL922

u Brute. If it wasn't for all the safety interlocks I would operate my TL922 with all the covers off, just to admire the sheer engineering beauty of the innards. The TL922 is THE linear amplifier, and once you own it you will never part. The effortless ease with which the TL922 produces RF power has to be experienced to be believed, and it is probably the world's most sought after station accessory.
TL922 . . . £1495.00 (carr. £8)

Glasgow: 4/5 Queen Margaret Road. Tel. 041-945 2626.
Darlington: 56 North Road. Tel. 0325 486121.
Cambridge: 162 High Street, Chesterton. Tel. 0223 311230.
Cardiff: c/o South Wales Carpets, Clifton Street. Tel. 0222 464154.
London: 223/225 Field End Road, Eastcote, Middlesex. Tel. 01-429 3256.
Bournemouth: 27 Gillam Road, Northbourne. Tel. 0202 577760.

Note. All our shops open Tuesday to Saturday inclusive.

NAME .....
ADDRESS .....
Post Code .....

Send to Matlock FREE INFO
Don't forget £1
to cover postage
PW

Count on us!

IC-575, 28/50MHz Dual band multimode.

The ICOM IC-575 base station has been developed to meet the demand for advanced communications for the recently acquired 6m band. Similar in appearance to the IC-275/475 2m and 70cm base stations, the beauty of this new transceiver from ICOM is that it gives you the best of both worlds, 6 & 10m in one compact unit. The IC-575 covers 28-30Mhz and 50-54Mhz. Operating modes are SSB, CW, AM & FM. Power output is 10 watts (AM 4 watts) with a front panel control to reduce output for QRP operations. A pass band tuning circuit narrows the I.F. passband width, eliminating signal in the passband. A built-in notch filter eliminates beat signals with sharp attenuation characteristics.

Some PLL systems have difficulty meeting the lockup time demands placed on them by new data communications. This is why ICOM developed the DDS (Direct Digital Synthesizer) method. With a lockup time of just 5msec the DDS method allows the IC-575 to handle data communications such as packet or AMTOR. 99 programmable memories can store frequency, mode, offset frequency and direction. A total of four scanning functions for easy access to a wide range of frequencies, memory scan, programmed scan, selected mode memory scan and lock out scan. The IC-575 has an internal A.C. power supply, but can also be used on 13.8v DC for mobile or portable operation.

Optional accessories available are the UT36 voice synthesizer, the IC-FL83 CW narrow filter, SM7 external loudspeaker, HP2 communication headphones and SM8/SM10 desk microphones. Other transceivers available in this range are: IC-275E 2m multimode 25w, IC-275H 2m multimode 100w, IC-475E 70cm multimode 25w, IC-475H 70cm multimode 75w.

IC-505, 50Mhz Transceiver

The IC-505 is a 6mtr BAND SSB, CW, FM (Optional) transceiver. It can be used as a portable or like other transceivers of this type as a base station unit. When used with an external 13.8v power supply the 505 gives 10 watts RF output, 3 watts or 0.5 watts on low power is available when using internal batteries. Other features include 5 memories with memory scan, program band scan, dual VFO's with split operation.

The easy-to-read LCD readout includes frequency, memory scan and call modes. Full metering of battery condition signal strength and power output is provided. When fitted with the optional EX248 FM unit the IC-505 offers 50MHz operation at an affordable price.

ommunications ltd. YAESU

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

Serious about VHF/UHF? Then the FT736R is for YOU!

- ★ Up to four band capability
- ★ LSB/USB, CW & FM
- ★ Full Duplex crossband operation
- ★ Memory storage of up to 230 frequencies
- ★ Keypad frequency entry
- ★ Fourteen VFO's
- ★ Global call channel
- ★ Programmable channel steps
- ★ Electronic keyer option
- ★ Remote preamplifier switching
- ★ TXCO high stability reference oscillator

The FT-736R is a frequency-synthesized amateur transceiver incorporating up to four band modules covering the 50, 144, 430, and 1200 MHz amateur bands. The standard model provides 25 watts RF power output on the 144 and 430. MHz amateur bands in SSB, CW, and FM modes. (10 watts output on the 50 and 1200MHz bands). Operating conveniences usually found only on HF transceivers, such as front panel adjustable IF shift and IF notch, a noise blanker, all-mode VOX and three-speed selectable AGC are included. GaAs FET receiver RF amplifiers are provided in the 430 and 1200 MHz band modules. The innovative memory system includes one hundred general purpose memories plus ten full duplex cross-band memories, one global call channel memory that can be recalled from any band or mode and up to four band-specific call channel memories, all of which store mode and receive and transmit frequencies independently. In addition, fourteen vfos are provided: two general purpose plus one PMS (Programmable Memory limit Scanning) on each band, two special-purpose full duplex vfos, and up to four clarifier memories, one per band. Each of the two full duplex vfos can be selected so that its receive and transmit frequencies and modes can be displayed and tuned independently, or linked to tune synchronously in opposite directions for satellite operation. You can retain twelve satellite uplink/downlink modes in the special vfos and ten full duplex memories at all times. Naturally, with FM the predominant mode on the VHF and UHF bands, the FT-736R includes all manner of convenient features for both FM simplex and repeater operation, like a discriminator center tuning meter, special narrow FM mode (to cut adjacent channel interference in crowded areas) and Automatic Repeater Shift when tuned to 2-meter repeater subbands. The FT736R also includes a t/r-switched DC supply line for masthead preamplifiers, activated from the front panel, and digital input connection directly to the modulator for high performance packet radio tnc interfacing (preamps, personal computers and packet tncs not supplied by Yaesu).

OPTIONAL ACCESSORIES

FEX 736/50	50MHz module	**£239.00**	XF455MC	600Hz CW Filter	**£60.00**
FEX 736/1.2	1.2GHz module	**£425.00**	SP767	External Spkr c/w Audio Filters	**£69.95**
FMP-1	AQS Message Processor c/w display	**£189.00**	MD-1B8	Desktop Microphone	**£79.00**
FTS-8	CTCSS Tone Squelch Unit	**£45.00**	MH-1B8	Hand Scanning Microphone	**£21.00**
FVS-1	Voice Synthesiser Unit	**£33.00**	FIF232Cvan	CAT/INC Interface for Packet & CAT	**£T.B.A.**
Keyer Unit B	Internal Iambic Keyer Unit	**£15.95**	FIF232C	CAT Interface for RS232 O/P	**£75.00**
TV-736	Fast Scan TV (ATV) Mod/Demod Unit	**£159.00**	FIF65A	CAT Interface for Apple II series	**£60.00**

FT736R R.R.P. £1450.00 C/W 2M & 70cms.

HY-GAIN – LOW PRICES

Due to the strong pound and our special purchase we can now offer for a limited period up to 15% discount on their range of antennas and 10% on their larger rotator Ham IV. Buy now whilst stocks last (from January 1st they increased their prices and if the dollar recovers prices could go up by 30% to 40%).

			Offer Price	p&p
12AVQ	Vert. 10-15-20M	£78.95	**£ 71.00**	£3.75
14AVQ	Vert. 10-15-20-40M	£106.00	**£ 95.00**	£3.75
18AVT	Vert. 10-15-20-40-80M	£172.00	**£146.00**	£3.75
18V	Vert. 10-80M tapped coil	£48.50	**£ 43.65**	£4.50
TH3JNR	3 Ele. Yagi 10-15-20M	£299.00	**£254.00**	£4.50
TH2MK3	2 Ele. Yagi 10-15-20M	£279.00	**£249.00**	£4.50
EX14	5 Ele. 10-15-20M Explorer	£499.00	**£449.00**	£7.50
TH5MK2	5 Ele. 10-15-20M T'bird	£649.00	**£575.00**	£7.50
TH7DXX	7 Ele. 10-15-20M T'bird	£755.00	**£669.00**	£7.70
105BA	5 Ele. Yagi 10M	£220.00	**£187.00**	£3.95
153BA	3 Ele. Yagi 15M	£135.00	**£121.00**	£3.95
155BA	5 Ele. Yagi 15M	£338.00	**£288.00**	£5.90
204BA	4 Ele. Yagi 20M	£420.00	**£357.00**	£7.30
205BA	5 Ele. Yagi 20M	£499.00	**£425.00**	£9.40
DB10-15A	3 Ele. Yagi 10-15M	£209.00	**£199.00**	£4.80
AR40	Famous Bell Type		**£125.00**	Free
CD45	Medium Bell Type		**£219.00**	Free
Ham IV	Heavy Duty Bell	£359.00	**£329.00**	Free
T2X	Very Heavy Duty Bell	£449.00	**£399.00**	Free

JAYBEAM VHF/UHF

Want the best, then why not buy JAYBEAM? High quality materials and heavy duty construction for long maintenance-free life.

		Normal Price	Car
HO/2M	Halo head only	£9.78	A
HM/2M	Halo with 2ft. mast	£11.50	A
UGP/2M	Ground plain folded radiator	£16.96	A
C5/2M MK2	Vertical Colinear 4.8dbd	£90.85	B
LR1/2M	Vertical Colinear 4.3dbd	£37.95	B
LR2/2M	Vertical omnidirectional	£29.61	B
LW5/2M	5 Element Yagi 7.8dbd	£18.69	B
LW8/2M	8 Element Yagi 9.5dbd	£23.98	B
LW10/2M	10 Element Yagi 10.5dbd	£29.04	B
LW16/2M	16 Element Yagi 13.4dbd	£42.55	C
PBM10/2M	10 Element Parabeam 11.7dbd	£57.50	C
PBM14/2M	14 Element Parabeam 13.7dbd	£70.15	C
Q4/2M	4 Element Quad 9.4dbd	£37.09	B
Q6/2M	6 Element Quad 10.9dbd	£48.59	B
D5/2M	5 over 5 slot fed Yagi 10.0dbd	£33.93	B
D8/2M	8 over 8 slot fed Yagi 11.1dbd	£46.58	B
5XY/2M	5 Element crossed Yagi 7.8dbd	£36.23	B
8XY/2M	8 Element crossed Yagi 9.5dbd	£46.00	B
10XY/2M	10 Element crossed Yagi 10.8dbd	£57.50	B
PMH2/C	2 Way harness circ. polarisation	£13.51	A
PMH2/2M	2 Way harness for 2 Metres	£14.89	A
PMH4/2M	4 Way harness for 2 Metres	£36.80	A
JAYBEAM 4M/6M			
DB4	4M/6M Dual Band 4 Ele	£117.88	D
4Y6M	6M 4 Ele 7dBd	£49.45	B
4Y4M	4M 4 Ele 7dBd	£40.54	B
PMH2/4M	4M 2 Way Phasing	£20.87	A

CARRIAGE: A = £1.75 B = £3.00 C = £4.00 D = £5.00

SMC WILL MATCH ANY GENUINE PUBLISHED OFFER PRICE ON YAESU PRODUCTS

Prices & availability subject to change without prior notice.

***FREE* FINANCE . . .**

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

***FREE* S.M.C. SERVICE INTERLINK DELIVERY . . .**

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

GUARANTEE

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

DEWSBURY ELECTRONICS

G4CLX

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

A FULL RANGE AVAILABLE

TS-140S £862.00

TS-940S £1995.00

APPROVED KENWOOD DEALER

TS-440S £1138.00

APPROVED KENWOOD DEALER

R2000 £595.00

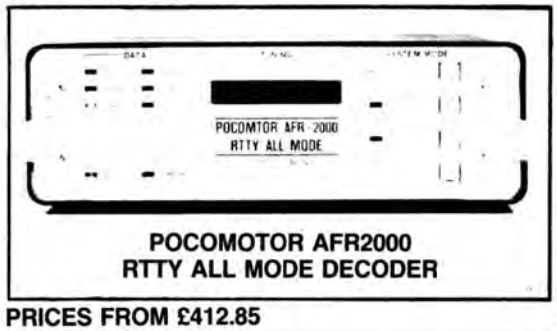
R5000 £875.00

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



POCOMOTOR AFR2000
RTTY ALL MODE DECODER

PRICES FROM £412.85

STAR MASTER – KEYER £54.70

Stockists of DAIWA – MET ANTENNAS – JRC – BENCHERS – VIBROPLEX – MICROWAVE MODULES – ICS – 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.

B.N.O.S. PRODUCTS

2M LINEAR AMPLIFIERS

L144-3-25	*New Linear 3w input 25w output	74.75
LP144-3-50	Linear/Preamp 3w input 50w output	138.00
LP144-10-50	Linear/Preamp 10w input 50w output	138.00
LPM144-3-100	Linear/Preamp/Meter 2w i/p 100w o/p	235.00
LPM144-10-100	Linear/Preamp/Meter 10w i/p 100w o/p	205.00
LPM144-10-180	Linear Preamp/Meter 10w i/p 180w o/p	355.00
LPM144-25-180	Linear/Preamp/Meter 25w i/p 180w o/p	305.00

4M LINEAR AMPLIFIERS

LPM70-10-100	Lin/Preamp/Met 10w i/p 100w o/p	235.00

70CM LINEAR AMPLIFIERS

L432-1-10	*New Linear 1w input 10w output	74.75
LPM432-1-50	Lin/Preamp/Met 1w i/p 50w o/p	255.00
LPM432-3-50	Lin/Preamp/Met 3w i/p 50w o/p	255.00
LPM432-3-100	Lin/Preamp/Met 3w i/p 100w o/p	395.00
LPM432-10-100	Lin/Preamp/Met 10w i/p 100w o/p	395.00

6M LINEAR AMPLIFIERS

L50-3-25	*New Linear 3w i/p 25w o/p	74.75
LP50-3-50	Linear/Preamp 3w i/p 50w o/p	138.00
LP50-10-50	Linear/Preamp 10w i/p 50w o/p	138.00
LPM50-10-100	Liner/Preamp/Met 10w i/p 100w o/p	235.00

RF FILTERS

F50-L/U	50MHz Low Pass Filter	29.95
F70-L/U	70MHz Low Pass Filter	29.95
F144-L/U	144MHz Low Pass Filter	29.95
F144-L/N	144MHz Low Pass Filter	35.35
F432-L/N	432MHz Low Pass Filter	35.35

POWER SUPPLIES

12/6A	13.8V 6A cont 7A max	78.20
12/12A	13.8V 12A cont 15A max	129.95
12/25A	13.8V 25A cont 30A max	193.20
12/40A	13.8V 40A cont 50A max	423.20
12/5E	*New 13.8V 5A cont 6A max	57.50
12/10E	*New 13.8V 10A cont 12A max	97.75
12/20E	*New 13.8V 20A cont 24A max	132.25
12/30E	*New 13.8V 30A cont 35A max	195.50

CUE DEE PRODUCTS

VHF/UHF ANTENNAS

VHF-DUO	6/5 Ele 6d Bd	129.95
4144A	4 ele 8dBd SO239	26.45
4144AE	4 ele end mount 8dBd SO239	27.60
10144A	10 ele 11.4dBd SO239	50.60
10144AN	10 ele 11.4dBd N female	57.50
10X144A	10 ele crossed 11.4dBd SO239	74.75
10X144AN	10 ele crossed 11.4dBd N female	86.25
15144A	15 ele 14dBd SO239	73.60
15144AN	15 ele 14dBd N female	78.20
15X144A	15 ele crossed 14dBd SO239	98.90
15X144AN	15 ele crossed 14dBd N female	110.40
17432AN	17 ele 14.5dBd N female	51.75
17X432AN	17 ele crossed 14.5dBd N female	82.80
23432AN	23 ele 15.5dBd N female	63.25

STACKED SYSTEMS

10144A2H	2 × 10 ele horizontal	228.85
10144AN2H	2 × 10 ele horizontal	243.80
15144A2H	2 × 15 ele horizontal	277.15
15144AN2H	2 × 15 ele horizontal	293.25
10144A4H	4 × 10 ele	405.95
10144AN4H	4 × 10 ele	447.35
15144A4H	4 × 15 ele	501.40
15144AN4H	4 × 15 ele	537.05
15144A8H	8 × 15 ele	1436.35
15144AN8H	8 × 15 ele	1511.10
15144A16H	16 × 15 ele	3382.15
15144AN16H	16 × 15 ele	3496.00
17432AN2H	2 × 17 ele horizontal	194.35
17432AN4H	4 × 17 ele	334.65
17432AN8H	8 × 17 ele	583.05
17432AN16H	16 × 17 ele	P.O.A.
23432AN2H	2 × 23 ele horizontal	212.75
23432AN4H	4 × 23 ele	379.50
23432AN8H	8 × 23 ele	645.15
23432AN16H	16 × 23 ele	P.O.A.

STACKING FRAME KITS

4S2	2 × 4144	39.10
10S2	2 × 10144	59.80
15S2	2 × 15144	66.70
10S4	4 × 10144	109.25
15S4	4 × 15144	123.05
71S2	2 × 17432	39.10
23S2	2 × 23432	40.25
17S4	4 × 17432	59.80
23S4	4 × 23432	63.25

PHASING HARNESSES INCLUDING POWER SPLITTER

4L2	2 × 4144A & 4144AE	72.45
10L2	2 × 10144A	74.75
10L2N	2 × 10144AN	81.65
10L4	4 × 10144A	112.70
10L4N	4 × 10144AN	129.95
15L2	2 × 15144A	77.05
15L2N	2 × 15144AN	87.40
15L4	4 × 15144A	112.70
15L4N	4 × 15144AN	129.95
17L2N	2 × 17432AN	70.15
17L4N	4 × 17432AN	109.25
23L2N	2 × 23432AN	70.15
23L4N	4 × 23432AN	109.25

POWER SPLITTERS

2-144	2 way 144MHz SO239	37.95
2-144N	2 way 144MHz N female	42.55
4-144	4 way 144MHz SO239	41.40
4-144N	4 way 144MHz N female	48.30
6-144	6 way 144MHz SO239	57.50
6-144N	6 way 144MHz N female	87.40
8-144	8 way 144MHz SO239	63.25
8-144N	8 way 144MHz N female	100.05
2-432N	2 way 432MHz N female	34.50
4-432N	4 way 432MHz N female	41.40
6-432N	6 way 432MHz N female	83.95
9-432N	8 way 432MHz N female	93.15

MONOBAND YAGIS

27G	7MHz 2 ele 5.6dBd	581.90
37G	7MHz 3 ele 7.0dBd	861.35
314G	14MHz 3 ele 7.0dBd	216.20
414G	14MHz 4 ele 8.0dBd	249.55
414	14MHz 4 ele 8.0dBd	294.40
514G	14MHz 5 ele 9.0dBd	364.55
614G	14MHz 6 ele 10.0dBd	515.20
321	21MHz 3 ele 7.0dBd	148.35
421	21MHz 4 ele 8.0dBd	169.05
521	21MHz 5 ele 9.0dBd	264.50
621G	21MHz 6 ele 10.0dBd	331.20
721G	21MHz 7 ele 10.3dBd	416.30
328	28MHz 3 ele 7.0dBd	93.15
428	28MHz 4 ele 8.0dBd	116.15
528	28MHz 5 ele 9.0dBd	161.00
628G	28MHz 6 ele 10.0dBd	207.00
628	28MHz 6 ele 10.0dBd	249.55
728G	28MHz 7 ele 10.3dBd	309.35
928G	28MHz 9 ele 10.6dBd	416.30

DUOBAND YAGIS

DUO2G	14/21MHz 5/4 ele 9/8dBd	483.00
DUO3	21/28MHz 4/4 ele 8/8dBd	264.50
DUO4	14/21MHz 4/4 ele 8/8dBd	426.65

VERTICALS

VA40	7MHz inc guy wire & ground mount	93.15
2VA40	7MHz full 1/4 wave, complete	323.15
VA80	3.5MHz inc guy wires & ground mount	324.30
2VA80	3.5MHz full 1/4 wave, complete	796.95

PHASING HARNESSES FOR CIRCULAR POLARIZATION

IC144	10 × 144A & 15 × 144A	37.95
IC144N	10 × 144AN & 15 × 144AN	52.90
IC432N	17 × 432AN	51.75

SHF PRODUCTS

SHF ANTENNAS

SHF 9644	1296MHz 44 ele	123.05
SHF 9667	1296MHz 67 ele	148.35
SHF 1693	67 ele (meteosat)	167.90
SHF 2320	2300-2350MHz 67 ele	202.40

PKW PRODUCTS

VHF/UHF ANTENNA'S

2GP58	144MHz 5/8 groundplane 3.2dBd	39.10
2GP258	144MHz 2 ×5/8 groundplane 5.7dBd	70.15
7GP58	432MHz 5/8 groundplane 3.2dBd	39.10
7GP258	432MHz 2 × 5/8 colinear 5.7dBd	59.80

HF DIPOLES

DP 01	3.5/14MHz	59.80
DP 02	3.5/7MHz	59.80
DP 03	1.8/7MHz	59.80
DP 04	1.8/3.5MHz	101.20
DP 05	14/21/28MHz	70.15
DP 06	1.8/3.5/7/14/21/28MHz	110.40

HF MULTIBAND BEAMS

THF 1E	1 ele (dipole) 14/21/28MHz	83.95
THF 2E	2 ele 14/21/28MHz	213.90
THF 3E	3 ele 14/21/28MHz	264.50
THF 5E	5 ele 14/21/28MHz	384.10
THF 6E	6 ele 14/21/28MHz	571.55
THF 7E	7 ele 14/21/28MHz	741.75
THF 8E	8 ele 14/21/28MHz	878.60
SPQ 2E	2 ele Spider Quad 14/21/28MHz	408.25
LPO 12E	12 ele Log Periodic 13-30MHz	918.85

HF GROUNDPLANE

GP 3B	14/21/28MHz	81.65

HOW TO ORDER
By Phone: using your Access or Visa/Barclaycard
By Mail: Cheque, Postal Orders or Credit Card
Or from your local BNOS Authorized Dealer
Post, Packing & Insurance
should be added to order totals as below
3 Working day delivery service
BNOS products are free of charge on this service
other products as below
Orders with a value less than £50 add £2.50 to total
Orders with a value more than £50 add £5.00 to total
Orders with a value more than £250 add £7.50 to total
Next day delivery service
BNOS products add £7.50 to order total
Other products add £10.00 to order total

COAXIAL CABLE: POPE H100....**80p p/metre.** RG213 (UR67)....**62p p/metre**

B.N.O.S. ELECTRONICS
Mill Lane, Stebbing, Dunmow, Essex, CM6 3SL.
Tel: 0371-86681 Tlx: 817763 BNOS G
E&OE

ALINCO – THE NAME THAT MEANS VALUE!

2M FM HANDHELD

★ 3 Watts FM
★ Memory Channel
★ Battery Save
★ Smallest in World

£189!

ALX-2E

The ALX-2E is a truly pocket transceiver. Capable of 3 watts output it covers the full 140-150MHz using the familiar thumbwheel dial. Features include memory channel, scanning, priority, battery saver, tone-burst, 600kHz shift etc. Supplied complete with nicad pack, AC charger, 12v DC charger, and helical. Accessories available include case, car cigar adaptor, headphone/mic, various batt. packs etc.

ALD-24E

DUAL BANDER

★ 2M/70cm
★ 25 Watts
★ Full Duplex
★ Built-in Diplexer/Dual VFO
★ Small size/21 memories

£449!

What can you say about this transceiver other than praise? The new ALINCO ALD-24E has brought the cost of dual banders down to a price that makes it a serious option to the 2 metre only rig. Just think of the pleasure of being able to select 2m or 70cm at the press of a button. No aerial switching (duplexer built in) and full duplex operation. The ALINCO actually has two completely separate transceivers built into its small case measuring 5.5" × 2" × 6.5". It has all the features of the ALR-22E (see below) at a huge saving over its competitors. We could mention the optional extended receiver coverage of 138-174MHz & 420-454MHz at no extra charge, but then everybody would want one! So we thought that we'd simply invite you to send for the full colour brochure instead.

ALR-22E 2M FM MOBILE

THE RADIO COSTS £249

THE SCANNER COMES FREE!

★ 25 Watts FM
★ 21 Memories
★ Rx 138-174MHz
★ Mini-size

ALINCO products are hitting the market in a big way. And the ALR-22E must rank as today's best buy. When you buy the ALR-22E you don't just purchase a 2 metre mobile, you purchase a vhf scanner as well. For no extra cost we will extend the frequency coverage to 138-174MHz on request. All this for a price that puts the competition in the shade! Features include 21 memory channels, programmable scan, priority channel options, programmable splits, reverse repeater button, dual speed scanning, optional delay, back-lighted LCD display, dual vfo, lithium battery back-up, 25/12.5kHz steps, mini size measuring 5.5" × 1.5" × 6.5", up/down microphone control, quick release mobile bracket plus mounting hardware, superb sensitivity, 5 watt low power position, manual or electronic tuning, 12 months parts and labour warranty etc. With a specification like this we suggest you phone for colour brochure, today.

BOOKS BOOKS BOOKS!

HF OCEANIC AIRBAND COMMUNICATIONS
Published December, 1987

Tune into the exciting World of long distance airband communications. Hear aircraft navigating the world's oceans; air and sea rescue in action; flight crews talking back to base; instant weather broadcasts from all corners of the world. It's exciting, and this book will tell you exactly where and when it all happens.
£3.50 plus 80p post.

UK LISTENERS CONFIDENTIAL FREQUENCY LIST
New 5th edition. Available April 1988

Everything you have ever wanted to know about the short wave services. Who uses them, their frequencies, callsigns and times. It's all in this book. 150 pages and some 7,000 entries plus editorial covering aerials, receivers, RTTY, FAX, TOR etc. A genuine UK publication based on the very latest information and monitoring. NOT AN AMERICAN COPY! Includes civil & military aircraft, press and meteo., embassies, maritime, emergency, broadcast, weather, beacons etc. Available April 1988. **£6.95 plus £1 postage.**

THE COMPLETE GUIDE TO VHF/UHF FREQUENCIES

Covering the range 26 to 47000MHz, this new edition provides full details of frequencies used within the UK. Covering emergency services, aviation, marine, PMR, beacons and repeaters, weather, space etc. The pages are full of all the information that you need in order to perate your scanning receiver. 90 pages crammed with frequencies, both simplex and duplex, plus editorial on all that you should know about VHF/UHF monitoring. **£5.95 plus £1 post.**

VHF/UHF AIRBAND FREQUENCY GUIDE

A complete list of all the aviation frequencies for both the military and the civil services. Frequencies are listed under airport/airfield headings and includes details of airways and company frequencies. Also supplied with the book is a list of all the recent changes to UHF and VHF frequencies that have taken place. Includes editorial and photographs etc. A must for the aircraft enthusiast. **£5.95 plus £1 post.**

THE SECRET OF LEARNING MORSE CODE

Here's a book that takes the problem of learning Morse by the scruff of the neck and exposes the myths and mysteries that surround this most valuable skill. The author, Mark Francis, takes you simply but thoroughly through the whole learning process and shows that with his method you will quickly be able to read Morse code. Long overdue, the book is written in a non technical language which makes it a joy to read. Mark Francis covers all aspects of the subject and provides some very valuable tips on the best ways to learn and improve your code. And once you have learnt the code you can test yourself with the sample tests at the back of the book. There is even a chapter that tell you exactly what you should expect when you take your seat in the examination room for your RAE Morse test. As one readers said, "it's the most comprehensive book available on the subject today." **£4.95 plus £1 post.**

ALINCO AMPLIFIERS

The new ALINCO amplifiers are great value. Compact, reliable and low priced. Now you can boost the power of your hand-held without boosting your overdraft!

ELH 230D$_2$	ELH260D
1-3 & 5w i/p 30w out	1-3w i/p 50w out
Gasfet pre-amp	Switch pre-amp
Vot or PTT	Vox or PTT
Full protection	Output meter
£75.00 inc vat	£119.00 inc vat

NEW! 50-1300MHz

CLP 5130-1
50-130Hz

CLP 5130-2
105-1300Hz

These antennas cover the complete range to 1300MHz with a VSWR better than 2:1. They can be mounted vertically or horizontally with the hardware provided. And with a power handling capability of 500 watts they are equally at home transmitting or receiving. Forward gain up to 12dBi & 13dBi and front to back ratios of 15dB are achieved respectively. Model 1 £179.00. Model 2 £89.00. Carriage £3.00.

NEW! SONY SW-1 Micro Short-Wave Receiver (+ FM Stereo)

The complete kit comprises: Receiver (150kHz-30MHz); Active aerial; Stereo 'phones; AC supply module, Frequency Handbook, and hard carrying case. Tests show it to be ultra sensitive! Size: 4.25" × 3" × 7/8". Limited stocks available now. **£249 carriage free.**

7600DS	AM/SSB Pocket size 150KHz-30MHz	£169.00
2001D	AM/USB/LSB all band + Airband VHF	£329.00
AIR-7	108-174MHz hand-held plus b'cast	£247.00
PRO80	HF/VHF AM/SSB handheld plus b'cast	£329.00
AN-1	Active antenna for 7600/2002	£49.00
AN-3	VHF antenna with 50ft coax	£45.00
ACD-4	Mains AC adaptor Air7/PRO 80	£16.95
BP23	Ni-cad battery pack	£16.95
DCC-12A	DC car adaptor all models	£16.95

DON'T BUY MAIL ORDER

UNTIL YOU'VE HAD OUR CARRIAGE FREE QUOTE ON ALL MAJOR ITEMS OF HAM GEAR!

Huge stocks of:

Kenwood, Yaesu, Icom, Alinco, Sony, Welz, Adonis, Revex, Microwave, BNOS, Datong, Jaybeam, Tonna, AOR, Signal, SEM, Kenpro

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.

WRITE ON . . . *the page where you have your say*

Be Prepared

Having recently passed the RAE and gained my licence, I would like to offer a piece of advice to prospective candidates. Don't set too much store by sample papers.

During the course of my studies, I bought two publications that contain supposedly sample questions from the City and Guilds.

From time to time, I tested myself with these papers to see how I was progressing. Eventually, I convinced myself that there was nothing the C & G could throw at me that I couldn't handle. So, when examination day dawned, my confidence was sky-high.

However, upon scanning the questions, my confidence deserted me, as I realised that it wasn't going to be as straightforward as I first thought. It was only after re-reading the paper that I realised that I had been looking for specific questions. When I hadn't seen them, of course, my mind went a temporary blank. Happily this situation didn't last, and I was delighted to learn approximately seven weeks later that I had passed.

On reflection, it occurred to me that this situation could apply to future candidates. Therefore, I strongly advise them to approach the examination with an open mind, and not depend on the papers being almost the same as the sample ones. Believe me, they aren't.

But take heart—if I can pass, then anybody can approach the RAE with confidence! I now look forward to the Morse test and an eventual G0+3.

P. T. Williams G7AFA
Whitehaven, Cumbria

Join the RSGB!

I think that it is time for all radio amateurs, licensed or not, to consider joining or rejoining the RSGB. Many legitimate objections may be raised about the Society's methods—I particularly object to the idea of candidates for election to Council not being allowed to state their intentions if elected, but it is the only recognised negotiating body for amateurs.

With the present tendency to sell off all saleable assets, the radio spectrum that we currently occupy is under a real threat. To present our position to the DTI, the RSGB needs to have the largest membership possible. Public opinion is unlikely to have any positive effect on our side. To most members of the public we are all Tony Hancocks—people who listen to some repeaters may have an even lower regard for us. If we lose frequencies it will be too late to complain.

D. W. Mepham G4ERA
Fairlight, Sussex

North of Watford

As one of the minority of RSGB members who attended the 1987 Annual General Meeting, I was pleased to hear that Council are to consider venues other than London for future AGMs. I have written to HQ suggesting a suitable venue, but have so far received nothing beyond a simple acknowledgement. I would therefore beg some space in *PW* to conduct for my own interest a poll amongst readers.

My proposition was that the meeting be held in the main hall at Cleckheaton Town Hall, which is located within a mile of Junction 26 of the M62, and is reasonably central to the UK (note, not just England).

The capacity is 377, well in excess of the usual turnout, and a big point in its favour is a cost of only £70 inclusive of coffee lounge and bar areas, surely well below the cost of the previous venue.

Through your magazine, I would like to ask RSGB members who would be interested in attending an

PW COMMENT

Fair Play or Fair Game?

A LETTER IN THE LATEST *RADIO COMMUNICATION* (February 1988) caught my eye. Under the heading *Fairplay or Freeloading?*, an RSGB member of 46 years standing, signing himself or herself "Name and address supplied", bemoaned the fact that only some 50 per cent of the UK's licensed amateurs are members of the national society.

I will not dwell upon the general question of the rights and wrongs of partaking in the hobby without paying one's dues to Potters Bar. That, after all, is very much along the same lines as the closed shop argument in trades union affairs, and one upon which there are many shades of opinion. The thing which I particularly noticed was the comment: "I have no doubt that members pass on their monthly copy of *RadCom* to their friends who are non-members, they in turn being only too happy to benefit, at again no cost to themselves, from all the information and technical articles therein."

It is generally accepted in publishing circles that each copy printed of any book, newspaper or magazine is quite likely to have more than one reader. Indeed, advertisers in newspapers and magazines are always interested in estimates of how many people will see each issue on average—what is called the "pass-on readership"—since the exposure of their products will be increased by that factor over and above the number of copies of the publication sold.

Rather different, though, is the adverse effect on magazine sales of the unauthorised photocopying of articles, especially from specialised and technical magazines. Again, there are circumstances where that is perhaps "fair dealing": making a copy of drawings from a constructional article to use on the workbench, for example, saving your copy of the magazine from the hazards of tea stains, tears and soldering iron burns, or copying an article for your own private study from a magazine or paper no longer in print.

Sadly, however, this legitimate one-off copying sometimes grows into perhaps half-a-dozen copies of a popular project for friends at the radio club, made "free" on the works' photocopier, and the magazine's sales suffer as a result. It may look very clever on the face of it, but it is the magazine reader that suffers in the end, for the revenue lost due to this infringement of copyright could have gone to produce bigger, better magazines.

It's a problem that was not with us 25 or 30 years ago. Copying machines were then primitive in their performance, producing an output which lacked contrast and generally faded to a delicate overall brown shade within a few weeks or months.

But technology, in moving forward by leaps and bounds, has as so often had an unfortunate spin-off. However did we write on boxes and parcels, rough or slippery, before felt-tipped marking pens? Can you imagine a world without aerosols for fly-sprays, car touch-up paints, or hair lacquers (that last one has even foxed the Prince and Princess of Wales, it seems!)? They are so useful, yet these things have also brought us the plague of graffiti and a growing hole in the ozone layer which could threaten the very existence of mankind.

The recorded music industry has a somewhat similar problem to that of magazines, but here it is the quality of the modern cassette recorder which is the culprit. The record producers are fighting a continuing battle to get a levy put on all blank tapes sold, regardless of their intended use. Perhaps magazine publishers should start a campaign to get a levy put on photocopying paper!

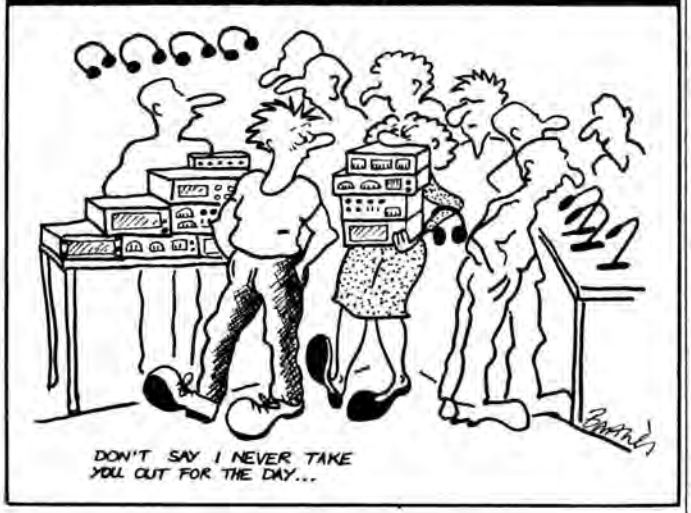
Geoff Arnold

AGM at this venue, or who support my proposal, to simply send me a QSL card or postcard for ease of counting, so that I may judge interest. All replies will be treated in the strictest confidence.

Martyn Bolt G4SUI
112 Leeds Road, Mirfield
West Yorks WF14 0JE

Though Cleckheaton may be central to the UK, I do not think that this makes it any more than just one candidate for a list of regional AGM venues. From Poole to Cleckheaton takes something in excess of six hours by road, and similar problems would be experienced by members in many other parts of the UK. By all means let's find out the response to Cleckheaton, but the Society should be looking at a network of sites, each in an area where there is a concentration of members, and with perhaps no more than a three-hour drive at most between one venue and its neighbour for another year.—Ed.

LAUGH WITH BARTHES



Q-Code Curiosities

It has long been a common practice in amateur radio to use the telegraphy Q-codes when speaking in the telephony modes, using them as nouns instead of phrases. This is often a useful shorthand and does no harm.

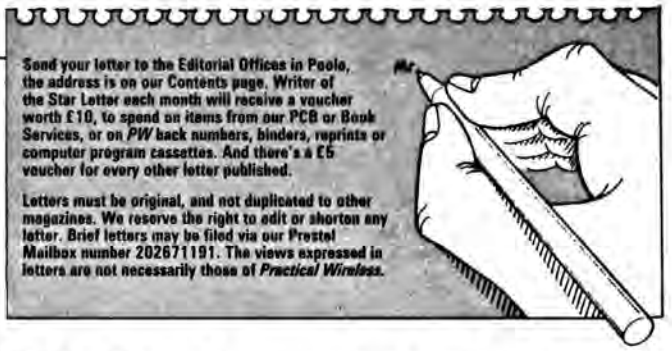
A curious and less satisfactory habit has grown in which the same Q-codes are reflected back into c.w. working without their full original meanings. For example, it has become normal to send "My QTH is", forgetting that QTH itself means "My location is" and like most other Q-codes can be turned into an enquiry merely by adding a question mark. It sounds especially odd when the redundant words are added by an operator who does not normally speak English anyway.

One significant lack in the Q-code is an accepted abbreviation for "What is your name?/"My name is . . .". Is there any generally recognised code for this—if not, how about QTN?

Bob Pearson G4FHU
Bourne, Lincs

It's another case of hijacking, I'm afraid! The international Q-code QRA means "What is the name of your vessel (or station)?"/"The name of my vessel (or station) is . . .", but radio amateurs stole it for the name of the old European Locator System. It's a bit like QRK, which officially means "What is the intelligibility of my signals?"/"The intelligibility of your signals is . . . (on a scale of 1 to 5)", but has been adopted in some amateur circles to mean loosely "cash" or "bank-balance", usually when talking of buying a new rig!

Incidentally, QTN? is already used, meaning "At what time did you depart from . . . (place)?".—Ed.



Et Tu, Brute!

I have been reading with interest the letters concerning the abbreviation "ES" for "and".

I sailed my final trip in the Merchant Navy 13 years ago, as a Radio Officer, and did not listen seriously to Morse again until I obtained my amateur licence and joined a local club. I write now because I am seriously puzzled.

I am sure that whilst I sailed under merchant flags, we used the abbreviation "ET" for "and". Can any other reader confirm this? It seems more logical to use "ET", as this means "and" in French, and Latin too, and is far more pleasant to the ears than "ES".

S. T. Smith G1ZPK
Reading

As an ex-seagoing R/O myself, I can confirm that in commercial Morse operating, "ET" is indeed the abbreviation for "and". I have often wondered why the amateur fraternity insist on expending all that extra wrist energy by sending "ES", though I must admit it comes more naturally to me now on the key than does "ET".—Ed.

Morse-less?

I have not read beyond the January editorial because it sent me to find out if my long preserved Murphy A50 can still receive amateur transmissions as it did 50 years ago, which is what first interested me in amateur radio. It can, but of course only produces sideband squawks now.

I hasten to support the suggestion of G2BZQ that d.s.b. 'phone operation be encouraged on h.f. amateur bands within the coverage of s.w. broadcast receivers.

There is no reason why existing a.m. equipped stations could not make a start at any time—many black boxes have the capability. However, this would have to be very quickly followed by access to these bands by interested listeners for transmission purposes, with a suitable technical examination but without Morse testing. Whether one likes it or not, it is indeed h.f. radio which interests people but it is the Morse test which drives them away. Witness the CB boom around 1979, many of whose supporters rapidly gained "B" licences and then almost as rapidly drifted to other, perhaps even previous, pursuits: and the surge of "ham" entries after the war, when many had exemption.

Now, please! I well know that many think Morse is a "Good Thing" and more see it as a means of keeping people off 20 metres, but these are the converted. Those you wish to bring in to amateur radio will see Morse as (roughly) antiquated, absurd, trivial, superfluous, vexatious, useless and in the light of the technology they know of almost barbaric — and **horrid** to learn. And you cannot at once bring them in to strengthen your grip on the bands **and** keep the bands clear of them!

I think that home construction of, and experimentation with, d.s.b. equipment is hard enough to be interesting without being impossible, at least it was with ex-service bits.

Alex L. Dick GM0IRZ
Dundee

So far as I recall, the post-war exemptions from the RAE did not absolve anyone from the need to know Morse. Someone with an ex-services or similar qualification including Morse was totally exempt, but those with only technical qualifications avoided the written RAE but still had to sit the Post Office Morse test.—Ed.

WRITE ON

Novice/Student Licence

The letters in March *PW* are interesting but leave me no wiser. I can't see how a novice/student licence will necessarily increase the numbers who take up amateur radio as a long-term active interest.

As I understand it, the idea seems to be that the existing RAE is a serious barrier to significant numbers of newcomers. Is this really the case? I suggest that the main reason is more likely to be one of cost, especially given the high unemployment among the younger people — the very ones that the RSGB now, very belatedly, claims it wants to attract. Furthermore, it is my impression that there's a significant proportion of qualified amateurs who are not active for the same reason; extremely high prices for equipment.

This raises an interesting point. Will inactive amateurs be allowed to use the low cost gear which is apparently envisaged, although where it is coming from no one can say.

I'm not opposed to the idea of a student/novice licence, but as ever, there's been no indication from our dear, secrecy obsessed RSGB just what they are proposing, nor, as far as I know, has any attempt been made to canvas the views of the ordinary members of the Society.

Finally, a sombre thought. What if the introduction of an easier licence causes existing members of the RSGB to resign in protest?

K. Gardiner
Doncaster

Please Keep Off

No doubt the allocation of specific frequencies to polar-orbiting satellites is a wasteful way of apportioning the v.h.f. spectrum, where space is already at a premium. For 24 hours a channel remains free only so that it may be used for a few minutes every so often.

No doubt, too, in the not so distant future, digitalised channel sharing techniques will bring a more economical use of the available frequencies.

However, until that day arrives, I do wish that those few mindless or uninformed licensed amateurs who insist on regularly using the UoSAT frequency of 145.825MHz for their incessant chinwags, would stop doing so.

Howard Barnes
Colchester

Pipesmoke?

I was interested to see the Richard Marris G2BZQ *Kitchen Konstruktion* item on using plastics water pipe for coil formers (*PW* March 1988). A friend of mine built an h.f. rig from a *Wireless World* design, in which he used plastics pipe for the p.a. coil, and it went up in smoke! I had the same trouble using pvc-insulated bell wire twisted to make a small "gimmick" capacitor—it didn't like r.f.

Some water pipe is pvc and some is glass fibre—the latter may be alright. I think that if you have a solid-state p.a., it would be better to use Paxolin. I hope Richard won't mind me stating this, but it is a fact.

May I also say how much I enjoy *Practical Wireless*. The feature *Battle of the Beams* was great.

John Tye G4BYV
Dereham, Norfolk

Stop Press

The Government is to consider the introduction of a short range radio system in the band 933-935MHz.

Therefore the 934MHz CB spec. MPT 1321 will be withdrawn from 30 December 1988, to provide warning to both traders and users that no more sets should be imported from that date.

"It is only fair that existing users get a good life from their sets," says the DTI.

Apparently, both the 934MHz UK Club and the Personal Radio Club of Great Britain have been consulted. As to the date that 934 will cease, we don't yet know.

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 44 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 54 of this issue. Airmail rates for overseas subscriptions can be quoted on request.

Oscilloscopes from Farnell

Farnell have introduced three new oscilloscopes to their product range. The DTV20 is the low-cost 20MHz model. The facilities include 1mV sensitivity, single-shot mode, variable trigger hold-off, TV trigger, component test and XY and Z modulation plus standard features such as fine controls for both sweep and gain. Comprehensive display modes, including add, invert and chop as well as alternate of the two channels.

The DTV 40 (shown in the photograph) offers all the features of the DTV20 other than component test. In addition, it has a fully calibrated delayed timebase allowing A to be intensified by B, A or B alternately and B starting after set delay or triggered after delay. The high potential p.d.a. tube gives a bright clear trace even at high speed, low repetition rate signals.

The DTV60 is the top model in the range and offers the same spec at the DTV40 but with the bandwidth increased to 60MHz, a faster timebase and an additional input channel.

For more details on these oscilloscopes, contact:
Farnell Instruments Ltd.,
Sandbeck Way,
Wetherby,
West Yorkshire LS22 4DH.
Tel: 0937 61961.

Linears

FJP Kits are producing a medium power linear for use with the PW Meon on 50 and 70MHz. The specification given in their press release quotes on output of up to 10 watts p.e.p. for an input of 0.8 watts. They also say that the linears have been designed to withstand a mismatch of greater than 3:1.

The linears are available in a variety of ways, a built p.c.b., tested and tuned; a boxed, built and tested r.f. switched linear, or just a kit of parts. Prices range from £28 to £39.50 exclusive of VAT.

For more details, contact:
FJP Kits & Components,
63 Princess Street,
Chadsmoor,
Cannock,
Staffs WS11 2JT.

Small Linear Power

Cirkit Distribution has introduced a new range of low cost 1 watt encapsulated linear power supplies. This range offers the convenience of p.c.b. mounting and measures only 50 x 50 x 30mm.

Single output voltages of 5 and 12V along with dual output of +12 and +15V are available. All outputs are short circuit protected with minimum input to output isolation of 1.25V r.m.s.

For more details on this range of products, contact:
Cirkit Distribution Ltd.,
Park Lane,
Broxbourne,
Herts EN10 7NQ.

Can You Help

We have a reader who would like to obtain a circuit diagram of the Hammarlund Super Pro 600. If you have one then contact: N. Robinson, 10 Abbot Street, Easington Colliery, Peterlee, Co. Durham SR8 3QN.

Mr Williams would like a copy of the book *Instruments of Darkness* by Alfred Price, published by William Kimber in 1967. If you can help, then write to: Ray Williams, 62 Kingscliffe Road, Grantham, Lincs NG31 8ET.

Mr Pontet has "dug up" a WWII B2 Marquis transmitter and would like to hear from anyone else who knows how they are operated. He has some circuit diagrams which may prove useful to anyone else with this transmitter. If you would like to get in touch with Mr Pontet, then the address is 4 Elsted Road, Cooden, Bexhill, East Sussex TN39 3GB.

Has any reader got any information on the Heathkit models VFO HG10B and TX final DX60B. The frequency is 28, 21, 14, 7 and 3.5MHz and Mr Turner wants to know could this unit be altered to cover 50MHz as the v.f.o. also covers 144 and 50MHz as well. He wants to know is it possible to beg, borrow or steal any manuals. If you can help, write to Mr E. Turner G1VMG, 19 Tack Lee Road, Yapton, Arundel, West Sussex BN18 0HB.

Dave Pritchard is searching for the manual(s) and/or circuit diagram for a Hammond organ type T202. Apparently it's developed laryngitis and locally no-one has records going back to "the stone-age"! If you can help, then write to Mr. D. Pritchard, 55 Walker Drive, Leigh-on-Sea, Essex SS9 3QJ.

Year 88 Project

Youth in Electronics via Amateur Radio is a project through which the RSGB hope to encourage youth into electronics through amateur radio. All affiliated clubs and societies will be receiving information packs explaining what they can do to help. If your club doesn't receive one then contact:
RSGB HQ.
Lambda House,
Cranborne Road,
Potters Bar,
Herts EN6 3JN.

On Air

On Air is the latest addition to the ITS 448 Magazine Stand recently launched on Prestel. It is an area edited by Keith Maton G6NHU.

Keith can be contacted via the AX.25 Packet radio network by sending a message @ G4DGK if you would like more details about On Air.

The first month has seen 20 000 accesses to the lively coverage, which includes news, rally dates and venues, contact information, a bring and buy section as well as an amateur radio prize competition.

If you would like to read On Air for yourself, Prestel:
Key *448900.

Competition

The Blackwood ARS are organising a competition for May 13. It's to be called "The Fastest Constructor in the West".

Every entrant has to construct a small project, the same one, in the shortest possible time. The project must, of course, work. If it does not, time will be added by a team of independent invigilators. Time will also be added for sloppy workmanship.

The competition is light-hearted and the club would like to invite anyone, anywhere, to take part. All competitors are invited to bring some moral and/or vocal support. Refreshments will be available.

There will be a prize for the fastest constructor, the fastest beginners and a trophy for the fastest club. Every competitor will receive a certificate showing he or she entered.

The project chosen is the Maplin Live Wire Detector. The entrance fee is £4.00 and the competitor gets to keep the completed project!

The closing date for entries is May 1. For further details contact:
Terry John GW4XCU,
QTHR,
Tel: 0495 222573.

Wire Stripper

A valuable item for any tool box is a gadget that makes wire stripping fast and simple.

Ceka have introduced a new adjustable precision wire stripper that can cater for diameters of 0.25 to 0.8mm. These different diameters are selected by simply turning a clearly marked adjustment wheel.

Lightweight in construction, the wire stripper has specially hardened blades to ensure long life and efficient stripping of both pvc and Teflon coated wires.

Ceka maintain it is fast to operate, you simply set the adjustment wheel to the wire size, pass the wire through the holes, squeeze the handles and withdraw it. An adjustable length marked in 5mm graduations ensures accuracy.

The wire stripper is priced at £25.50 and further details can be obtained from:
Ceka Works Ltd.,
Pwllheli,
Gwynedd,
North Wales LL53 5LH.
Tel: 0758 612254.

No. 88 Signals

Following the series *Battle of the Beams* we have received a letter from Mr W. Priestnall G3BBU. He spent all his service during the war on the type of work described in the series, with No. 88 Signals Wing, RAF.

He would like to contact his ex-colleagues of that time. If you worked with Mr Priestnall in No. 88 Signals Wing during the war and would like to get back in touch then write to him at:
Mr W. Priestnall,
2 Corngrave Close,
Marske-by-Sea,
Cleveland TS11 7ER.
Tel: 0642 472231.

Rally Calendar

***May 8:** The Swindon & District ARC have arranged with the British Science Museum to set their rally against the backdrop of the exhibits at its outstation at Wroughton airfield, near Swindon. The Science Museum at Wroughton houses aircraft, agricultural equipment, fire appliances, hovercraft, expedition vehicles, commercial transport vehicles and much more.

Outside, on the airfield, there will be helicopter sightseeing trips around Swindon, a model steam engine rally and various other attractions for all the family. Access to the site is from Junction 15 of the M4, signposted to the Science Museum.

May 15: The Parkanaur Rally, organised by the Mid-Ulster ARC, will be held at The Silverwood Hotel, Lurgan, Co. Armagh. Doors open at 12 noon and the entrance fee is £1. There will be the usual trade stands, bring & buy, RSGB bookstall, QSL bureau, etc. Talk-in on S22. The proceeds from this rally go to the Stanley Eakins Memorial Fund. More details from ***Sam White GI1BIW on 07622 22855.***

June 12:** The Royal Naval ARS Annual Mobile Rally will again be held in the sports field, HMS Mercury, Nr Petersfield, Hants. Gates open between 1000 and 1700. As usual there will be plenty of attractions for all the family at this very friendly rally. More details from ***Cliff Harper G4UJR. Tel: 0703 557469.

June 12: The open day for the Mid Lanark Society will be held at the Community Centre, Newarthill, by Motherwell. This new venue is about half a mile from the old venue of Wrangholm Hall. There will be the usual traders, a bring & buy stand, demonstrations of packet radio and RTTY, lectures and the annual award of the EHI Trophy. Talk-in will be on S22 and catering will be provided.

June 18:** The Royal Air Force Halton Air Show and Amateur Radio Rally will take place at RAF Halton near Aylesbury, Bucks. The RAFARS (Golden Jubilee) Rally will be held inside a hangar. For more details you should contact ***Terry F. Owen G4PSH on 0296 85760.

June 26:** The 31st Longleat Mobile Rally will be held, as always, at Longleat Park, Longleat, near Warminster, Wilts. The rally starts at 10am. More details from ***Brian Goddard G4FRG. Tel: 0272 848140.

July 2 & 3: The Popular Flying Association Annual Rally is being held at Cranfield Aerodrome, Bedfordshire.

British DX Club

The January issue of *Communication*, the monthly journal of the British DX Club has some very interesting articles in it.

There are constructional details for a spiral loop antenna for medium wave listening, some very rare and unusual QSL cards from different collections and lots of interesting loggings.

Subscription rate for the UK (1st Class post) is £7.50; Overseas surface mail (including Eire) is £8.50 and Overseas airmail (including Eire) is £11.

For more details, contact:
Colin Wright,
54 Birkhall Road,
Catford,
London SE6 1TE.

Special event Stations

GU4NYT/P. On May 22, the Guernsey ARS will be active on 3.5 and 7MHz on the usual WAB s.s.b. frequencies from the Island of Alderney. The group will be active for the first three hours of the WAB contest.

GB6BH. This station will be on the air from Barlborough Hall, Barlborough near Chesterfield (IO93IH). It will be active most weekdays and every weekend during the month of May. The station will be operational on the following bands and modes: all h.f. bands, 50, 70, 144 and 430MHz, using s.s.b., ATV, AMTOR, Packet and RTTY. For further information/skeds contact Peter McArdle G0DAG, QTHR.

GB75SEM. The Bournemouth & District Group of the RAIBC will be operating the annual special event station from the Southern Electricity Museum, Bargates, Christchurch on May 14/15. They will be active on h.f., v.h.f. and u.h.f.

Visitors are welcome to look around the museum between 10am and 4pm on both days. Talk-in will be available on v.h.f. A colour QSL cards will be sent to all contacts via the bureau or direct on receipt of an s.a.e. Bob Burrows, 40 Fairmile Road, Christchurch, Dorset BH23 2LL.

Morsum Magnificat

Are you interested in the history and quirks surrounding Morse, or perhaps you have a story about Morse that others would like to know then the magazine *Morsum Magnificat* could be for you.

It is for all Morse enthusiasts, amateur or professional, active or retired. It manages to bring together material that would otherwise be lost. It provides an invaluable source of interest, reference and records relating to the traditions and practice of Morse.

This latest issue has a very interesting article about the Morse test in Spain, how they abolished it and have now brought it back, with all the confusion and trouble that caused.

A subscription to *Morsum Magnificat* costs £6 per annum in the UK and Eire, all other countries £7 sterling by international cheque or postal order made payable to *Morsum Magnificat*.

If you would like more details on *Morsum Magnificat*, then contact:

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

Milli-ohmmeter

Levell Electronics have introduced a hand-held milli-ohmmeter called the M210 into their range.

It has a three and a half digit l.c.d. and is auto-ranging. It is designed to measure, accurately, low resistances from 0.001Ω to 200Ω using four terminal configuration. The accuracy is ±0.1% of range with maximum test current of 5mA and test power of 5mW. The M210 is powered by an internal PP3/MN1604 battery and is supplied complete with a set of leads with spring clip connectors and ever-ready case. The cost is £165 plus VAT.

For more details on this instrument, contact:

Levell Electronics Ltd.,
Moxon Street,
Barnet,
Herts EN5 5SD.

Packaging

As p.c.b.s and i.c.s proliferate, there is an increasing need for them to be sent through the mail or via a courier. Inmac now has available a new design of rigid card mailer that will protect such devices from physical or static damage whilst in transit.

SafePak is available with either anti-static foam for packing microchips at a cost of £10.95 for five, or with bubble lining for p.c.b.s. The latter is available in three sizes to match standard European circuit board sizes and costs £11.95 for five packs measuring 195 x 115 x 30mm, £13.95 for five measuring 250 x 180 x 30mm and £18.95 for five measuring 300 x 250 x 30mm. All versions have a security seal to show if the contents have been tampered with.

For more details, contact:

Inmac (UK) Ltd.,
Westerly Point,
Market Street,
Bracknell,
Berks RG12 1EW.

CQ Prudential

The Prudential ARS are in the process of being formed. They already hold the call G8PRU and hope to obtain other calls for the Prudential Property Services.

If any licensed or s.w.l. employees, retired or otherwise would like to get in touch with the rest of the Prudential ARS, then contact:

Dennis Egan.
4 Hazel Grove,
Longmeadow,
Dinas Powis,
S. Glamorgan.

Digital Clamp Meter

A digital clamp meter that can measure both a.c. and d.c. as well as voltage and resistance is now available from TMK Instruments. The SK 7710 has a large, autoranging, 9999-count l.c.d. with 11mm high numerals, a full range of annunciators and is microprocessor controlled so easy to use.

Both a.c. and d.c. are measured to 600A with autoranging and best resolution to a maximum of 0.1A and a basic accuracy of 1.5% of reading. Voltage ranges, both a.c. and d.c. are to 600V and resistance to 10kΩ.

Additional modes include "data hold" via a touch control for the retention of the last reading, ideal for bad light or awkward positions.

The TMK's new clip-on ammeter comes ready for use with test leads, battery, instructions and carrying case. It weighs only 270g and is fitted with a wrist strap. It will clamp around conductors up to 36mm diameter.

For more details, contact:

Harris Electronics (London) Ltd.,
138 Grays Inn Road,
London WC1X 8AX.

Data Maps

British Telecom and Ordnance Survey have signed an agreement covering the acquisition, selling and maintenance of digital data produced from Ordnance Survey large scale map information.

Under the agreement, BT will employ contractors to convert OS maps to the computer readable form that they and other utilities require. OS will market this map data and share the proceeds with BT.

By this means, financing of the considerable task of digitising the 230 000 maps covering Great Britain will be shared and equally importantly, the task will be completed earlier.

If similar agreements can be reached with other bodies, the projected "end of the century" completion date might be brought forward to the early years of the next decade.

Dubus

Dubus is a German magazine, published four times a year. It is run as a non-profit making magazine and therefore relies totally on subscription and not advertising.

It is aimed at amateurs interested in the v.h.f, u.h.f. and s.h.f. bands. Each issue provides articles on antennas, constructional projects, microwave news and aurora news as well as details of skeds. It is mostly written in both German and English which can throw the reader at first because the German paragraph is written first, with the English underneath. Full constructional details are given for each project as well as p.c.b. track pattern to enable constructors to build their own boards.

A year's subscription costs £8.50, but if you would like more details on *Dubus*, send an s.a.e. to:

Ken Hatton.
Hamilton House,
Carleton,
Carlisle,
Cumbria CA4 0AD.

RAYNET in Scotland

There will be a meeting on Sunday May 1 at the Freedon Inn, Aviemore Centre, Aviemore. The aim is to promote RAYNET in Scotland and meet representatives of the User Services. The meeting is open to all amateurs and RAYNET members who are interested.

The programme for the day is:

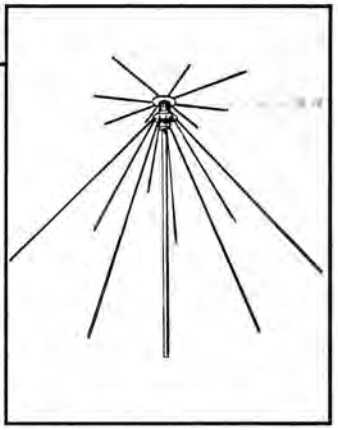
1000 Coffee
1030 RAYNET by Mr G. Griffiths G3STG, Chairman RSGB RAYNET Committee
1130 Local Authorities by Mr G. Milligan, Highland Region Emergency Planning Officer
1230 Lunch
1400 Fire by Mr E. Weighman, Asst. Div.Officer Highland & Islands Fire Brigade
1500 Mountain Rescue by Flt. Sgt. T. Taylor GM0GHN, Mountain Rescue Team Leader, RAF Kinloss
1600 Coffee
1645 —
1730 RAYNET Open Forum with G3STG.

You could always make a long weekend of the event with the family making use of the facilities of theAviemore Centre.

For further details on this meeting, contact:

Eric Garrington GM3RFA.
QTHR.
Tel: Fort William 3833.

Wide Band Discone Antenna



South Midlands Communications Ltd., have introduced a wide band discone antenna into their range, the DSC770. The frequency coverage is from 70 to 700MHz and the gain is 3.5dB compared with a $\frac{1}{4}$ wave dipole. It is designed for use as either a receiving or transmitting antenna, up to 500 watts p.e.p.

The top centre disc, cone and elements are all manufactured from high grade aluminium alloy. The element screws direct into the cone and disc, as opposed to using wing nuts. The antenna is supplied with a stub mast of 40mm diameter and mast clamp to fit 32 to 50mm mast. The stub mast protects the input connector from the ingress of moisture.

The DSC770 costs £55.75 including VAT, with more details being available from:

SMC Communications Ltd.
SM House,
School Close,
Chandlers Ford Ind Est.,
Eastleigh,
Hants SO5 3BY.
Tel: 0703 255111

The Jackson Connection

The popularity of the PW "Orwell" project has thrown up a problem, regarding the availability of good quality, 3-gang 500pF/section tuning capacitors. In answer to this shortage Maplin Electronic Supplies in conjunction with Jackson Bros (LONDON) Limited, have arranged a supply route by which the home constructor can purchase products from the Jackson component range. The Jackson capacitor suitable for use in the "Orwell" receiver is an "E Law" 487pF three-gang unit, catalogue number 4507, and is priced at £19.50. The current delivery time on this component is four weeks.

For other current Jackson components, telephone Maplin Retail Sales on 0702 554161 quoting the Jackson part number of the component required, and within 36 hours they should be able to quote you a price and a delivery time. A product list of Jackson components can be obtained by sending an A4 size s.a.e. to:

Jackson Brothers
(LONDON) Ltd,
Kingsway,
Waddon,
Croydon CR9 4DG.

New Tantalum Capacitors

STC Electronic Services has introduced a high performance Kemet T356 series of solid tantalum capacitors.

They incorporate a solid electrolytic layer of manganese dioxide to promote seal-healing and are encapsulated in flame-retardant epoxy. The range is available to IECQ 300301/US0003 standards and provisionally approved to BT D2589.

The T356 series has a capacitance range between 0.1 to 680µF and has an operational temperature range of −55°C to +125°C. Type dependent, the rated voltage varies between 3 and 50V d.c. and operation can be continuous even at the highest rated temperature.

For more details on these capacitors, contact:

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

Miniature Multimeter

A miniature auto-ranging digital multimeter, small enough to slip into a shirt pocket, has been introduced by Beckman Industrial at the price of £24.50 (plus VAT).

The DM78 has a three and a half digit meter and five functions. These can measure up to 250V a.c. in four ranges, 250V d.c. in five ranges, 20MΩ in six ranges and it can check diodes and continuity with an audible beeper. The d.c. volt accuracy is 1.3% ±4 digits.

The meter measures 180 x 53 x 10mm and is supplied in a neat wallet together with the test leads. For more details, contact:

Beckman Industrial Ltd.,
Temple House,
43–48 New Street,
Birmingham B2 4LJ.
Tel: 021-643 8899.

Battery Brochure

An eight-page full-colour brochure outlining a wide selection of cells and batteries has been produced by STC Electronic Services.

Products are available from such leading manufacturers as Varta, Duracell, UCAR, Sonnenschein, Saft, Ever-ready and Vidor. The range covered by the brochure extends from traditional zinc-carbon batteries through memory protection lithium chromium oxide and lithium copper oxide types to large sealed lead acid products. The publication aims to provide concise information on part numbers, formats, voltages, capacities and sizes.

Copies of the brochure are available, free of charge, from:

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

A Marconi Anecdote

Marconi's early experiments were not without an element of humour, one of these incidents was recorded in 1926, almost 30 years later, by a member of the party concerned. Eric Westman tells us the story.

Following his successful Bristol Channel transmission of May 1897 (described in the July 1987 issue of *Practical Wireless*), Marconi returned in triumph to Italy. By autumn, he had returned to Britain and was staying in the bungalow allotted to him on Three Mile Hill, near Salisbury. Here he continued his experiments, using huge kites to raise his antennas. These kites had been lent by Major Baden Powell (of later Boy Scout fame) who had been using a string of five hexagonal kites, each measuring four metres across, to raise a basket containing an artillery observer. To get the kites airborne on windless days, Baden Powell attached them to a horse which he then sent galloping down a field, dragging the kites after it. On one occasion, the rope became entwined around his leg, and the future Chief Scout found himself suspended upside-down in the air by his left ankle.

Encouraged by his 14km transmission across the Bristol Channel, Marconi decided to attempt a really ambitious feat: to transmit from Salisbury Plain to the City of Bath, 55km away. Late in September 1897, a Post Office party, accompanied by a squad of Royal Engineers, set up a receiving station at Battlefields, Lansdown, a high point above Bath. They soon had their kite soaring 70m above them tethered by a great length of piano wire that also acted as the antenna. At the appointed time, the first signals from Salisbury Plain tic-tacked through their recorder: Marconi had succeeded in his farthest transmission so far.

The success was not to last long, for a sudden gale sprang up and the antenna wire snapped. Away blew the kite, trailing after it nearly a kilometre of wire that dragged along the ground, frightening people working in the fields. Later, it chased the members of the experimenting party in an unpremeditated cross-country run. At the end of a flight of 9km, the kite plunged to the ground near a cottage, whose acquisitive inhabitants quickly hid it in an outhouse.

To no avail, for they had been seen. When the rescue party panted up and demanded their kite and wire, the cottagers refused to give it up, adopting the attitude that "finding is keeping". Eventually, threats of being charged with stealing Government Property persuaded them to reluctantly hand it over.

So ended Marconi's record-breaking transmission. The chronicler of 1926, who took part in the chase after the kite, gives the names of the two officers who assisted, but Baden Powell was not included. Presumably he and his horse remained on Salisbury Plain with Marconi. **PW**

". . . FINDING IS KEEPING . . ."

". . . ON WINDLESS DAYS . . ."

REALISTIC®

Portable All-Band World Receiver

Realistic DX-440. Tune into international news, views and entertainment from all over the world! This exciting "Voice Of The World" receiver features PLL synthesized circuitry which locks onto exact frequency so you can enjoy drift-free reception from around the globe. Receives FM stereo and full AM (150-29,999 KHz) including longwave, mediumwave and SW bands. Simply punch in any frequency with the direct-entry keys or use the 9-station memory for even faster access! Features automatic and manual scanning modes to locate any station on the air. With built-in monaural speaker, LCD quartz clock with timer, telescoping aerial and headphone socket. Requires 2 "AA" and 6 "C" batteries or AC/DC adapter.

20-221 ..... **£149.95**

Tandy®

Tunes You Into A World Of Better Listening

Over 400 Tandy Stores And Dealers Nationwide.

Prices may vary at Dealers. Offers subject to availability.

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

PW REVIEW

This latest addition to the Kenwood range has many features including h.f. and 50MHz amateur band coverage, and AMTOR/Packet compatibility. Mike Richards G4WNC gives the TS-680S a good airing, whilst Geoff Arnold G3GSR examines the laboratory performance.

The TS-680S is a very comprehensive multi-mode transceiver which, with its multiple features, should appeal to many amateurs.

All the main operating modes are included, i.e. s.s.b., a.m., f.m. and c.w. There is even a dedicated socket on the rear for the connection of a terminal unit or TNC for data communications. The c.w. mode can also be run using full break-in which is a very useful addition.

With most modern transceivers a well written and comprehensive manual is essential in order to fully utilise all the facilities. Unfortunately the review TS-680S was so new that the first manual available was in Japanese! Fortunately I did manage to obtain an English language version before writing commenced.

The review transceiver and its Japanese manual had no coverage of the 18.1 and 24.9MHz (17 and 12m) bands on transmit. The Specifications in the English manual did include those bands, and also promised an increased output power of 95W on c.w./s.s.b. and 40W on a.m. on the 28MHz band.

The manual comprises 43 pages and is very well illustrated with plenty of simple diagrams where appropriate. The operation of each control is separately described with a particularly good description of the i.f. shift function. This is followed by a detailed description of the use and connections of all the sockets on both the front and rear panels.

The main core of the manual then continues with descriptions on how to operate in the available modes, including the use of the very comprehensive memories. The final sections of the manual are concerned with a functional description, fitting of options and a simple help section. In addition to the manual there is a separate large, double-sided, sheet containing a full circuit diagram which is quite readable by Japanese standards.

Connecting-up

The TS-680S is a very easy transceiver to interface with the outside world. The power requirement is nominally 12V and is supplied via a heavy gauge lead which plugs into the rear panel. This power lead is well protected with a separate fuse in each leg. The antenna is connected to a standard 50Ω SO239 socket also on the rear panel. The only criticism I have here is that there is only the one antenna socket to cover from 50kHz to 54MHz! This of course means that some sort of antenna switching has to be provided by the user as I have yet to discover a really efficient antenna that will work over that range! I would have preferred to see separate sockets for l.f., h.f. and v.h.f. which would allow the connection of, for example, an all band h.f. antenna, a long wire for l.f. and a beam for 50MHz. Having said all that, antenna switches are not all that expensive so perhaps it's not a serious defect.

The microphone connection is via a standard 8-pin Kenwood microphone socket on the front panel and includes remote up and down switch operation as well as the normal p.t.t. switch.

For c.w. operation a key can be plugged into the 6.3mm standard jack on the rear panel. The voltage on the key jack is a maximum of 5.5V so virtually any key can safely be connected. Headphones can also be connected via another 6.3mm jack mounted on the front panel. I'm sure users of hi-fi headphones will be pleased to hear that both mono and stereo headphones can be accommodated without any phasing problems.

If you want to improve the audio quality from the internal speaker then an external speaker can easily be added by using the 3.5mm jack socket on the rear panel. This jack follows normal practice in that it automatically disables the internal speaker when a jack plug is inserted.

The remaining three sockets on the rear panel are used for the connection of various accessories, the most interesting of these being the one marked ACC-2. This socket will please the RTTY/AMTOR/Packet operators as it has been provided for the connection of a data terminal unit. The facilities provided are:

(1) Fixed audio output (about 300mV)
(2) Low level audio input (10mV)
(3) Trans/receive switching with the microphone disabled when in transmit.
(4) Squelch output.

The automatic isolation of the microphone when in transmit is a very useful feature as it means that the microphone can be left plugged in when operating a data mode. In addition to isolating the microphone the transmitter output is automatically reduced to a maximum of 50 watts to help prevent accidental overheating of the p.a.

The final two rear panel sockets are used for remote control operation and the connection of the Kenwood AT-250 automatic a.t.u.

Operation

The TS-680S, like many other modern transceivers, is microprocessor controlled which usually means lots of user selectable options. With the TS-680S, seven of the basic functions of the transceiver can be changed on power-up as follows:

(1) 10Hz display digit on/off.
(2) r.i.t. frequency step 10Hz/20Hz.
(3) a.m. tuning step 9kHz/10kHz.
(4) Program scan on/off.
(5) Mode announcement beep/Morse.
(6) Alarm announcement beep/Morse.
(7) Band switch steps 500kHz/1MHz.

As you can see these are all options that do not need changing very often, but nevertheless it's handy to be able to change them. The technique employed to change one of these options is to hold the appropriate button operated whilst turning on the power.

You may well have noticed from the foregoing that the TS-680S makes extensive use of Morse code to indicate mode changes and alarm conditions. My only criticism of this technique is that the tones are injected into the audio path after the volume control and therefore are unaffected by the volume control setting. This means that they are very often either too loud or too quiet. The pre-set level of the Morse can be adjusted but it does require a fairly extensive disassembly of transceiver. I would have liked to see the tone injected prior to the volume control or perhaps a pre-set pot adjustable from the rear panel. Still, this is only a minor gripe.

The TS-680S is equipped with a good selection of features to aid the reception of a wide range of signals. Starting with the front-end, a 20dB attenuator can be switched into circuit to reduce overload in the presence of very strong signals. These strong signals can also be reduced by backing off the r.f. gain control which comprises a miniature slider on the front panel. When receiving very weak signals above 21.5MHz, an r.f. amplifier can be switched into circuit by operating a push-button on the front panel. The r.f. amplifier actually comprises two amplifiers, one operating between 21.5MHz and 34MHz whilst the other operates in the 50MHz band.

If the required signal is suffering from impulsive noise, then the TS-680S is very well equipped with two adjustable threshold noise blankers. The first of these has been optimised for short duration interference similar to that produced by car engines, whilst the other blanker is best suited for "Woodpecker" noise. The provision of an adjustable threshold makes it very easy to obtain just the right amount of blanking with minimum degradation of the wanted signal.

An i.f. shift control is provided to facilitate the rejection of an interfering station whilst operating s.s.b. and c.w.

When listening or operating on a net, it is very useful to have a r.i.t. (receive incremental tuning) control. On the TS-680S the r.i.t. is enabled by operating a push-button switch on the front panel and tuned with a rotary control. One rather good point is that the r.i.t. offset is indicated on the right-hand side of the main frequency display with a resolution of 100Hz.

The final aid to reception is the front panel selection of the a.g.c. response time. The TS-680S has two options of fast or slow, with slow optimised for s.s.b. whilst the fast position is useful when searching for stations or when monitoring an AMTOR QSO between a local and a distant station.

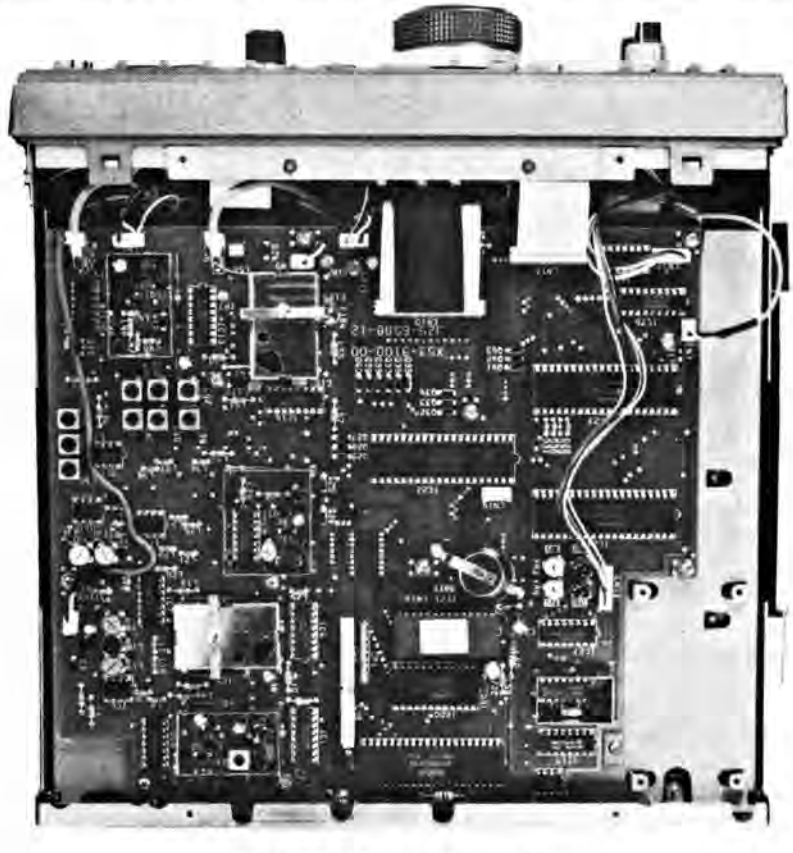
When it comes to frequency selection, the TS-680S is positively bristling with features. The first and most obvious method is to use the UP and DOWN buttons to select the required band and then tune to the wanted frequency with the main tuning knob. The turning resistance of this knob can be adjusted by rotating the inner ring of the knob which provides a good range of adjustment. Personally, I found that the loosest setting was the most pleasant. Normally the UP and DOWN buttons allow stepping between amateur bands but if the 1MHz button is depressed these buttons provide band changing in 1MHz steps. When using this facility the receiver operates between 50kHz and 34MHz and 50 to 54MHz, while the transmitter only operates whilst tuned to an amateur allocation. Just to confuse things the UP and DOWN buttons can be reconfigured to give 500kHz steps if required, during the power-on function setting.

One very good aspect of the main tuning control was the dual rate tuning function. This automatically gives a faster tuning rate when the knob is spun quickly. I found the changeover point from fast to normal tuning to be ideally set giving fast tuning without any unpredictable frequency jumps.

The TS-680S has dual v.f.o.s allowing for split frequency working or rapid frequency changes. The changeover from v.f.o. A to v.f.o. B is achieved by pressing a toggle-action touch button on the front panel, whilst the v.f.o. in use is clearly indicated on the main display. The other standard facility provided is the ability to set the unselected v.f.o. to the same mode and frequency as the selected v.f.o.

One other frequency adjustment provided used the dual purpose v.f.o. channel/memory channel switch. This twelve-position rotary switch, when operated, shifts the v.f.o. frequency to the next whole 10kHz and each subsequent operation either increments or decrements the frequency by a further 10kHz. This can be useful for fast frequency changes.

In addition to the main tuning knob, thirty-one programmable memories are provided for the operator to store popular frequencies. Rather than provide thirty-one simple memories the TS-680S memories are split into three groups. The first group of ten memories are simple memories which are able to store the operating frequency and mode. The second ten can be used to store split transmit and receive



The internal view of the TS-680S

★ MAKER'S SPECIFICATIONS

TRANSMITTER

Frequency coverage: 1.8– 2.0MHz (160m)
3.5– 4.0MHz (80m)
7.0– 7.3MHz (40m)
10.1–10.15MHz (30m)
14.0–14.35MHz (20m)
21.0–21.45MHz (15m)
28.0–29.7MHz (10m)
50.0–54.0MHz (6m)

RF power output:	c.w./s.s.b.	a.m.	f.m.
1.8–21MHz bands	100W	40W	—
28MHz band	50W	20W	50W
50MHz band	10W	4W	10W

Carrier suppression: More than 40dB with 1.5kHz a.f. input

Unwanted sideband: Better than –50dB with 1.5kHz a.f. input

Spurious emissions: More than 40dB below peak output (<30MHz)
More than 60dB below peak output (>50MHz)

Microphone: Impedance 500Ω to 50kΩ

Deviation (f.m.): ± 5kHz max.

RECEIVER

Frequency coverage: 500kHz–30.0MHz (extended to 50kHz–35MHz with reduced performance)
50–54MHz

Intermediate frequencies: 40.055MHz (1st), 455kHz (2nd)

Sensitivity: Input in μV for 10dB S/N (with pre-amp ON for frequencies above 21.5MHz) less than:

Mode	0.5 to 1.62MHz	1.62 to 21.5MHz	21.5 to 30.0MHz	50 to 54MHz
s.s.b./c.w.	3.98	0.25	0.18	0.16
a.m.	39.8	2.5	1.78	1.58
f.m. (for 12dB SINAD)	—	—	0.18	0.18

Image and i.f. rejection: Better than 50dB

I.F. Shift range: More than ± 1.2kHz

RIT variable range: More than ± 1.2kHz (10Hz steps)
More than ± 2.5kHz (20Hz steps)

Squelch sensitivity: Less than 0.32μV (f.m.)

Selectivity: (–6/60dB)
s.s.b./c.w. 2.2/4.4kHz
a.m. 6/18kHz
f.m. 12/25kHz

Audio output: More than 1.5W into 8Ω with 10% t.h.d.

Output load impedance: 8–16Ω

GENERAL

Antenna impedance: 50Ω unbalanced

Power requirements: 13.8V d.c. ± 15%, negative ground
20A transmit
1.5A receive (no signal)

Operating temperature: –10 to +50°C

Frequency stability: Better than ± 10 parts per million

Dimensions: W281 × H107 × D305mm including projections

Weight: 6.1kg

★ PW LAB TESTS

TRANSMITTER

Outputs in c.w. mode:

Freq.	Max. Output	Spurious outputs at 100W* (dBc)			
		Harmonics			Other
(MHz)	(W)	2nd	3rd	Higher	
1.81	100	–56	–58	—	—
3.51	110	–64	–66	–64	—
7.01	115	–58	–56	—	—
10.11	110	–64	–50	—	—
14.01	110	–66	—	—	–54 @ ±1.9MHz
21.01	105	—	—	—	–52 @ 1.92MHz
28.01	55	—	—	—	–60 @ 11.4 & 18.0MHz
29.01	55	—	—	—	–58 @ 12.5 & 16.0MHz
51.00	12	—	—	—	—

Notes: dBC = dB referenced to carrier.
– = better than –70dB.
*Measurements at 28.01 and 29.01MHz made at 50W
*Measurements at 51.00MHz made at 10W

2-tone Intermodulation products:
(100W p.e.p. at 14.1MHz using 700 and 1900Hz tones)
Wanted signals 0dBc
3rd order products –30/–34dBc
5th order products –43/–47dBc
7th order products –56/–56dBc

Carrier suppression: 48dB (1kHz modulation)

Unwanted sideband suppression: 60dB (1kHz modulation)

Maximum deviation (f.m.) 5kHz

RECEIVER

Sensitivity: (input p.d. in μV for 10dB S+N/N with pre-amp in circuit and Filter switch in Out position)

Freq. (MHz)	c.w./ s.s.b.	a.m. (70% mod)	f.m. (3kHz dev)	Input for S9
1.81	0.24	0.44	—	28
3.51	0.17	0.41	—	28
7.01	0.12	0.31	—	19
10.11	0.17	0.37	—	24
14.01	0.16	0.35	—	23
18.11	0.15	0.33	—	23
21.01	0.19	0.40	—	27
24.91†	0.15	0.68	—	7
28.01†	0.12	0.44	—	6
29.01†	0.11	0.44	0.12*	7
51.00†	0.07	0.53	—	14

Note: † = Pre-amplifier "ON"
* = for 12dB SINAD

Dynamic range: (two-signal) at 14.01MHz s.s.b.

Signal separation from carrier (kHz)	Dynamic range (dB)
20/40	62 (reciprocal-mixing limited)
50/100	92

Squelch threshold: 0.2–0.5μV (f.m.)

S-Meter calibration: (at 14.01MHz u.s.b.)

Reading	Input required	
	μV p.d.	dBμV
S1	1.33	2.5
S2	1.77	5.0
S3	2.33	7.4
S4	3.1	9.9
S5	4.3	13
S6	6.1	16
S7	9.2	19
S8	14	23
S9	26	28
S9 + 20dB	350	51
S9 + 40dB	3.5mV	71
S9 + 60dB	29.4mV	89

Image and i.f. rejection: Better than 60dB

AGC threshold: 1dB gain reduction threshold 0.8μV (s.s.b.)

RF attenuator: 22dB at 29MHz

Pre-amplifier: 3dB at 29MHz

Selectivity:
c.w./s.s.b. 1.8/5.0kHz (–6/60dB)
a.m. 5.8/12kHz (–6/50dB)
f.m. 13.4/27kHz (–6/50dB)

Audio output: 1.5W into 8Ω with 10% t.h.d.

Test equipment used:
2017 and 2019 signal generators, TF2370/TK2373 spectrum analyser, 2435 frequency meter, TF2304 modulation meter, TF2337A distortion and SINAD meter, TF2005R two-tone generator, TF893A power meter, TF2163S attenuator, all by Marconi Instruments; Bird Model 43 r.f. power meter plus power attenuators; Hatfield Instruments 3159 signal combiner.

frequencies as well as the operating mode.

The final eleven memories are particularly useful as they can store band limits and mode. If, for example, you are a keen c.w. operator then you could store the c.w. segment of each band in a memory. Band changing is then achieved by a simple click of the rotary memory channel switch on the front panel. One other very good point about these memories is that they prevent the operator from operating outside the predefined band segment. When the upper band limit is reached the operating frequency simply resets to the lower band limit and vice-versa.

The frequency band stored in the final memory channel has a rather special secondary role as the limits for a scan facility. This scan is enabled by selecting normal v.f.o. operation, tuning to the required band and then pressing the SCAN button on the front panel. The receiver then continuously tunes the frequency band stored in the last memory channel. This facility can be very useful for scanning the DX section of a band for signs of activity, leaving the operator free to do other things.

The changeover from v.f.o. to memory frequency selection is achieved by pressing a front panel touch button which, like all the others, has a toggle effect. Any memory frequency can be transferred to the v.f.o. by a single press of another front panel button. The actual programming of the memories was quite straightforward once the manual has been read.

The selection of the operating mode was achieved using three dual-purpose buttons on the front panel. Confirmation of the selected mode is provided by the main display and a Morse code announcement, which was rather novel and quite effective. If you find the mode announcement irritating then it can be changed to a beep quite easily during power-up.

Operation on s.s.b was very straightforward, with the appropriate sideband (l.s.b. below 10MHz and u.s.b. above) automatically selected, though this can be changed to the opposite sideband with a second press of the mode button. The usual microphone gain and r.f. power level controls were provided in the form of miniature sliders on the front panel. A switch selected speech processor is also included though the amount of processing is not adjustable. The only facility lacking was a voice operated switch (VOX), but this can be included externally if required by using the Kenwood VOX-4.

The c.w. operator is well catered for with a choice of break-in modes and the facility to include a 250Hz bandwidth i.f. filter, though this filter is not fitted as standard. The full break-in mode allows the user to listen for signals between individual dots and dashes whilst the SEMI position holds in transmit for a pre-settable period. This hold period can be varied by a

rotary control on the rear panel. When the break-in option is turned off the transmit/receive switching is achieved by either grounding the p.t.t. line or by operating the SEND/REC push button on the front panel.

Operation using a.m. and f.m. was also very simple and included a variable threshold squelch control for f.m. signals.

As mentioned earlier, a socket has been provided on the rear panel for the connection of data terminal units for RTTY/AMTOR or packet communications. One point to note here is that direct f.s.k. (frequency shift keying) is not supported and operation is achieved by using upper or lower sideband and injecting audio tones (audio frequency shift keying).

Circuit Description

It is probably appropriate at this point to describe the general technical configuration of the TS-680S. The antenna is fed to the transmit/receive changeover switch via a bank of six band pass filters. These filters are automatically selected according to the band in use. The receive section then adds extra band pass and i.f. trap filtering before passing the signal to a mixer for conversion to the first i.f. of 40.055MHz. This signal is then filtered by a monolithic crystal filter, amplified and fed to the second mixer for conversion to the final i.f. of 455kHz. The main receive selectivity is achieved at this second i.f. with separate filters for a.m., f.m., s.s.b. and an optional narrow c.w. filter. In order to achieve good audio quality, separate detectors are used for each mode. The recovered audio is then fed to a two stage audio amplifier before passing to the internal speaker.

The microphone output is amplified and limited by an automatic gain controlled amplifier before being split in two and fed to both the f.m. modulator and the transmit balanced modulator. The frequency translation process then follows the inverse of the receiver with the exception of an automatic level controlled amplifier between the first and second mixers. The final power amplification is achieved using separate modules for h.f. and 50MHz.

Performance

The TS-680S proved to be quite straightforward to use, with the operation of most functions being self-explanatory. The only exception to this was the memory operation which required careful reading of the manual. Once the memory system had been mastered I found the facilities to be extremely useful and easy to use. One other good point is that an internal battery back-up system ensures that the transceiver starts from the last used mode and frequency when it is turned on.

The on-air performance was marred somewhat by synthesiser noise. The most obvious display of this shortcoming was when listening to a station in the vicinity of a strong AMTOR station. The wanted signal would be badly affected by what sounded like key clicks from the AMTOR station, the problem being that the clicks are caused by the synthesiser noise not the quality of the AMTOR signal. On the review model, the clicks could be heard up to 7kHz either side of the offending station. When working close to a strong s.s.b. station the effect was less easily detected as it resulted in a general raising of the noise floor. In the lab tests, this problem was evident in the poor close-in dynamic range results, due to reciprocal mixing of the synthesiser noise with adjacent signals.

When using s.s.b. the audio quality was very good, both transmitted and received, though the received audio was best fed to an external speaker. The i.f. shift worked particularly well, removing adjacent channel interference whilst retaining reasonable inteligibility. Great care was required when using the speech processor as it was very easy to overdrive the transmitter. This problem was not helped by the miniature slider microphone gain control which was rather fiddly to use and seemed to have most of its adjustment at one end of its travel.

AMTOR operators will be delighted to hear that the TS-680S works very well on this mode without any modification. I was able to successfully run AMTOR directly from the microphone socket, though normally you would use the dedicated socket on the rear panel. The lack of a direct f.s.k. facility was a disadvantage, as was the fact that there was no provision for including a narrow filter when using the data modes. On the plus side, the i.f. shift could be used to provide some narrowing of the i.f. passband which helped the reception of RTTY, etc. The tuning rate and step was satisfactory for the data modes but a slightly slower rate would have been better. The frequency stability of the TS-680S was excellent and

good enough for the long term reception of FAX.

The full break-in facility on c.w. worked very well and was quite comfortable at 25 w.p.m. Unfortunately the c.w. side-tone level was set too low on the review model so adjustment was called for. Although the manual described the adjustment quite well, the operation required the removal of the top and bottom covers and then hinging out the p.a. sub-assembly to reveal the required pre-set potentiometer. I thought that this amount of disassembly was rather excessive.

The overall feel of the tuning control was very good with the dual rate tuning one of the best that I have encountered. The v.f.o. exhibited a slight glitch every 50kHz but this did not really affect the operation.

The front panel was well laid out and easy to use with the main display providing a clear indication of mode and frequency. The multi-function meter was also very clearly marked, serving as an S-meter in receive and either output power or a.l.c. in transmit. I did not like the operation of the miniature sliders for power and microphone gain, as it was very difficult to set precise levels.

Summary

The TS-680S is basically a well organised modern transceiver, the main features being the coverage from 1.8MHz to 54MHz coupled with the excellent frequency setting options. The poor synthesiser noise performance may have been exclusive to the review model but nevertheless should be borne in mind.

The TS-680S costs £995. Thanks to **ARE Communications Ltd., 6 Royal Parade, Hanger Lane, Ealing, London W5A 1ET, Tel: 01-997 4476** for the loan of the review model. ***PW***

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 Hamgear Preselector and a.t.u., mains powered, cost £78 and in mint condition. Would exchange for Mizuho KX2/3 or Global AT1000 in same condition. Tel: 091-526 7902. *E016*

Have Marconi CR100 with manual. Would exchange for AR88, FRG-7 or Hallicrafters S27 with cash difference. Keith Heselton, 3 Upavon Court, Penhill, Swindon, Wilts SN2 5HD. *E018*

Have Practical Electronics organ, full specification, in console cabinet, plus all the electronics for the footboard. Would exchange for commercial made amateur bands receiver with s.s.b. facility. Tel: Aldershot 29687. *E030*

Have WWII Wireless Set No. 38 Mk2, covers 7 to 9MHz. With headphones, mic, throat mic, all original plus CB. Would exchange for Superstar, Cobra, Nato 2000, etc. Paul. Tel: Sittingbourne 74384 *E032*

Have AOR AR-22 hand held synthesised receiver, 140–149MHz with charger and circuit. Would exchange for G4WPO parametric equaliser or working 10m multimode. Eddie McLean GM4EWM, Woodside Cottage, Longmorn, Elgin IV30 3SE. Tel: 0343 86435. *E043*

Have Satellit 2100 stereo f.m. in quality audio world zone RX, plus s.s.b. adaptor and 476 Dryfit battery, showroom condition. Would exchange for Sony CRF-330K, 320 or CRF-1 RX. Tel: 061-743 1570. *E044*

Have HRO communications receiver and manual, good condition. Nine tuning units cover frequencies 50kHz to 30MHz, other accessories available. Would exchange for 144MHz c.w. transceiver, about five watts output. Cash adjustment possible. Maurice Leadgat, Co. Durham. Tel: 0207 506280. *E053*

Have Datong MK Morse keyboard, v.g.c. Would exchange for 144MHz f.m. transceiver, plus cash if necessary. Tel: 0305 813202 (Weymouth). *E054*

Have APR-4Y v.h.f. a.m./f.m. RX TS-382 audio generator 10Hz to 20kHz 0–10V output plus other test equipment. Would exchange for a HRO, AR88, Hallicrafters, Stoddart receiver or Racal preselector MA1978. Cash adjustment if required. Bob. 247 Sandy Lane, Hindley, Wigan. Tel: 55948. *E056*

Have SX200N scanning monitor RX and power pack worth £200 and Philips D2935 p.l.l. world receiver worth £200. Would exchange for FRG-8800 receiver. John Smith. Tel: 0542 41043. *E059*

ERRORS & UPDATES

PW "Orwell" Medium Wave Receiver February/March 1988

In the p.c.b. as shown in Fig 2.3, a short piece of track has been omitted, removing the positive supply to IC2. This can be corrected by adding a short link between pin 6 of IC2 and the adjacent lead of decoupling capacitor C34. Two suitable suppliers for the 500pF 3-gang tuning capacitors have come to light; FJP Kits and J Birkett, both of whom advertise in *PW*.

An error also crept into the circuit diagram Fig. 1.1. The connection between IC1 pin 10 and X1 should also be grounded to 0V. The track pattern in Fig. 2.2 is correct. In the buying guide, the 14-pin d.i.l. i.c. socket should read 16-pin.

Practically Yours

By Glen Ross G8MWR

Test gear is something that costs a lot of money and, for many people, the amount of use it gets cannot justify the cost of purchase. One of the penalties that comes with high cost is the fact that the makers have built in a lot of features that you may never use—but have to be included to give the equipment a wide sales base.

Something that no amateur should be without is a general purpose meter and this is something that even the least technical amongst us can build easily and cheaply.

Specification

It was thought that with modern equipment what most people need is a method of measuring d.c. volts and resistance. With solid state gear, voltages rarely exceed fifty and due to inherently low impedance circuitry most resistances encountered are not of high value. The meter is designed with this in mind and provides five ranges of 1, 5, 10, 50 and 100 volts plus a resistance range of 0 to 100 000 ohms. All these ranges can be easily changed to suit your own requirements if you find those provided are not convenient.

All components used are easily obtainable and cheap and the initial calibration is very simple. No great claims are made for accuracy but the readings are more than good enough for normal use and, with care in the choice of the range resistors, could be within plus or minus five percent.

The Circuit

The circuit is shown in Fig. 1 and is so simple as to require little comment. The meter circuit is in the form of a bridge, the basic elements being the meter, f.e.t. the two 470 ohm resistors and the balance control. In this configuration the meter will give a full scale reading when half a volt is applied to the gate of the f.e.t. and intermediate values are indicated linearly. The voltage ranges are obtained by dividing the maximum voltage for any required range down to give a maximum of half a volt at the f.e.t. To alter the ranges, change the value of the appropriate range resistor (R2 to R6) remembering that lowering the resistance increases the maximum voltage for that range. Alterations to the resistance range can be made by changing the values of R7 and R8. As an example, if a maximum resistance range of 1000 ohms is needed then R8 becomes 27 ohms and R7 is 12 ohms.

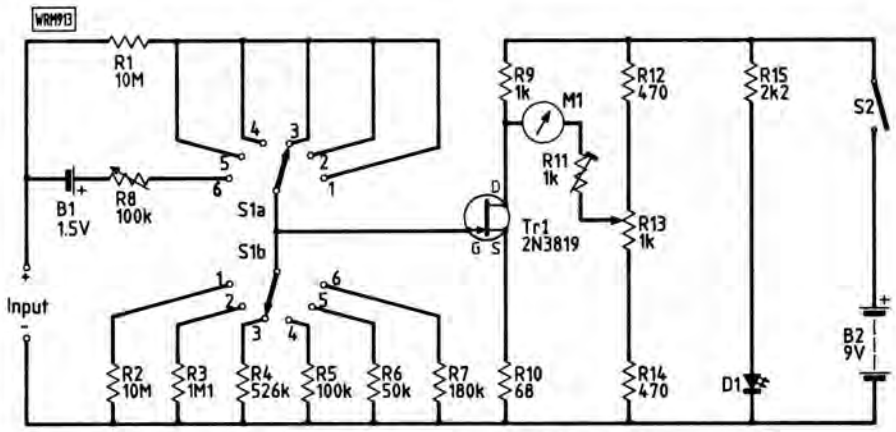


Fig. 1: The circuit diagram of the meter

kΩ	Scale
0	100
0.2	95
0.3	90
0.5	85
0.7	80
1	75
1.3	70
1.6	65
2.0	60
2.4	55
3.0	50
3.7	45
4.5	40
5.6	35
7.0	30
9.0	25
12	20
17	15
27	10
57	5
68	3
100	2

Table 1

Construction

The meter is perhaps best built in a diecast box and should use the largest open scale meter you can get. Both the input terminals should be insulated from the box and all the internal wiring can be on a self supporting point to point basis with clips being provided for the two batteries. Layout is not critical but remember that R8 and R13 are panel mounted controls not presets. Battery drain is around 5mA and an l.e.d. is provided to remind you to switch off when not in use. Calibration consists of switching on and setting a suitable range on which to measure a known voltage. Adjust R13 to set the meter to zero, apply the known voltage and adjust R11 to set the reading correctly.

Resistors

0.25W 2% Carbon film

68Ω	1	R10
470Ω	2	R12, 14
1kΩ	1	R9
2.2kΩ	1	R15
2.7kΩ	1	R6*
47kΩ	1	R6*
56kΩ	1	R4*
100kΩ	2	R3*, 5
180kΩ	1	R7
470kΩ	1	R4*
1MΩ	1	R3*
10MΩ	2	R1, 2

Potentiometers (linear)

1kΩ	1	R13
100kΩ	1	R8

Potentiometer (pre-set)

1kΩ	1	R11

Semiconductors

Transistors

2N3819	1	Tr1

Miscellaneous

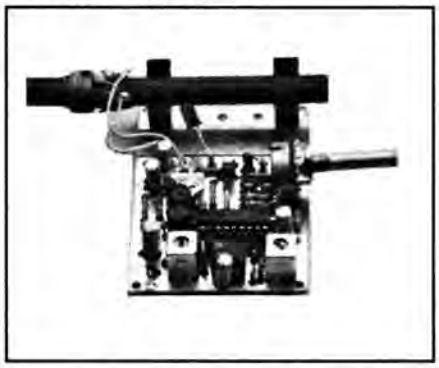
Batteries 1.5V & 9V; 0-1mA meter; 2 pole 6 way rotary switch; S1; s.p.s.t. switch S2; input terminals (2); case.

To measure resistance set the range switch to the ohms position (6), short circuit the test leads and use R8 to set the meter to full scale. Connect the unknown resistor and read its value either from a scale drawn on the meter face or from a calibration chart. This could be fixed to the back of the box and covered with a thin Perspex panel. A typical calibration is shown in Table 1 and this can be easily checked by measuring a few known value resistors. **PW**

PICK OF THE POPS!

CONSTRUCTORS CHART TOPPERS FROM Cirkit

MSF RECEIVER



Lock into the National Physics Lab Atomic clock with the Rewbichron II and MSF receiver. The 60KHz receiver will tune to the MSF transmitter from Rugby, the data is displayed on the Rewbichron II in 12 or 24 hour format with day and date information. Bright 6 digit LED display.

MSF RX	40-06002	**£13.20**
RewII	41-00506	**£36.00**

14MHz RECEIVER

The RC14 is a simple direct-conversion receiver for the 14MHz amateur band. The design has been originated by the RSGB as an introduction to home construction. The RC14 nevertheless offers a very good specification with sensitivity of 1uV, wide dynamic range, a stable VFO and a steep-sloped audio filter.

RC14	41-03412	**£30.69**

Watch Out for our special offer in next month's P.W.

FET DIP OSCILLATOR KIT

One of the most important items of test equipment in the amateur's arsenal, the new MKII design offers enhanced performance in both dip and wavemeter modes with an extended low frequency range. The FDO covers 0.8-170MHz in 6 ranges.

FDO MKII	40-16216	**£30.08**

NICADs AND CHARGERS

High quality rechargeable NiCads batteries from Uniross.

Size	Capacity(Ahrs)	Stock No.	Price
AAA	0.18	01-12104	**£1.20**
AA	0.5	01-12004	**£0.90**
C	1.2	01-12024	**£2.10**
D	1.2	01-12044	**£2.50**
D	4.0	01-12054	**£3.90**
PP3	0.11	01-84054	**£3.70**

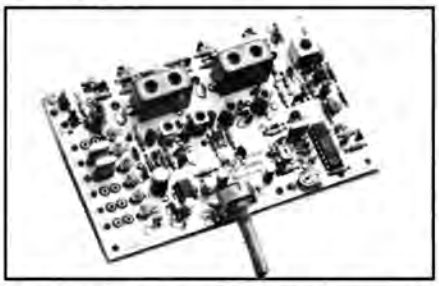
CHARGERS

CX4 To charge AA,C,D and PP3 size NiCads at standard charge rate.
01-02205 **£7.65**

KB-18DF To fast charge AA, C and D size NiCads.
01-02206 **£9.80**

KB-68DF Plug in charge to fast charge AA and AAA and also PP3 at the standard rate -shown above.
01-02207 **£5.50**

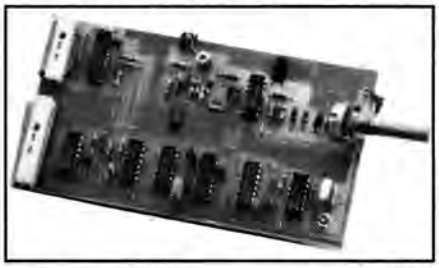
VHF WEATHER SATELLITE RECEIVER



Reception of the Polar Orbitting Weather Satellite can be surprisingly easy. The 6 channel VHF receiver kit offers a high specification especially tailored for the weather satellite, which in conjunction with the interface and Satpic software (and aerial) is all that is required to receive and display the pictures on a BBC computer.

Sat RX	40-02300	**£42.52**

BBC INTERFACE KIT



For use with the above receiver and Satpic software, features careful filtering, demodulator, fast A to D converter and sync pulse.

Sat IF	41-03416	**£33.83**

SATPIC

A sophisticated ROM based software package to display virtually all VHF and UHF weather satellite transmission as well as HF and VLF fax transmissions. Pictures may be saved directly onto Disc.

Satpic	40-90090	**£32.50**

Please add 15% VAT and 70p P&P to all orders.

Cirkit

Access VISA

Cirkit Distribution Ltd.
Park Lane, Broxbourne, Herts EN10 7NQ.

Mail Order and Sales Counter

Sales Counter **53 Burrfields Road, Portsmouth PO3 5EB**

Telephone Orders (0992) 444111 Enquiries (0992) 441306 Telex 22478

A Profile of Mauritius

Mauritius is an island about 65km long by 55km wide, and geologically consists entirely of solidified volcanic lava. P. G. Fry G0FUS is lucky enough to visit there regularly and tells us more about one of the island's operators.

The prefix 3B8 is rarely heard in the UK, but of late, many operators have had their day made by working 3B8CF, Jacky Mandary. Through my visits to the island, I have been lucky enough to meet him. Being married to a Mauritian citizen has enabled me, whilst visiting my in-laws, to meet Jacky, for the first time, in November 1986.

Jacky, whose real name is three times as long, but shortened for convenience, lives with his family in a bungalow he built himself. It is in the suburbs of Quatre Bornes, a fairly large town situated near the west coast of the island. Candos, a rather large imposing hill, lies about 180 metres south east of his QTH, but fortunately does not interfere with Jacky's antenna farm.

Jacky has a three element Tribander, with an "armstrong" rotator, long wires and dipoles for most of the h.f. bands. His neighbours are very kind and helpful. They allow him to rig his longer antennas across their properties and use supports in their gardens, (what a contrast to some UK neighbours . . .). Some slight TVI is evident, so he limits his operating times accordingly.

For those readers wishing to work him, Jacky is normally on every Saturday, a day he reserves for operating, on the following frequencies and times:
1.832MHz 0300UTC onwards (c.w.)
3.507MHz 2200UTC onwards (c.w.)

Spot frequencies favoured for general operating are:
14.027, 14.245 (s.s.b.), 21.027 and 28.027MHz.

His equipment comprises an FT-902DM and FRG-7000, and he much prefers the c.w. mode where he uses his electronic keyer which has an auto CQ.

Jacky works as a technician for the Mauritian Meteorology Department, where he services the satellite transponders and ancillary equipment, both on Mauritius and its surrounding islands, where equipment is located. One of these islands is St Brandon, which is only activated when Jacky is on the island, the call being 3B7CF.

He is a wonderful character, very knowledgeable and enjoys meeting visiting amateurs. In fact, no visit can be complete without meeting Jacky. His family did consist of two boys, both under ten, but last year Jacky's delightful wife presented him with a daughter.

During my visit, I watched in awe as Jacky activated his station and tore through the callers to his CQDX. I now realise why DX operators get frustrated in dealing with the pile-ups—they have my sympathy. An important note to add here is that when sending a QSL card to Jacky, he only QSL's direct. To ensure a return card from him, ALWAYS include a couple of IRCs and a self addressed envelope.

With the huge deluge of weekly QSL mail Jacky receives, it goes without saying that every little effort helps to make his life easier.

The QSL address for 3B8CF is: Jacky Mandary, No 6 Shastri Road, Candos, Quatre Bornes, Mauritius, Indian Ocean.

Unfortunately, during my last visit in November 1986 (the year I passed the RAE), the Mauritian Telecommunications Department had stopped issuing new amateur licences to both its own and visiting amateurs. The reason for this action was through the discovery of short wave amateur type transmitting units during a large drugs raid.

This sadly had the effect of tarnishing the small amateur community on the island, which consists of nine licensed stations, with unfounded suspicion and distrust. Jacky, himself, has been affected by these measures. He is an employee of the government and yet he was refused the special call for operating on the island of St Brandon (3B7). To my knowledge, the situation still exists, but for verification it would be wise to contact the Minister for Telecommunications, Edith Cavell Street, Port Louis, Mauritius. Normally, an application for a visitor's licence should be made at least six months in advance of your trip. The call, when granted, takes the form of your own callsign and /3B8 following.

A further word of warning, in the present circumstances, don't be tempted to take any equipment with you, as it is likely to confiscated by the Customs. It will be treated as imported goods, for which a special permit has to be obtained.

On January 2 this year, I had a phone call from G3BDQ in Hastings. He had just had a QSO with Jacky and phoned me on his behalf. I duly fired up my trusty FT-200 and dipole (only 4m a.g.l.) and enjoyed a nostalgic chat with 3B8CF at 1745UTC on 14.245MHz s.s.b. His signals were 5 and 7, and his report of my signals with my modest station was 5 and 5.

Anyone requiring further information about working Mauritius, or just about the island's make-up, are welcome to contact me QTHR as in the Winter callbook.

Notwithstanding the problems the island has endured, it is a pure paradise and the opportunity of visiting it should not be missed. The icing on the cake is obviously the chance to operate as /3B8, and I will be in touch with the relevant authorities, soon, to establish the current position. **PW**

RAYCOM give 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 LICENCED CREDIT BROKERS. APR 29.8%, SUBJECT TO VARIATION. FREE CREDIT ON CERTAIN PRODUCTS AT LIST PRICES, 50% DEPOSIT AND SIX MONTHLY PAYMENTS. PLEASE TELEPHONE FOR MORE DETAILS AND APPLICATION FORMS.

NEW HELPLINE 0836 282228 (until 9pm Daily)

RAYCOM COMMUNICATION SYSTEMS LIMITED

ORDERING INFORMATION

ALL PRODUCTS WE ADVERTISE ARE NORMAL STOCK ITEMS. OUR NEW MAIL ORDER DEPARTMENT CAN NOW DESPATCH MANY LINES 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 DETAILS.

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, 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 MODS!

NEW PRODUCTS

NEW IC781

ICOM

Come and see in the NEW ICOM IC781 HF Professional transceiver with built in Band Scope, Auto ATU and PSU, the new KENWOOD RZ1 Mobile Scanner, the new YAESU VHF Base Station and Mobile, and the new FOX mobile Scanner . . . because of our purchasing power and overseas contacts we get the new models first! And offer the best introductory prices!

SPECIAL OFFERS

WHILE STOCKS LAST!	NORMAL	SPECIAL
YAESU FT726 BASE STATION C/W 2MTRS	£999.00	£695.00
YAESU YD844A BASE STATION MIC 600/50K	£39.95	£19.95
YAESU FT77 5W-120W 1.6-30MHz PA UNIT	£149.00	£75.00
YAESU HORN RELAY ALARM UNIT WITH 555	£12.50	£4.50
ICOM ICA20 AIR BAND CAA APPROVED H/H	£429.00	£379.00
ICOM ICA2 AIR BAND CAA APPROVED H/H	£399.00	£279.00
KENPRO KT400EE 2W UHF H/H C/W CHARGER	£279.00	£199.00
COLOUR-ROTA 40KG ROTATOR 3 CORE CABLE	£45.00	£37.50

Please ask for our SPECIAL OFFERS LIST, USED LIST, SCANNERS LIST, and LATEST PRODUCT NEWS. Please send a large S.A.E.

BASE STATIONS

YAESU FT767GX RWC/MK2 ALL MODE/BAND BASE STATION	£1499.00
YAESU FT767GX RWC/MK2 AS ABOVE C/W 2 OR 6 METRES	£1590.00
YAESU FT757GX MK2 MODEL WITH IMPROVED FEATURES	£895.00
YAESU FT726R MULTI-BAND MULTIMODE SPECIAL OFFER	£695.00
YAESU FT747GX NEW MULTIMODE 100W HF TRANSCEIVER	POA
NEW YAESU FT736R MULTIMODE BASE STATION C/W 2 METRES	POA
ICOM IC735 HF HIGH PERFORMANCE MINI HF TRANSCEIVER	£892.50
ICOM IC275 25W 2 METRE MULTI-FEATURE SUPERB BASE STATION	£949.00
ICOM IC575 10W 10 & 6 METRE ALL MODE SUPER BASE STATION	£949.00

CALL FOR BEST PRICES ON OTHER ICOM AND YAESU BASE STATIONS.

YAESU

FT767 GX RWC MK2

YAESU

Raycom offer our own improved version of this fabulous HF-UHF transceiver, we fit a small SMD chip component mod board in the VCO to improve the RX dynamic range by up to 20dB, FOC when purchased new from us. If you are lucky enough to own the FT767 already, send your unit + £59.50 and we will fit it for you! (inc. return carriage). Also available at some Yaesu dealers. **SEE REVIEWS FOR DETAILS OF THIS ACCLAIMED MODIFICATION.**

ANTENNAS & ACCESSORIES

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

ICOM AH7000 SUPER 50-1300MHz 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 300 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.80239	£29.50
SUN KG209 SE2 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.

SCANNERS

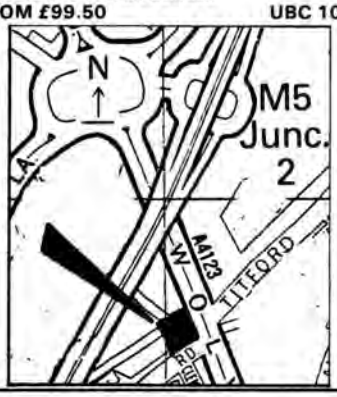
Bearcat by uniden

UBC 175XL

UBC 100XL

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 £99.50



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

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 DEALS AVAILABLE ON ALL MAKES.

Icom ICR7000 25M-2GHZ superb quality professional Rx	£859.00
Icom ICR7000/AH7000 Receiver plus Matching Discone	£937.50
Kenwood RZ1 New 25-905MHz Mobile 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	£99.50
Uniden-Bearcat UBC 70XL VHF-UHF 20ch. Miniature H/held	£199.00
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	£220.00
AOR 2002 25-550, 800-1300MHz Desk-Top/Mobile AM/FM	£469.00
Sony Air 7 Top Quality VHF-Airband Handheld Scanner	£245.00

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/71HF Top Grade Communications Receiver	£799.00
Sony PRO80 HF/VHF Handheld Scanner c/w accessories	£345.00
Sony 2001D Short Wave/Airband DEI IIXF RX with ANI kit	£395.00

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)

HANDHELDS

* = Extended Receiver coverage available, call for details.

YAESU FT727R/FNB4A 2.5W (5W) DUAL BANDER C/W CHRGR	£395.00
*YAESU FT23R/FNB10 2.5W (5W) 2MTRS C/W CHARGER	£249.00
*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.

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 ACCESS	£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

MOBILES

YAESU FT211E 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
ICOM IC48E 70CMS 25W	£429.00
ICOM IC3200 DUAL BAND 25W	£399.00
ALINCO DUAL BANDER	£445.00

Opening hours 9am-5.30pm 6 days. **LATE NIGHTS** Thursday & Friday till 7pm.

SONY RAYCOM now appointed official Sony dealers, full range of both professional and domestic models available to order.

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

Reading & Understanding

(with a bit of theory thrown in)

Part 3 of this series, by R. F. Fautley G3ASG, takes a look at transistor amplifiers.

First we must look at the circuit symbols for transistors in Fig. 3.1.

There are two types, *npn* and *pnp*, which differ in the type of semiconductor junctions which are sandwiched together. Either type may be basically silicon or germanium material. The subject is outside the scope of this article, but further information can be obtained from standard semiconductor text books.

The main difference between the use of the two types is that for the *npn* type (which is by far the most popular) the collector is required to be positive with respect to its emitter, and for the *pnp* type the collector has to be negative with respect to its emitter. The table may help in understanding the differences.

Both *npn* and *pnp* types can be used, but we will consider only the *npn* transistors at this stage as they are more often used for simple amplifiers. The other component symbols used in the circuit diagrams for simple amplifiers have already been described.

Pictorially, some different physical shape transistors are shown in Fig. 3.2. Regardless of whether they are *npn* or *pnp* types—they still look the same!

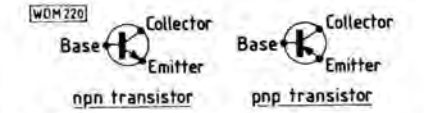


Fig. 3.1. Symbols for *npn* and *pnp* transistors

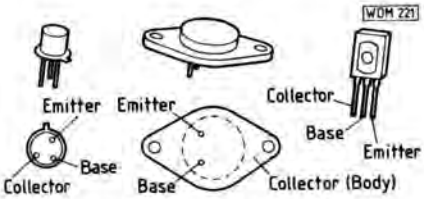


Fig. 3.2. Some different transistor shapes

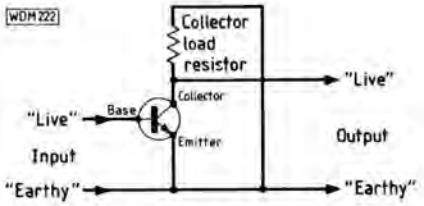


Fig. 3.3. Simplified circuit of the common emitter amplifier

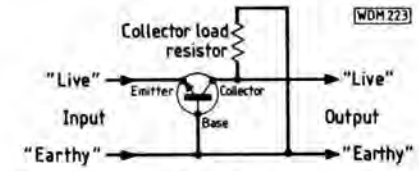


Fig. 3.4. Simplified circuit of the common base amplifier

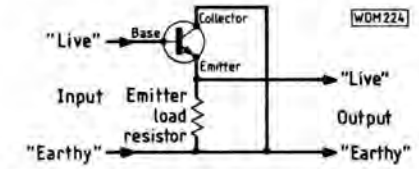


Fig. 3.5. Simplified circuit of the common collector amplifier

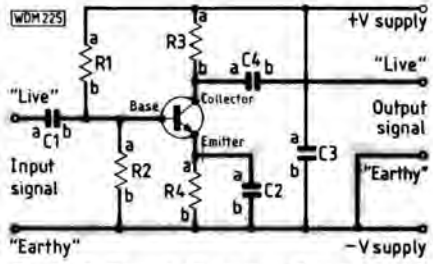


Fig. 3.6. Circuit diagram of a common emitter amplifier

Common Emitter Amplifier

It is not the intention here to describe the operation of the amplifier, but to give sufficient information for it to be **identified.** A **very** much simplified circuit of the amplifier as it appears to the **a.c.** signals which it is to amplify is shown in Fig. 3.3.

The reason for the name **common emitter** amplifier is because the emitter connection is common to both input and output signals. Look at the input first, you can see that it's applied between base and **emitter.** Now look at the output, it is between collector and **emitter.** As the emitter is **directly** connected to both input and output, it is a **common** connection. That's why it's called a common emitter amplifier.

Common Base Amplifier

The **common base** amplifier is so-called because the **base** connection is **common** to both input and output circuits as in Fig. 3.4. Using the same method as for the common emitter amplifier, look at the input circuit between emitter and **base**, and the output between collector and **base.** This time it is the **base** which is directly connected to both input and output circuits—thus **common base** amplifer.

Common Collector Amplifier

As you've probably guessed, this type has the **collector** connection common to both input and output circuits, as in Fig. 3.5. It is also called an "emitter follower" because the emitter signal is very nearly identical to the input on the base. That is, the emitter "follows" the base.

The common collector amplifier is also often referred to as a **buffer** amplifier, because one of its features is that it has a high degree of isolation between its "live" input and "live" output terminals. What do we mean by isolation in this context, and why is isolation between input and output desirable?

An example may help in answering the questions. A v.f.o. (variable frequency oscillator) is to be used as the basis of a transmitter. As the output power of the v.f.o. may be only a few mW, it will be necessary to amplify its output considerably before the required transmitter output power is attained. So the output from the v.f.o. must be connected to some form of power amplifying stage, or stages.

Now, one of the problems to be faced is that **any** connection to the output of an oscillator is likely to have some effect on its frequency and possibly also on its output level. However, the principle requirement of a v.f.o. is that its frequency remains constant at that set by the operator and is **not** subject to changes by any other means. So, we have to prevent the addition of an amplifier stage from affecting the oscillator frequency.

This "prevention" is achieved by **isolating** the v.f.o. from the amplifier by means of a buffer stage similar to the common collector amplifier described previously, Fig. 3.5, connected between the v.f.o. stage and the following amplifer stage.

The circuit diagrams of Figs. 3.3, 3.4 and 3.5 have been purposely drawn in

Circuit Diagrams

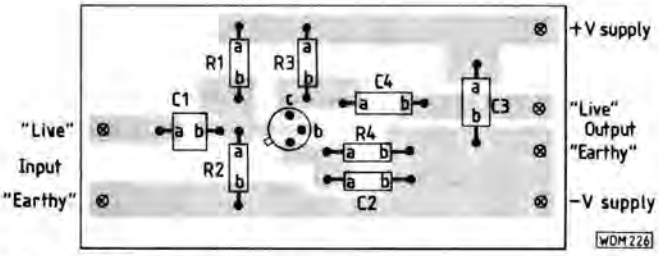


Fig. 3.7. Possible printed circuit board layout for Fig. 3.6

◀ NOTE: The p.c.b. layout shown here is given as an example only. This board is **NOT** available from the *PW* PCB Service

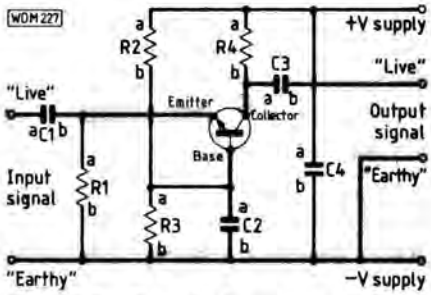


Fig. 3.8. Practical common base amplifier

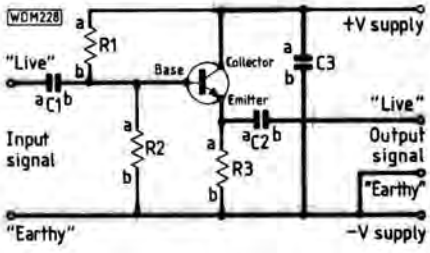


Fig. 3.9. Practical common collector amplifier

an over-simplified manner to highlight their operation. For example, the a.c. coupling and decoupling capacitors to the input and output circuits (C1, C2, C3 and C4 in Fig. 3.6: C1, C2, C3 and C4 in Fig. 3.8: and C1, C2 and C3 in Fig. 3.9) have been considered as short-circuits at the frequencies of the signals being amplified. Also, the biasing components for the transistors (R1, R2 and R4 in Fig. 3.6: R1, R2 and R3 in Fig 3.8: and R1, R2 in Fig. 3.9) have been completely ignored as they do not affect the mode of operation, i.e. common emitter, common base or common collector connection.

But these other parts of the circuit, although essential in a practical amplifier, tend to "hide the wood amongst the trees" when looking for the key to identifying the mode of operation. Because there are so many components in a practical amplifier circuit, as in Fig. 3.6, the parts which identify it as a common emitter type have been highlighted.

A Practical Common Emitter Amplifier

The next step in understanding circuit diagrams is to take a look at the complete single-stage common emitter amplifier, Fig. 3.6, and compare it with a possible printed circuit board layout as in Fig. 3.7. The word "possible" is used as many different layouts are feasible, provided that the components are connected together as required by the circuit diagram. The terminal marked "$+V_{supply}$" and "$-V_{supply}$" represent the connections to a battery or a d.c. power supply.

Resistors R1, R3 and capacitor C3 all have one of their terminations (marked with an "a") connected directly together (i.e. they are joined to one line) to the positive terminal of the d.c. supply to the amplifier marked "$+V_{supply}$". As long as these "a" terminations of the three components and the positive supply are all connected directly together, the actual physical positions of the components are not very important.

Table 1

CONNECTION	*npn* type Voltage	*pnp* type Voltage
Collector	+5	−5
Base	+0.6	−0.6
Emitter	0	0

The table shows the different voltages you can expect for both *npn* and *pnp* transistors

Table 2

Transistor Common Connection	Approximate Impedance at Transistor Input	Approximate Impedance at Transistor Output	Possible Use
Emitter	1000Ω	10kΩ	a.f. amplifier
Base	75Ω	50kΩ	receiver r.f. amp
Collector	100kΩ	1000Ω	buffer

The table shows some of the different uses for the various types of circuit we have mentioned in this section of the series

Again, the "b" terminations of R2, R4, C2 and C3 must be directly connected together and also to the "earthy" terminals of the input and output circuits and the negative of the d.c. supply, "$-V_{supply}$".

One possible component layout on a printed circuit board is shown in Fig. 3.7. The shaded areas on the layout represent the copper track on the back of the board looking from the front, or component, side (i.e. looking "through" the board).

Practical Common Base & Common Collector Amplifiers

Practical circuits for (a) a common base amplifier, and (b) a common collector amplifier are shown in Figs. 3.8 and 3.9. The parts of the circuit which identify the type have again been highlighted. As an exercise, try to draw a layout similar to Fig. 3.7 for each of the two amplifiers.

Summary

The preceding three circuits have all been of simple single amplifier stages and the tables above may help to fix the uses of the different types in your mind.

The input and output impedances in the table (which can be considered as resistances, because the reactive components can be ignored in the approximations) are those existing at the **transistor connections**. The input and output impedances at the "live" and "earthy" input and outputs marked in Figs. 3.6, 3.8 and 3.9 will be modified by other circuit components.

For example, the biasing and collector, or emitter, load resistors will shunt (i.e. be connected in parallel with) the input and output impedances respectively.

Next month we will look at oscillators.

The Eightypole

The Eightypole, by Richard Q. Marris G2BZQ, is a portable TX/RX 3.5MHz, 1.14m high vertical antenna which can be assembled, or disassembled, in about 3 minutes. It has obvious potential for /A or /P working, indoor working or on your mini QE2, *if you have one.*

The Eightypole was originally designed as an antenna to take on holiday with a small 3.5MHz c.w. rig. It can be stowed in the back of the car, or even in a fishing rod bag.

The antenna was tested at home, standing on a coffee table, using a 10 watt 3.5MHz, c.w. transmitter. It happily worked around E & W Europe. My testing theory is that, if you cannot get results using 10 watts c.w., then the antenna is a dead loss!

The Eightypole is far less "earth conscious" than the usual $\frac{1}{4}$ wave shortened vertical, where the impedance may be as low as 3.5Ω. Indoors, it has been earthed to a waterpipe, to a large metal window frame, 4.8m of wire along the floor and 10m of flex aimlessly zigzagging around the floor of the apartment.

The antenna is a short, helically-wound vertical with an effective electrical length of just over 0.3λ plus a simple *LC* match a.t.u. During the design, an initial estimate indicated that something well over 45m of wire would have to be wound onto a suitable rod. So, small models were made up at a much higher frequency, to establish the "groundrules" and to get the "feel" of the resulting design.

The electrical circuit and front view of the assembled Eightypole is shown in Figs. 1 and 2. The quick "break down" portability is shown in Fig. 2 and Fig. 3 shows the prototype base unit. Basically, it consists of a 1.010m close-wound coil (L1) which plugs into a supporting base; into the top of L1 is plugged a small top hat. At the base, a simple "L" network a.t.u., in a small metal box, is located. From the a.t.u., a 50Ω coaxial feedline (3 metres of RG58) goes to the TX, which has the usual pi-network output circuit.

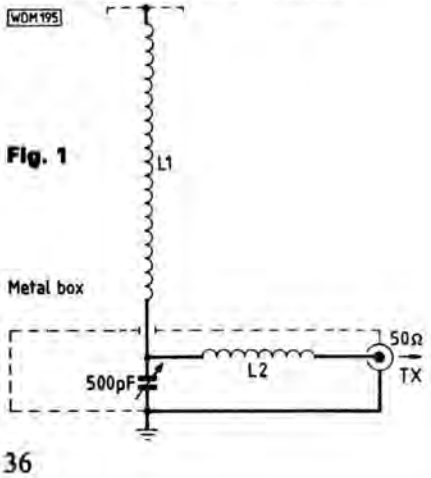


Fig. 1

The prototype, when loaded at 3.54MHz, has a useful bandwidth of about 80kHz without having to re-tune the a.t.u. With minor adjustments to the antenna, it will go up to 3.8MHz. The a.t.u. is earthed by a 6m length of cable taken to a water pipe; but other earthing arrangements have been tried (see later) and the Eightypole does not seem to be too fussy in this respect. The bandwidth is greatly reduced without the top hat, and loading becomes more critical.

Construction

A vital statistic is that a 25mm width of close winding, of the specified wire, (7/0.2mm stranded, pvc covered, 1kV r.m.s.) on the specified tubing comprises 19 turns and needs 1.42m of wire. At the bottom of the plastics tubing, a 230mm wooden dowel is inserted and Superglued into place, leaving a 67mm length outside as shown in Fig. 2. The 75mm length of dowel is Superglued and screwed in the centre of the 190mm diameter top hat disc.

For the winding of L1, anchor one end of the wire 19mm from the top of the pvc tube leaving a 38mm tail for connection to a small terminal fitted on the disc. Close wind 1.010m winding length of the specified wire and anchor the far end with a 255mm flying lead, as shown in Fig. 2. Approximately 57m of wire will have been used. The centre pin, with the insulation surround removed, of a coaxial plug is soldered to the 255mm flying lead for plugging into the a.t.u. The metal shroud of the plug can be disposed of.

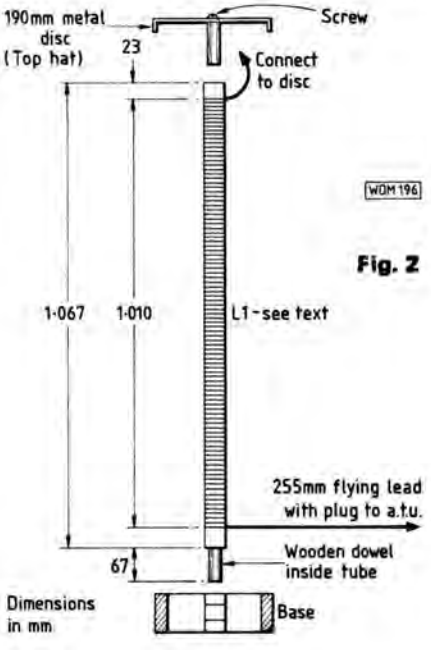


Fig. 2

The ATU

This is a conventional *LC* matching unit. It consists of L2 and a 500pF, good quality, air-spaced receiver type variable capacitor. The de-shrouded plug of the Eightypole, plugs into a coaxial socket at the top of the a.t.u. Three metres of RG58 50Ω coaxial feedline goes to the transmitter, and a banana socket is used at the a.t.u. box to receive the earthing system.

The a.t.u. is built into a small aluminium box approximately 150 × 110 × 110mm, although the dimensions are not critical as long as there is plenty of clearance around the inductor L2.

The L2 inductor consists of 20 turns, closewound, of 1 × 0.6mm single strand pvc covered wire (1.2mm o.d.). The coil former is a 75mm length of 22mm o.d. pvc tubing as used for antenna winding L1.

The Base Unit

The simple base mounting unit is shown in Fig. 3. The "H" shape is made up of 3 pieces of 45 × 20mm wood screwed together as shown. A further 95mm length of the 22mm o.d. pvc piping is fastened to the cross piece with two Marley stand-off wall clips, see Fig. 3. The 18mm dowel plug at the base of L1 should be rubbed down to be a free fit into the base unit.

Other types of base unit can be used as long as they have a 18mm diameter socket to plug in L1, e.g. a wall bracket. The object has been to retain versatility for the antenna.

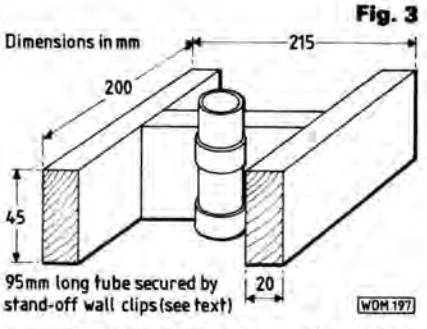


Fig. 3

The Result

The Eightypole, having now been completed, results in a useful and versatile 4-part structure consisting of a top hat disc, antenna rod L1, the base unit and the a.t.u. The whole thing can be assembled, or broken down, in about 3 minutes, and in either state only takes up a minimum amount of physical space. It therefore makes a very useful and handy portable (indoor or outdoor) 3.5MHz transmitting antenna.

Ideas Department

Many amateurs, when they read an article of particular interest to them say, "that is just what I need except that...". The author is one of the more guilty types. There is always a compulsive desire to change, or improve, the design. In anticipation of this, the following is submitted:

A: Though specifically designed, as described, for c.w. use between 3.5 and 3.6MHz, it will work up the higher frequency end of the band. However, it is suggested that loading efficiency might be then improved by putting a "tap" about 25mm up from the bottom of L1, with an optional shorting link using "croc" clips.

B: Perhaps the transmitter has a 75Ω impedance and not the 50Ω for which the Eightypole was designed. If the a.t.u. will not cope with this, then the turns of L2 should be slightly adjusted.

C: A larger diameter top hat disc should increase the bandwidth somewhat, but it may be necessary to adjust the size of L2. Anyway, the existing disc is small and takes up little room.

D: The Eightypole prototype is not too earth conscious, though the better the earth then the better the results and the easier the loading. All tests were carried out using a 6m length of stout cable clipped onto a water pipe with a large connector clip. However, it loads and works with a 5m long wire, lying on the floor, plugged into the a.t.u. earth socket. It works even better with 20m of flex zigzagging along the floor into another room. A good report was received from an ON4 using 2.5m of flex clipped onto a large metal frame window.

E: What about 14 and 7MHz band working? Well: Reduce the size of L2 progressively, by trial and error, to load 7 and 14MHz, or fit taps to L2 with a rotary switch, though there is a personal dislike for switches in low power TX a.t.u.s. Earthing should get progressively easier, e.g. 10m of flex or a water pipe on 7MHz, and 5m of wire on 14MHz.

SHOPPING LIST

How Much? & How Difficult? £17 Intermediate

[1]J. Birkett Tel: 0522-20767

DIY Products

1.240m Marley Extrusions 22mm upvc overflow pipe 22mm o/d; 2 off Marley plastics stand-off wall mounting clips; wooden dowel to fit inside plastics tube; 610mm wood 45 x 20mm.

Electrical Products

Stranded 7/0.2mm pvc covered wire rated 1kV r.m.s. 1.4A; Solid 1/0.6mm pvc covered wire; 500pF good quality airspaced RX type variable capacitor[1]; metal box for a.t.u.; 2 off coaxial sockets.

Miscellaneous

190mm diameter metal disc for top hat; Superglue, sundry screws, pvc tape, wire.

In Part 6 of this series, A.J. Harwood C Eng MIERE G4HHZ looks at the phase of polarisation and reflection.

Making Waves– A Guide to Propagation

Part 6—Planes and Reflections

One aspect of radio waves which is important in the "real world" is the plane of polarisation, usually defined as the plane containing the E field. For waves relatively close to the surface of the earth, this can be defined in terms of the angle of the electric field to the earth's surface. Where this field is vertical to the earth's surface, the wave is said to be vertically polarised and I leave it to the reader to work out what a horizontally polarised wave is.

It is, of course, possible to have slant polarised waves and, in this case, the polarisation can also be referred to as mixed because the wave can be resolved into separate vertical and horizontal waves as shown in Fig. 6.1. The maximum received signal occurs when the receiving antenna (assumed to be a dipole), is aligned so that its length is parallel to the electric field and at 90 degrees to this direction there is virtually no signal received.

There is another type of polarisation possible which is a little more difficult to understand, circular or more accurately elliptical polarisation. This is best explained by considering one of the ways by which a circularly polarised wave can be generated. This is by means of a pair of crossed dipoles, as shown in Fig. 6.2. The dipoles are mutually at right angles and fed with a phase difference of 90 degrees by means of a quarter wavelength of feeder between the two. Dipole 1 will produce a vertically polarised field and dipole 2 a horizontal one. Now look at the waves generated by each dipole during one cycle.

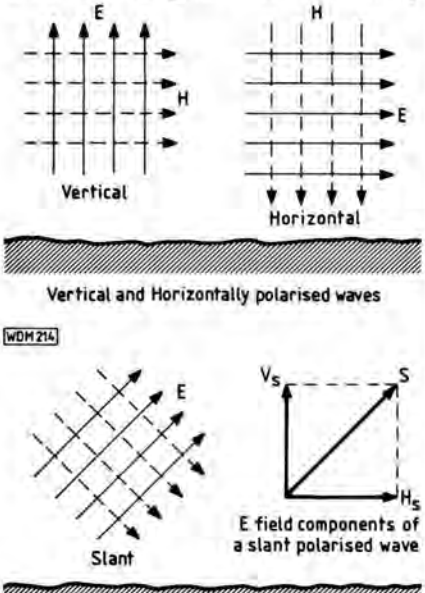


Fig. 6.1: Vertical, horizontal and slant polarised waves. The slant polarised wave has a vertical component Vs and a horizontal component Hs

For simplicity, we'll consider a wave at an integral number of wavelengths from the dipoles. This means that the phase of the wave is a whole number of cycles behind that of the driving voltage and can thus be considered as in phase. The maximum amplitude at this point can be taken as 1, for reference purposes. At a time when A is at the beginning of a cycle, and hence the amplitude of its wave is 0, the wave from B is a quarter of a cycle behind. This is due to the phase lag arising from the quarter wave cable and producing the maximum field strength of −1. One eighth of a cycle, or forty-five degrees, later the amplitude from A has risen to 0.707 (sin 45) and that from B decayed to −0.707 (cos −45). At the quarter cycle point (90 degrees) the amplitudes are +1 from A and 0 from B and so on as shown in Fig. 6.2. The total field strength is the vector sum of the two waves, as shown. The electric field component of the wave (and also the magnetic), always has a magnitude of 1, but the direction of polarisation appears to an observer to rotate once per cycle. In this case the rotation is clockwise as the wave travels away from us and the polarisation is said to be clockwise circular. Reversing the connections to dipole 2 would make it rotate anti-clockwise. Feeding the dipoles with unequal power would result in unequal amplitudes for the separate horizontal and vertical components with the wave being elliptically polarised.

In order to receive the maximum signal from a circularly polarised wave, and antenna must also be circularly polarised and with the correct direction of rotation, often called the hand of polarisation. If the correct hand is used, one signal will have a phase shift of 90 degrees relative to the other arising from the inherent difference in phase of the two fields. Remember that the 90 degrees, due to the phasing cable between the dipoles, is used to delay the signal from the other dipole so that the two are in phase at the feed point. If the hand is of the opposite type, then nothing will be received since the signals from the two dipoles cancel at the feed point. A linearly polarised antenna, such as a dipole, will however react to one field or the components of both fields in the plane of the receiving antenna. These components always add up in a way which equals the signal from one dipole. As it can only receive half the total power contained in the circularly polarised wave front, there is a loss of 3dB compared to reception on a circularly polarised antenna.

One advantage of using circular polarisation is that a good signal is received by a linearly polarised receiving antenna, for any orientation in the plane at right angles to the transmission path. This makes circular polarisation ideal for mobile communication, and explains why it is used for v.h.f. radio transmission where car radios make up a significant part of the audience.

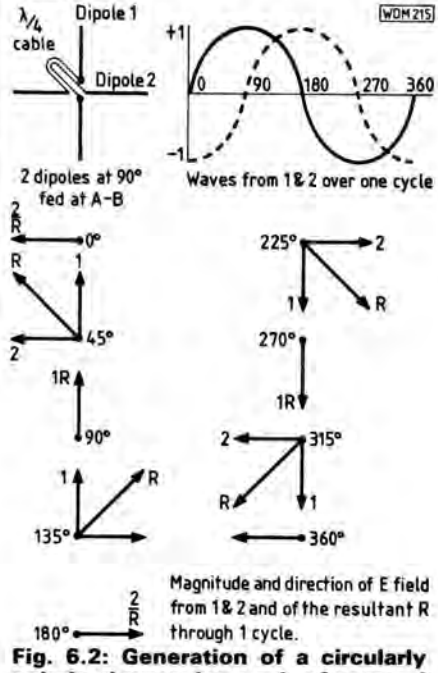


Fig. 6.2: Generation of a circularly polarised wave by a pair of crossed dipoles. The resultant wave rotates through 360° clockwise every cycle

Polarisation is also of importance when considering the question of reflections. We saw in Part 3 that for a strong reflection to occur, the first Fresnel zone about the reflection point should be free from obstruction. If this is the case, then the reflection can be considered as a simple ray which is reflected at the centre of the zone. When talking about reflections, the optical convention whereby the angle of incidence is measured from the vertical is very often used, i.e. an angle of incidence of zero occurs when a wave strikes the reflecting surface at right angles about the angle of elevation, which is what I have chosen to do.

To understand the phenomenon of reflection fully, we also need to know something about the magnitude and phase of the reflected wave. This is dependent on the polarisation of the incident wave. The other factors which are of great importance in determining these characteristics for the reflected wave are the electrical properties, the permittivity and conductivity of the material forming the boundary from which the wave is reflected. Materials commonly encountered, such as earth and sea, are translucent to radio waves. When a wave strikes the boundary between the air and such a surface, some of the energy is refracted into the material and some is reflected, as shown in Fig. 6.3. This is the same process as happens to a beam of light when it strikes a boundary such as air to glass. In the case of radio waves, the amount of energy refracted into the material is lost (unless the receiver is perhaps in a submarine), and hence determines the magnitude of the reflected wave. The relative permittivity is what mainly decides the phase, although this is to some extent dependent on the conductivity. The process of reflection can be characterised by the reflection coefficient of the boundary. This shows the relative magnitude and phase of the reflected wave to the incident at the reflection point.

For a horizontally polarised wave, the electric field is parallel to the reflecting surface. If this is of relatively high conductivity then it will tend to "short circuit" the electric field giving a net field of zero at the surface. This action gives rise to the reflected field, which is thus in anti-phase to the incident field at the reflection point since the incident and reflected field in

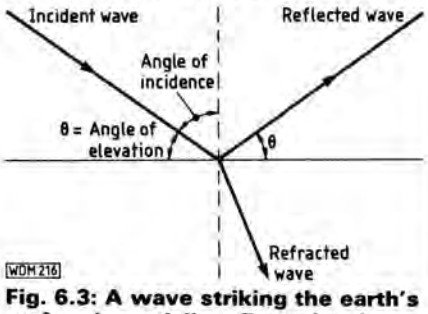


Fig. 6.3: A wave striking the earth's surface is partially reflected and partially refracted. The refracted energy is lost and so the reflected wave is smaller than the incident wave

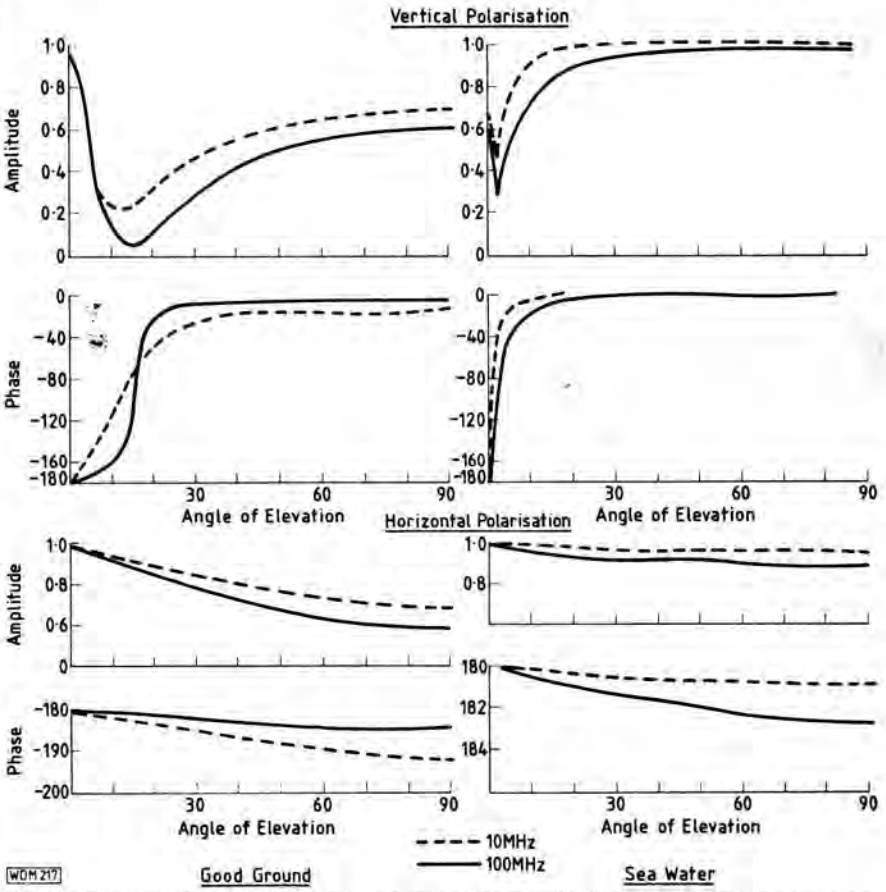


Fig. 6.4: Reflection coefficients for good conductivity ground and sea water. The amplitude and phase of the reflection depend on polarisation, conductivity, permittivity and frequency

effect cancel each other out giving the net zero field. The reflection coefficient for horizontally polarised waves is fairly high. This is because not much energy is refracted into the reflecting material and the phase angle of the reflection is 180 degrees or a little higher.

For vertical polarisation, the situation is more complicated. At low angles of elevation most energy is reflected and there is a complete phase reversal between the incident and reflected wave. As the angle increases, more energy is refracted into the reflecting surface and the magnitude of the reflected wave decreases, still having a phase reversal. This goes on until a point is reached where the magnitude of the reflected wave is at a minimum. This occurs at an angle known as the Brewster angle after the physicist who first discovered and explained its significance. At this angle, refraction of energy into the surface is greatest and the angle between the refracted and reflected waves is 90 degrees. For angles of elevation greater than the Brewster angle the magnitude of the reflected wave rises and the incident and reflected waves are in phase at the reflection point.

Reflection coefficients are also frequency dependent. Examples are shown in Fig. 6.4 for both horizontal and vertical polarisation and for two differing surfaces, high conductivity ground and sea water, at two different frequencies. A particular case of reflection occurs when the conductivity of the surface is very high, i.e. it is a good conductor. Here there is no diffraction into the reflecting medium and hence virtually no loss of energy for either vertically or horizontally polarised waves; a good conductor is therefore a good reflector. For vertical polarisation, there is no phase change on reflection and for horizontal there is 180 degrees change down to an angle of elevation of zero or grazing incidence.

An interesting case is that of reflection of a circularly polarised wave. As we have seen, this consists of vertically and horizontally polarised waves with a phase shift of 90 degrees between them. If the angle of elevation is greater than the Brewster angle for the vertically polarised component, then on reflection the phase of this component does not change whilst that of the horizontally polarised component reverses. This is equivalent to a reversal of the hand of polarisation so that a clockwise polarised wave gives rise to an anti-clockwise polarised reflection. A receiving antenna correctly polarised for the direct wave will thus not respond to the reflection. Experiments in the United States have shown that this is an effective way of reducing ghosting on television transmissions. It can also be used to minimise the effects of reflections where these are troublesome in other areas such as data communications, where the delayed data can cause errors due to inter-symbol interference.

Perhaps a few words on the roughness of the reflecting surface are also in order, since this also has an effect on the reflected signal. This was referred

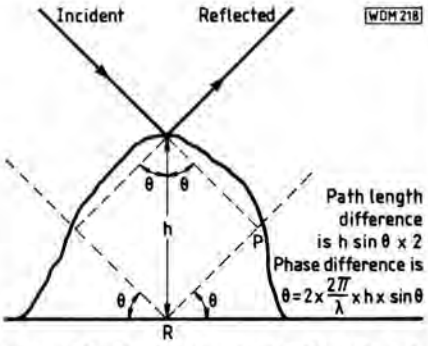


Fig. 6.5: A wave reflected from a bump suffers a phase difference of θ compared to reflection from the level surface. The surface can be considered smooth if the total phase change is less than π/4 radians or 45°

to in the article "Vertical Antennas" by P. Newton in the February edition of *PW*. He points out the analogy between a ground plane and a shiny surface. Optical studies have given rise to what is known as the Rayleigh criterion of roughness which can also be applied to the radio case. A wave which would be reflected from a surface but instead is reflected from a bump is shown in Fig. 6.5. This gives rise to a change in the phase of the reflected wave. The magnitude of the phase difference can be calculated from the geometry of the system and is seen to be:

$$\emptyset = 2 \times 2 \times \frac{h}{\lambda} \times \pi \times \sin\theta$$

where the phase and geometric angle are measured in radians.

Using the approximation that for small angles (in radians) the angle is very closely equal to the sin of the angle, and converting to degrees this becomes:

$$\emptyset = 4\pi \times \frac{h}{\lambda} \times \theta \times \frac{\pi}{180} = \frac{\pi^2}{\lambda} \times \frac{h}{45}\theta$$

Rayleigh showed that if this phase change did not exceed π/4 radians (45 degrees) the effect on reflection was not significant. By rearranging the formula, and making the phase change π/4 radians, we can see that the surface can be considered smooth if for an angle of elevation of degrees the height of the irregularities is not greater than:

$$h = \frac{\pi}{4} \times \frac{\lambda}{\theta} \times \frac{45}{\pi^2} = 3.6\frac{\lambda}{\theta}$$

Another point raised in "Vertical Antennas" is the importance of the ground conductivity in the immediate vicinity of an antenna, particularly a vertically polarised one. This is a subject I wish to deal with in some detail in a later part on surface wave propagation. To end for this month, I would like to introduce the topic of the image of antennas over a good conducting ground plane. The images of a vertical and a horizontal antenna over such a plane are shown in Fig. 6.6. The image of the portion of the antenna immediately below the antenna is of opposite sign to the antenna itself, since positive charges on the antenna induce negative charges in the ground plane and vice versa. A vertical antenna and its image thus behave in a similar manner to a pair of dipoles fed in phase. A horizontal antenna and its image are effectively in anti-phase which can be considered as the vertical antenna having a positive image and the horizontal a negative one. We can calculate a radiation pattern for the antenna and its image in a way similar to that used in Part 5 to calculate the pattern for a pair of dipoles.

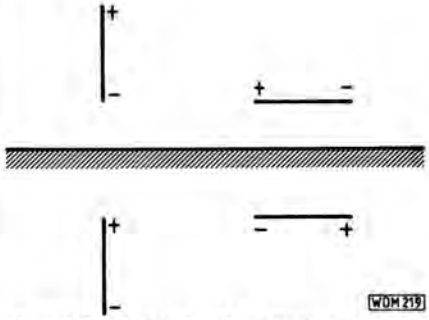


Fig. 6.6: A vertical antenna has a positive image in a good conductor and a horizontal antenna a negative image

Next, in Part 7, we will consider the case of antennas and their images, antennas such as the monopole on a ground plane in more detail and see how the waves they generate are propagated.

NEWS DESK EXTRA

Testing Products

Testing to ensure that the requirements of standards have been met is vital to ensure customer confidence, new contracts and a presence in the market place. BSI Testing has been established for more than a quarter of a century and is nationally and internationally recognised as a world-leading Test Centre. Its testing facilities are both NAMAS and British Calibration Service accredited.

BSI Testing have recently announced that manufacturers or suppliers could obtain independent backing for any claims of "compliance with British Standards" they may be making by having their products successfully tested at BSI's own laboratories at Hemel Hempstead.

Many do not know that a similar testing service is also available for verifying such claims made against other Specifications such as International or European Standards, Trade Association of Manufacturers' specifications or other similar documents.

Products can be tested during development, before they are put onto the market, or as samples taken from the marketplace. BSI Testing's independent, confidential and accurate technical reports carry an authority and value.

If interested manufacturers or their agents wish to discuss ways in which they can use these BSI facilities, they should contact Ian Peplow in 0442 230442.

Microwave Newsletter

The RSGB Microwave Committee launched a construction competition back in June 1986. They have been a little surprised and disappointed with the response from UK amateurs. They know that there are a number of people who are "pushing the frontiers" forward in the constructional field, but these people seem to be hiding their lights under a bushell

You can enter by sending a letter of intent to the Chairman of the Committee, Dr M. W. Dixon G3PFR, c/o RSGB HQ, or QTHR. Then by 1 September 1988 you must send a basic description and documentation (e.g photographs, circuits and p.c.b. layouts) to enable the committee to make an initial assessment prior to the arrangements for viewing of the equipment by committee members.

The prizes are worth winning too. The winner will receive the John Rouse Memorial Trophy which is held for a year as well as a plaque and cheque for £75. The runner-up gets £25 and a certificate.

If you would like the full rules of the competition, contact the Microwave Committe at the RSGB HQ.

Venue Change

Due to circumstances beyond their control, the Cornish Radio Amateurs Rally will not be able to be held at the usual venue.

The new venue is the Village Hall at Perranwell, which is about 8km south-west of Truro. The hall is in the centre of the village and will be sign-posted.

Invitation to Authors

Practical Wireless welcomes manuscripts from readers. If you have an idea for an article you'd like to have considered for publication, send to the address on page 1 for a free copy of the *PW Author's Guide*. An s.a.e. would be appreciated.

Radio, Electronics & Hobbies Fair

AT THE SCIENCE MUSEUM, WROUGHTON AIRFIELD, SWINDON, WILTS.

on Sunday 22nd May from 10am

Amateur Radio, CB, Electronics, Computing, Model Railway Swopmeet, Model Boat Show, Model Aircraft Show, Model Car Show, Model Steam Engine Rally, trade Stands, Model Boat, Aircraft, Railway and Car Demonstrations and other working model displays, plus many Science Museum exhibits including Aircraft, Fire Fighting Appliances and Equipment, Submersibles, Hovercraft, Radar Equipment, Rockets, etc. All housed in spacious display hangers, also working Vintage Machinery, Traction Engines, Fire Engines, Classic Cars, Vintage Vehicles, Helicopter Trips, Refreshments, Free Car Parking. Don't miss this great event, make it a day out for the whole family.

Wroughton Airfield is located on the A4361 and is signposted to the Science Museum from Junction 16 on the M4 Motorway.

Admission £1 per person

Organized by the SWINDON & DISTRICT AMATEUR RADIO CLUB

Trade enquiries and further details Tel: 066689 307

TX - 3

RTTY/CW/ASCII TRANSCEIVE

The high performance, low cost system

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

See reviews Dec 87 & Jan 88 issues.

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

RX - 4

RTTY/CW/SSTV/AMTOR RECEIVE

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

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

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

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

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

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

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

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

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

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

504 ALUM ROCK ROAD
ALUM ROCK
BIRMINGHAM

SMC

Opening Hours
Tues – Fri 9 – 5 Sat 9 – 4

SEE AND TRY THE
FT747GX
YAESU'S NEW RIG

BARCLAYCARD VISA **Your LOCAL EMPORIUM**

Special Lowest Prices on HY-GAIN HF Antennas and Rotators.
AR40 25% Discount on a wholesalers R.R.P.

SMC Birmingham

FULLY STAFFED AND EQUIPPED WORKSHOP FACILITIES FOR ALL YOUR SERVICE NEEDS

PHONE (021) 327 1497/6313

SALES ONLY . . . Rod Ashley
SALES AND SERVICE . . . Stuart Foreshaw and David Wright

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

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**

RECEIVING STATION LOGBOOK (RSGB)
Standard logbook for the s.w.l. in horizontal A4 format. 32 lines per page. *50 pages* **O/S**

SCANNERS
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* **£4.95**

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

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, receiver, antennas, Latin American DXing, reporting, computers in radio, etc. *240 pages* **£6.95**

★ GUIDE TO FACSIMILE STATIONS
7th 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. *252 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 (2nd Edn.)
Bill Laver
Aircraft channels by frequency and band, main ground radio stations, European R/T networks, North Atlantic control frequencies. *24 pages* **£3.50**

INTERNATIONAL RADIO STATIONS GUIDE (BP155)
Revised and updated in 1985, this book shows the site, country, frequency/wavelength and power of stations in Europe, the Near East and N. Africa, North and Latin America and the Caribbean, plus short-wave stations worldwide. *128 pages* **O/P**

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 GBAUU
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 (4th Edn. 1987/88)
Bill Laver
Covering the services and transmission modes that can be heard on the bands between 1.635 and 29.7MHz. *124 pages* **£6.95**

VHF/UHF AIRBAND FREQUENCY GUIDE
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

A GUIDE TO AMATEUR RADIO (RSGB)
Amateur Radio—the hobby, the equipment, workshop practice, the licence, the RAE (including sample questions). *154 pages* **O/P**

AMATEUR RADIO CALL BOOK (RSGB)
Winter 87/88 Edition
This useful work now incorporates a 48-page reference section of useful information for amateur radio enthusiasts. *310 pages* **O/P**

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

AMATEUR RADIO OPERATING MANUAL (RSGB)
A mine of information on just about every aspect of amateur operating, including international 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 of 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* **£3.15**

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 x 636mm* **O/S**

THE RADIO AMATEURS 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 patterns 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* **£12.92**

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

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

NEWNES ELECTRONICS POCKET BOOK
5th Edition
Presenting all aspects of electronics in a readable and largely non-mathematical form for both the enthusiast and the professional engineer. *315 pages Hardback* **£8.95**

NEWNES RADIO AMATEUR AND LISTENER'S POCKET BOOK
Steve Money G3FZX
This book is a collection of useful and intriguing data for the traditional and modern radio amateur as well as the short wave listener. Topics such as AMTOR, packet radio, SSTV, computer communications, airband and maritime communications are all covered. *160 pages Hardback* **£8.95**

NEWNES RADIO AND ELECTRONICS ENGINEER'S POCKET BOOK (17th Edition)
Keith Brindley
Useful data covering maths, abbreviations, codes, symbols, frequency bands/allocations, UK broadcasting stations, semiconductors, components, etc. *201 pages Hardback.* **£6.95**

★ NEWNES TELEVISION AND VIDEO ENGINEER'S POCKET BOOK
Eugene Trundle
This is a valuable reference source for practitioners in "entertainment" electronic equipment. It covers TV reception from v.h.f. to s.h.f., display tubes, colour camera technology, video recorder and video disc equipment, video text and hi-fi sound. *323 pages Hardback* **£9.95**

POWER SELECTOR GUIDE (BP235)
J. C. J. Van de Ven
This guide has the information on all kinds of power devices in useful categories (other than the usual alpha numeric sort) such as voltage and power properties making selection of replacements easier. *160 pages* **£4.95**

RSGB RADIO DATA REFERENCE BOOK
G. R. Jessop G6JP
The 5th Edition of an essential book for the radio amateur's or experimenter's workbench. *244 pages Hardback* **O/S**

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* **£7.50**

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**

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* **£5.95**

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* **£15.95**

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* **£8.95**

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 x 455mm (approx)* **£0.95**

PROJECT CONSTRUCTION

HOW TO BUILD ADVANCED SHORT WAVE RECEIVERS (BP226)
R. A. Penfold
Greater satisfaction can be gained from the hobby of shortwave listening when using home constructed equipment. This book gives full practical constructional details of a number of receivers as well as some add-on circuits like S-meters and noise limiters. *118 pages* **£2.95**

HOW TO DESIGN AND MAKE YOUR OWN P.C.B.s (BP121)
R. A. Penfold
Designing or copying printed circuit board designs from magazines, including photographic methods. *80 pages* **£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**

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* **£5.50**

ALL ABOUT VERTICAL ANTENNAS (USA)
W. I. Orr W6SAI and S. D. Cowan W2LX
Theory, design, construction, operation, the secrets of making vertical work. *191 pages* **£7.50**

AN INTRODUCTION TO ANTENNA THEORY (BP198)
H. C. Wright
This book deals with the basic concepts relevant to receiving and transmitting antennas. Lots of diagrams reduce the amount of mathematics involved. *86 pages* **£2.95**

BEAM ANTENNA HANDBOOK (USA)
W. I. Orr W6SAI & S. D. Cowan W2LX
Design, construction, adjustment and installation of h.f. beam antennas. *198 pages* **£6.75**

HF ANTENNAS FOR ALL LOCATIONS (RSGB)
L. A. Moxon G6XN
Taking a new look at how h.f. antennas work, and putting theory into practice. *260 pages* **£6.17**

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**

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* **£5.95**

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**

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**

... cont ▶

REVISED SERVICE!
LOWER PRICES!

Practical Wireless **0202 678558**

PCB SERVICE

Printed circuit boards for *Practical Wireless* constructional projects are available from the PW PCB SERVICE. The boards are made in 1.5mm glass-fibre, and are fully drilled and tinned. All prices include postage, packing and VAT for UK orders. Please add £2.00 per order for despatch to overseas addresses.

Orders and remittances should be sent to: **PW Publishing Limited, FREEPOST, Enefco House, The Quay, Poole, Dorset BH15 1PP,** marking your envelope **PCB SERVICE.** Cheques should be crossed and made payable to PW Publishing Ltd.

When ordering, please state the Article Title and Issue Date as well as the Board Number. Please print your name and address clearly in block letters, and do not send any other correspondence with your order. You may telephone your order using Access or Visa. A telephone answering machine will accept your order outside office hours.

Please allow 28 days for delivery. Always check the latest issue of *PW* for the current details of price and availability. Please enquire for p.c.b.s not listed here.

Board Number	Title of Article	Issue Dated	Price (£)
WR068	AF Speech Processor	Jan 80	5.20
WR095	Transceiver Power Supply	Sep 80	3.85
WR126	"Exe" 10GHz Transceiver	Aug 81	7.70
WR144	Iambic Keyer	Mar 82	6.50
WR143	ATV Converter	Apr 82	7.10
WR156	Repeater Time-out Alarm	Nov 82	5.20
WR160	LMS Regenerative Receiver	Feb 83	5.20
WR167	RTTY Terminal Unit for ZX81	June 83	7.80
WR165	"Severn" (VFO)	June 83	5.20
WR166	"Severn" (Receiver/Audio)	Jun 83	6.50
WR168	"Severn" (Ch.over/Sidetone)	Jul 83	6.50
WR169	"Severn" (Transmitter)	Jul 83	6.50
WR165 etc set	"Severn"	—	14.90
WR161	"Marchwood"	Jul 83	2.40
WR179	Transceiver VOX Unit	Mar 84	6.50
WR183	Top-band DF Receiver	Apr 84	6.50
WR184	Simple Top-band Receiver	Jun 84	6.50
WR185	Auto-notch Filter	Jun 84	6.50
WR187	Morse Sending Trainer	Jul 84	4.50
WR190	Mod FRG-7 (Switching)	Oct 84	4.50
WR189/192 pr	Bug Key with 528-bit memory	Oct 84	8.50
WR194	Mod FRG-7 (FM/squelch)	Nov 84	4.50
WR195	Stable Toneburst	Nov 84	2.60
WR196	"Teme" (Transmitter)	Nov 84	3.70
WAD246	"Dart" Follow-up	Dec 84	4.00
WA001	"Teme" (VFO/Doubler)	Dec 84	2.80
WA002	"Teme" (Receiver)	Jan 85	4.30
WAD280**	Triambic Keyer	Feb 85	7.10
WAD249	Mod FRG-7 (BFO)	Feb 85	3.00
A004	"Colne" (RF Amp)	Apr 85	3.10
A005	"Colne" (VFO)	Apr 85	3.10
WR198	"Colne" (Product Det/Audio)	May 85	3.90
WR197	"Colne" (Oscill/Converter)	Jun 85	3.90
WAD302	Battery Charger Controller	Jun 85	3.00
WR200	Low-cost Crystal Tester	Jul 85	2.50
WR201	Add-on BFO	Aug 85	2.50
WR202	Economy UHF Pre-scaler	Sep 85	3.70
WR199	"Meon" 50MHz Transverter	Oct 85	6.70
WR203	Simple Capacitance Meter	Oct 85	2.80
WR204	WQ Medium Wave Loop	Nov 85	3.00
WR205	RTTY/Morse Modem	Jan 86	5.40
WR206	RTTY/Morse Modem (plug-in)	Jan 86	2.80
WR207	Crystal Calibrator	Jan 86	2.10
WR208	RF Speech Processor	Mar 86	4.10
WR209	Simple Audio Oscillator	Mar 86	4.30
WR211	"Meon" Filter	Apr 86	3.10
WR210	"Arun" Parametric Filter	May 86	8.10
WR213	Mod FRG-7 (Carrier Osc)	Jun 86	2.70
WR215	Simple 50MHz Converter	Sep 86	3.60
WR217	Automatic NiCad Charger	Oct 86	2.40
WR220	Get Started Low-cost Converter	Oct 86	2.40
WR216	LF Bands Active Antenna	Nov 86	2.40
WR222	"Taw" VLF Converter	Nov 86	2.80
WR223	High-imp MOSFET Voltmeter	Dec 86	2.90
WR214	Mod SRX-300 (Audio)	Dec 86	3.00
WR224	"Westbury" Basic Wobbulator	Jan 87	3.50
WR218	Masthead Pre-amp for 144MHz	Feb 87	4.20
WR219	Masthead Pre-amp PSU	Feb 87	2.50
WR225	"Woodstock" SW Converter	Mar 87	4.10
WR298	"Itchen" LCR Bridge	Apr 87	3.40
WR226–8 set	"Blandford" Rcve Converter	Apr 87	9.70
WR230–2 set	"Axe" Signal Tracer	May 87	9.20
WR233	"Downton" F-V Converter	Jun 87	3.90
WR234	Side-tone Oscillator	Jun 87	2.70
WR235	Mains on/off for Batt Radios	Sep 87	3.00
WR236	"Blenheim" VHF Converter	Sep 87	4.50
KANGA	High Stability VFO (see issue)	Oct 87	—
WR237	RTTY Tuning Indicator	Nov 87	5.20
WR238	"Otter" 50MHz Receiver	Jan 88	7.10
WR239–241 set	"Orwell" Medium Wave Recvr	Mar 88	9.10
WR242	"Orwell" Varicap Tune Option	Mar 88	2.90
WR243	VHF Monitor Receiver (Audio)	Apr 88	2.30

◀ . . . *more books*

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**

Mini Beam for 14/21MHz Bands

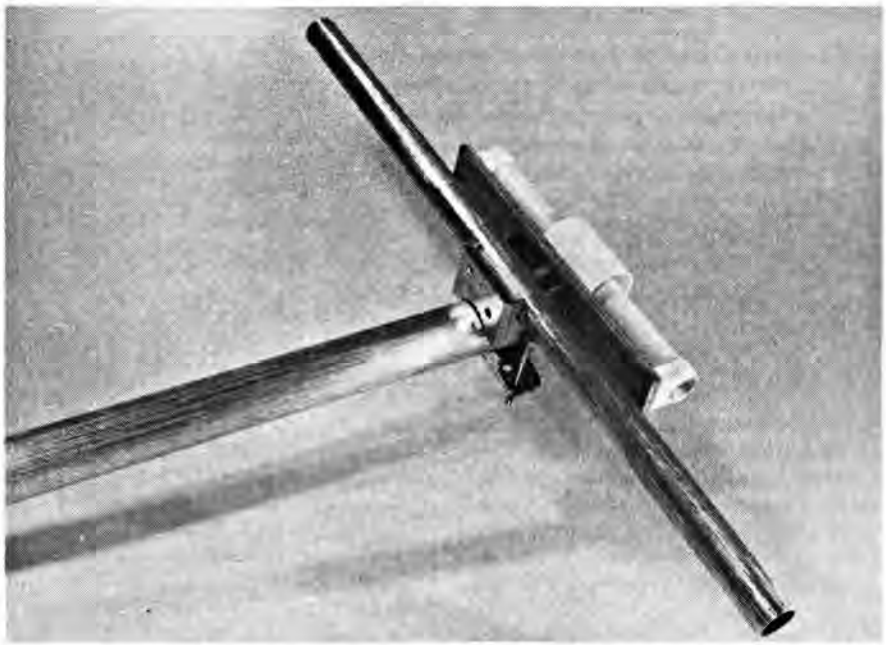
This article will be of little interest to those amateurs who have acres of land. But to those of you like F. C. Smith GW2DDX, who lack the necessary real estate to accommodate such luxuries as tilt-over towers and large h.f. arrays, this antenna design may come to your rescue.

It is well known that both the gain and bandwidth of an antenna suffer as a result of reducing its overall dimension.

Unfortunately, these problems are not easily overcome, but if care is taken in the construction and tuning of this mini beam, it will hopefully ease a few of them. All the extra effort will pay handsome dividends with DX that can be worked on this diminutive antenna.

After a four month testing period, the author was well pleased with the results gained using the 14MHz version of the beam. These compared favourably with a full size 14MHz two element beam. Even under poor conditions many W's and VE's were worked at varying signal strength in the region of S5–9, while European stations worked with the beam gave R9 and R8 reports including UA8's and UA9's. The antenna showed good directivity and some gain, even at a height of 10m, this being the limit of the author's mast.

The beam performed so well on 14MHz the author decided to try it on 21MHz, even though the dimensions of the elements fell short of what was needed for them to become resonant on that particular band. However, with the use of an a.t.u. and the addition of a pair of 300Ω ribbon, quarter-wave transformers, it loaded up nicely on 21MHz. The two quarter wave transformers effectively short out the 14MHz loading coils when the beam is being used on 21MHz. The author using his KW Viceroy transmitter made several contacts into the USA on 21MHz, thus proving the antenna was now working successfully on two bands.



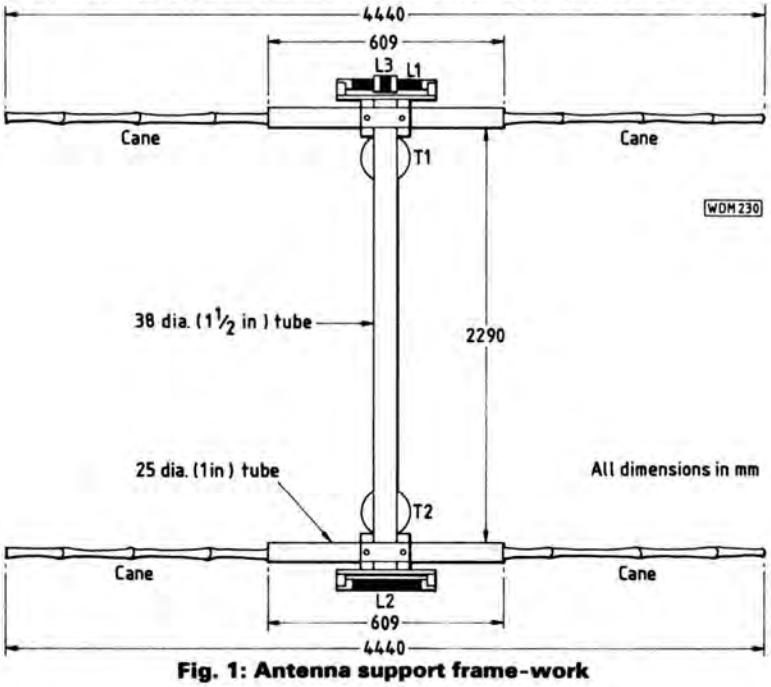


Fig. 1: Antenna support frame-work

Construction

The main boom of the antenna is made from a 2.29m length of 38mm (1½in) diameter aluminium tubing. Clamped at right angles to each end of the main boom, are two 609mm lengths of 25mm (1in) diameter aluminium tubing. These form two sets of outrigger sockets, into which are placed, back to back, four 2.22m lengths of bamboo garden cane, two at either end. Once the canes are slotted into position they are secured with epoxy resin, the type supplied in motorist glass fibre kits.

Now that the basic antenna framework has been completed (see Fig. 1), the canes should be treated against moisture ingress with two good coats of polyurethane varnish. The two 14MHz loading coils are fixed to the clamp assembly via a baseboard made from exterior grade plywood, which should also be treated against moisture ingress.

The antenna clamps suggested for this project are available from Maplin[1], they come with ready-drilled end plates, and are well suited to amateurs with few tools.

Loading Coils

The two 14MHz loading coils L1 and L2 are the most important items in the antenna's construction. Both coils are wound in 14 s.w.g. enamelled copper wire (e.c.w.), on a 240mm length of 20mm o.d. plastics overflow pipe. The driven element inductor L1 comprises 43 turns, while L2 has 42. The completed coil centrally occupies 178mm of the former overall length, making the space between turns approximately the same as the wire diameter. Each winding end is terminated around a 6BA machine screw secured with a nut through the wall of the former.

The correct turns spacing can be kept by winding a suitable diameter piece of cord alongside the wire. Once the winding has been terminated either end, the cord can be removed. Finally each coil must be secured to the former with several blobs of epoxy resin along its length. After the resin has set, tightly wrap each assembly in pvc insulating tape.

Inductor L3 consists of 5 turns of 14 s.w.g. (e.c.w.), centrally wound on a 60mm length of 42mm o.d. plastics waste pipe, the winding being spaced over 32mm.

This inductor, unlike L1 and L2, does not use "single hole pipe fixers", instead it is spaced off the base board with two small pillars, and is fixed into place with two brass woodscrews (Fig. 3).

21MHz Transformers

The quarter-wave matching transformers T1 and T2 are constructed from 2.9 metres of standard 300Ω ribbon feeder (not Bofa ribbon). This length was calculated from the formula:

$$\frac{75 \times \text{velocity factor}}{\text{frequency}} = \text{metres}$$

The velocity factor of standard 300Ω feeder is approximately 0.82. Once the 300Ω ribbon has been cut to length and connected across L1 and L2 (see Fig. 2), it can be neatly coiled up and secured under the boom with nylon cable ties.

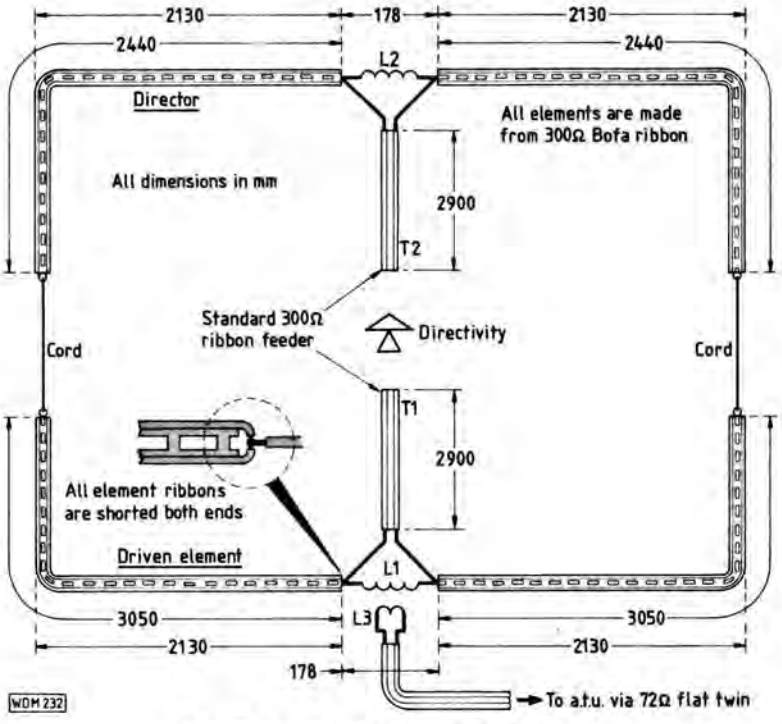


Fig. 2: Electrical diagram of antenna

Installation

The beam elements are made from lengths of 300Ω Bofa ribbon shorted at either end, the dimensions of which are given in Fig. 2. The joints at the ends farthest away from the loading coils should only be shorted temporarily at this stage, because their position will change when the beam is tuned.

After the elements have been cut and soldered into place any exposed joints should be sealed with silicone rubber compound. The elements can then be secured to the cane outriggers with pvc insulating tape or nylon cable ties.

After the element tensioning and support cords have been fitted, as indicated in Fig. 2, the antenna can be hoisted aloft. A support boom can be made from the same material as the main boom, if desired.

The tuning of the beam is the final and most important job to carry out. The author tuned his beam by standing on top of a 2.5 metre set of steps. Using a g.d.o., tune the driven element to 14.2MHz and the director to approximately 14.8MHz. When the elements have been tuned to length, and their ends finally shorted together and sealed, suitable insulators may be installed between the element and tensioning cord, if desired.

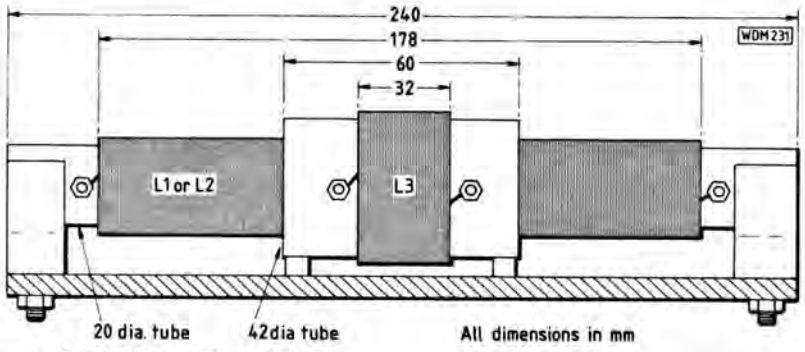
Antenna Tuning Unit

In order to match the antenna across the two specified bands a small a.t.u. must be built, the circuit of which is shown in Fig. 4. It should be noted that although C1 and C2 appear as ordinary ganged capacitors, they are in fact two separate 150pF capacitors, ganged by an insulated shaft or mechanism.

Such a system may be constructed with two Jackson type C804A[1] capacitors, mounted on a sheet of Perspex, and ganged with a cord drive system.

Cord fixing drums and cord drive spindles, together with tension springs and cord, are available from the same source as the capacitors. The exact construction details have been left to the individual in this case, as each person will have his own ideas on the matter, and possibly his own surplus components.

Inductor L4 is 10 turns of 16 s.w.g. (e.c.w.) spaced at wire diameter, wound centrally on a former made from a 50mm length of 75mm plastics



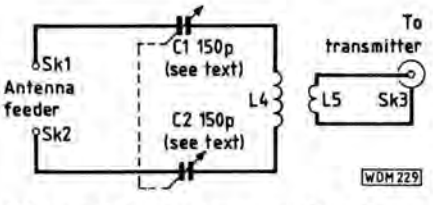


Fig. 4: Circuit diagram of antenna tuning unit

◀ Fig. 3: Mechanical construction of loading coil assemblies

down pipe. The coil is terminated and mounted in the same way as L3, with small stand-off pillars and screws.

Coupling coil L5 consists of 3 turns of pvc covered hook-up wire, centrally wound on top of L4. The output terminals of the a.t.u. are a pair of 4mm sockets, while the input is taken from the transmitter via an SO239 socket.

Conclusion

Although, as is to be expected, the bandwidth is reduced from that of a full-size antenna, the beam performs well in the lower portion of the phone band, and all of the c.w. section.

Bearing in mind that the actual span of the elements is just over 4 metres, and the design goes against generally accepted theories of having coils at the ends of elements, or capacity hats, the performance of this "pigmy" beam has been a revelation to the author and has provided very satisfactory results. ***PW***

SHOPPING LIST

Capacitors

Variable type

150pF	2	C1,2(1)

Miscellaneous

4mm plugs (2); 4mm sockets (2); SO239 socket; 2.5m of 38mm dia. aluminium tube; 1.5m of 25mm dia. aluminium tube; Right-angle antenna clamps (type BW42V) (2)(1); 2.5m bamboo garden canes (2); 500mm of 20mm dia. plastics pipe; 60mm of 42mm dia. plastics pipe; 50mm of 75mm dia. plastics pipe; 20mm dia. single hole pipe fixers (2); 14 s.w.g. and 16 s.w.g. enamelled copper wire; Exterior grade 5-ply 250 × 90mm; 6BA machine screws, nuts, washers and solder tags; 2BA machine screws, nuts and washers; 12m of 300Ω Bofa ribbon cable (W. H. Westlake, 0409 253758 or your local amateur dealer); 6m of standard 300Ω ribbon cable; 72Ω flat twin feeder; Nylon cord; Polyurethane varnish; Epoxy resin; pvc tape; Nylon cable ties; sealing compound.

(1) Maplin Electronic Supplies Ltd
P.O. Box 3 Rayleigh Essex SS6 8LR
Tel: (0702)554155

Feature

Something's Afoot...

OR Sexton Blake and the Missing Formula *(A Translation)*

One May morning, Sexton Blake was at ease in his favourite armchair when he heard heavy and urgent footsteps on the stairs. A moment later someone pounded on the door.

"Blake, are you there?" cried a familiar voice. Blake recognised it at once as belonging to Inspector Miles of New Scotland Yard. He sprang to his feet and flung open the door.

"Come in, old friend!" he cried. "How can I help you?"

Miles perched himself on the edge of Blake's desk. "A most serious matter," said he in grave tones. "Some scoundrel has stolen the British Standard Yard from Trafalgar Square!"

Blake's face hardened, as if turned to stone. "Great Scott!" he exclaimed. "That can only mean . . . ! "

"Exactly!" Miles broke in with a groan. "Moriarty the Mad Metricator has struck again! You realise that until he is brought to book none of us is safe from his machinations! Blake, you must assist the Yard with every ounce of your strength, or Britain as we know it today is surely doomed!"

Blake bared his teeth in a mirthless smile. "Fear not!" he said quietly. "I shall find Moriarty, and when I do I will show him no quarter. It shall be his life or mine!"

Blake called for his faithful assistant. "Tinker, there's not a moment to lose. The game's afoot!"

Events moved swiftly. Blake's investigations took him to an office in Long Acre, where Moriarty, under an alias, ran a seedy publishing business. The door of the building was locked, and refused to budge an inch. Blake ran to the rear, where there was a folding fire escape. He pulled on a rusty chain and the escape dropped to his feet. He ran up it and clambered into Moriarty's private office. The arch-criminal was standing with his back to the window, holding a length of metal that Blake recognised immediately as the missing British Standard Yard.

Moriarty spun round as he heard Blake's feet hit the floor. "Sexton Blake!" he hissed. "Come in! you are just about to witness a milestone in the annals of crime! I am about to melt the British Standard Yard down into scrap metal! The last bastion of Imperialism shall be destroyed!"

"You swine!" Blake burst out. "Stay your hand, or you shall answer to me!"

Moriarty laughed evilly. "Don't you know I always pack a rod?" he asked, producing a 0.38in* automatic. He motioned Blake to a chair, and within seconds the detective was bound hand and foot. "And now I leave you—forever!"

"You are only making a rod for your own back by this villainy," gritted Blake between clenched jaws. "I will track you down, even if you travel to the North Pole!"

Moriarty laughed again. "You fool. Had you a grain of sense you would realise that you shall never leave here alive! Beneath your chair is a pint beer mug packed with a lethal mixture of baked beans and senna pods, connected electrically to that clock on the wall. When the hands reach noon you shall be blown to the wind! Keep watching that clock, Blake. It's very accurate, for it's controlled by quartz. You have precisely eleven minutes to doom!" So saying, he fled from the room, the Standard Yard clasped in his arms . . .

Will Sexton Blake escape? Will he prevent Moriarty from destroying the Standard Yard and save Britain from the Mad Metricator?

The Results

Our apologies that, owing to a misplaced decimal point in the item on page 46 of our March issue, the calibre of the automatic* was inflated to the metric equivalent of 3.8 inches—quite a cannon!

Many readers correctly guessed that the dimensions should have been 0.009576m, and so got the right answer. Quite a few more took it to mean a "hand" (a measure of a horse's height), but a hand is officially 4 inches or 0.016m.

Because of the confusion caused by our mistake, we felt it fairest to ignore that particular dimension in marking the entries. The winning entry, drawn at random, came from Mr. P. J. Bradshaw of Louth, Lincs., who receives a PW £10 Voucher. Feeling in uncharacteristically generous mood, Editor Geoff Arnold offered also to give PW £5 Vouchers to the first two runners-up, who are Wyn and Eileen Mainwaring of Cowes, IoW, and Michael Rowles of Neath, W. Glam.

Thank you to all the readers who played our little metrication game. It's nice to know it was appreciated! ***PW***

PW REVIEW

The AFtronics SuperSCAF Audio Filter

There has been a lot of development in recent years with various types of filters for improving the selectivity of receivers, both on c.w. and s.s.b. As our amateur bands continue to become more crowded it is therefore essential that filter technology keeps pace to enable us to maintain QSOs through the increased QRM. In this article Christopher J. Page G4BUE describes the AFtronics Inc. SuperSCAF audio filter for c.w. and s.s.b., which he regards as a break-through in filter development for the radio amateur.

I first saw the SuperSCAF at the QTH of N4AR in Kentucky in April 1987. Bill had purchased one a few weeks earlier and was very excited about it, claiming it was the best available and that he never operated without it. Having tried most of the audio filters available on the amateur market I was very sceptical of his claims. Although audio filters helped, all the ones I had tried started "ringing" and distorted the signal when you narrowed the bandwidth on c.w. At that time I was convinced the only way to get efficient filtering was to use good crystal filters in the i.f. of the receiver. But, I knew Bill well enough to know that when he gets excited about something it pays to listen, and so, I examined his SuperSCAF further.

The SuperSCAF is manufactured by AFtronics Inc. of Florida, USA. The company is run by Rich Amdt WB4TLM and Joe Fikes KB4KVE, who designed the filter. Both men are engineers and work on the design of telecommunication products. They were awarded the ARRL (American Radio Relay League) 1986 Technical Excellence Award for their design of the SuperSCAF.

The SuperSCAF consists of an audio filter, audio power amplifier and power supply. The circuit diagram is shown in Fig. 1, and all the components, except the transformer, switches and hardware, are contained on a p.c.b., measuring some 110 × 150mm. The unit is contained in a smart two-tone brown/beige cabinet approximately 210 × 150mm and 50mm high.

The SuperSCAF uses a switched capacitor filter with digital processing, and this is what makes it different from active audio filters which use analogue signal processing. Rich and Joe say that high order op-amp filters are difficult to fabricate because resistor

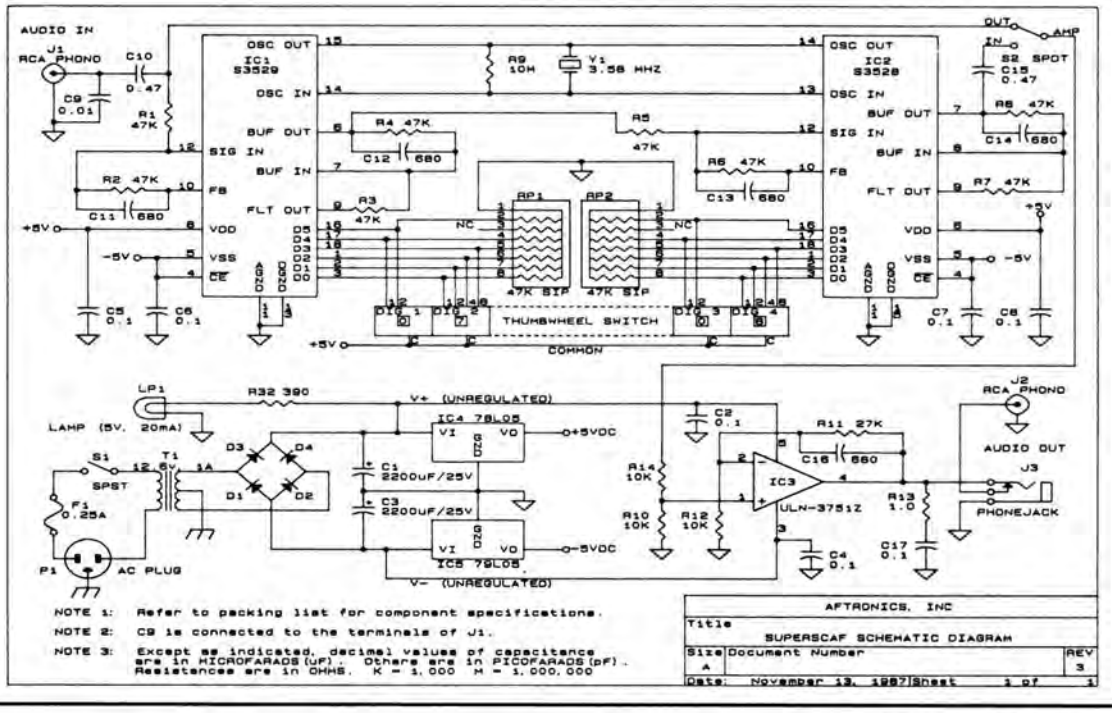


Fig. 1: Circuit Diagram

and capacitor values become extremely critical as filter order increases. Normally this means that many critical components must be adjustable, and the adjustments made by skilled personnel with very expensive test equipment. As components age and temperature changes, all the adjustments go to pot anyway, resulting in poor performance. They suggest the only reasonable compromise available to the manufacturer is to use a lower filter order and accept a reduced performance.

The SuperSCAF overcomes this problem by using the switched capacitor filter, the quality of which is dictated by the ratio of components, not their absolute value. The critical components in the SuperSCAF are contained in the pair of i.c.s, which are precisely trimmed during manufacture. There are no operational amplifiers, coils or other precision matched components which are usually found in ordinary audio filters in the SuperSCAF.

What is switched capacitor audio filtering? When an electrical signal is modified in some way, apart from pure amplification or attenuation, it is described as having been "processed", and this can be accomplished by either a continuous or a discrete process. Continuous processing is called analogue signal processing and discrete processing is known as digital signal processing.

Digital signal processing uses a series of samples of the signal which are then combined and manipulated to perform the required function. The principle is used in computerised speech, TV image enhancement and radar. An important part of this process is digital filtering, of which switched capacitor filtering is one type.

Switched capacitor filtering is based on storing discrete samples of an analogue signal as charge on a capacitor, which are then transferred through a chain of capacitors which form the filter. A clock or frequency source controls the sampling and transfer operations and the filtering is obtained by combining the charges on different capacitors in specific ratios and then feeding them back to earlier stages in the chain.

AMI in the USA produce two i.c.s, the S3528 and the S3529, which contain a clock generator, a programmable clock frequency divider and a pair of buffer amplifiers. They also contain a seventh-order elliptical filter, low-pass in the S3528 and high-pass in the S3529. It is these two i.c.s that form the heart of the SuperSCAF audio filter. They have the ability to digitally select the low or high-pass cutoff frequency using binary-coded decimal switching.

So what is an elliptical filter? Commonly used filters are named after their inventor or the kind of mathematical functions used in their design, e.g. Butterworth and Chebyshev. Elliptical filters form another class having the property of their cutoff skirts as steep as possible for a given order. Whilst they are like the Chebyshev in that they have passband ripple, they also differ from the Chebyshev as they have ripple in the stopband as well. That is, they attenuate only so far, while the Chebyshev continues to roll off indefinitely. Steeper skirt slope is traded for less total stopband attentuation, which is a good compromise in an audio filter. The stopband in the SuperSCAF is reached one third of an octave beyond the digitally selected cutoff frequency and provides attenuation greater than 51dB.

SUPERSCAF HIGH-PASS AND LOW-PASS CUTOFF FREQUENCIES

BCD Code	High-Pass Cutoff Frequency (Hz)	Low-Pass Cutoff Frequency (Hz)
00	40 (1)	44 (1)
01	91 (1)	100 (1)
02	182	200
03	273	300
04	363	399
05	455	500
06	546	601
07	635	699
08	726	799
09	822	904
10	914	1005
11	1005	1105
12	1099	1209
13	1179	1297
14	1271	1398
15	1355	1491
16	1453	1598
17	1535	1688
18	1627	1790
19	1731	1904
20	1808	1989
21	1892	2081
22	1985	2183
23	2086	2295
24	2198	2418
25	2260	2486
26	2392	2632
27	2465	2711
28	2543	2797
29	2625	2887
30	2712	2983
31	2805	3086
32	2905	3196
33	3013	3314
34	3129	3442
35	5423 (2)	5965 (2)
36	3254	3579
37	3389	3728
38	5811 (2)	6392 (2)
39	3537	3891

1. Setting the HP or LP switch to 00 or 01 may result in clock feed through or aliasing.

2. Deviations from the normal 100 Hz. sequence.

Selection of the 39 cutoff frequencies is made by the use of the four digital thumbwheel switches on the front panel. The high-pass filter is controlled by the two switches on the left and the low-pass filter by the two on the right. I found it helped to think of the left switches as setting the frequency which turn the filter on and the right ones as setting the frequency which turn it off, see Fig. 2.

The table gives a listing of the cutoff frequencies for all of the thumbwheel settings and it will be seen that the low-pass cutoff frequency is almost one hundred times the setting of the two right-hand switches. The high-pass cutoff frequency for a given switch setting is about 10 per cent less than one hundred times the setting of the two left-hand switches. You can turn the 10 per cent figure to your advantage when using the SuperSCAF for c.w. as I will describe later. Although this sounds complicated you very quickly get used to it. For example a setting of 03/24 gives a passband which turns on at 270Hz (300-30) and turns off at 2400Hz (24×100), see Fig. 3. This allows all signals between these settings to pass while signals outside that range are quickly attenuated. Examination of the table will show that passbands as narrow as 40Hz can be obtained on c.w., (04/04 setting which gives a bandwidth of 399-363=36Hz).

The audio power amplifier uses a ULN3751Z i.c. This is a later modification from the earlier units which used discrete components. It has the advantage of cutting down on the number of components making the SuperSCAF easier to build and more reliable. The audio output is 1.5W into a 3.2/8Ω load. The power supply is a standard design using 78L05 and 79L05 regulator i.c.s to provide the +5V and −5V lines.

It took me an hour or so of on-the-air operating with the SuperSCAF in N4AR's shack to get used to its principle of operation, and how to get the

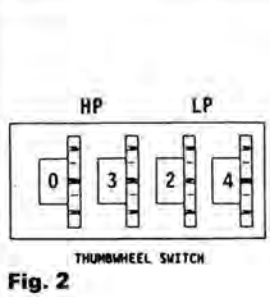


Fig. 2

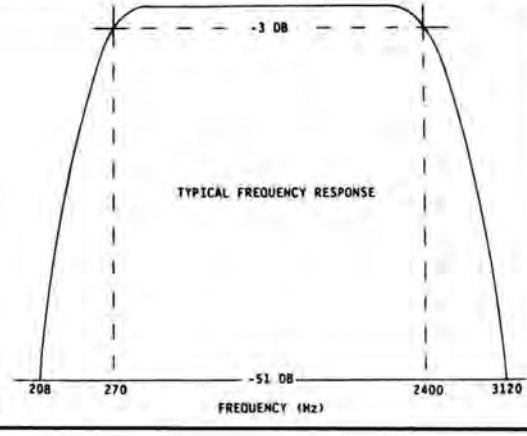


Fig. 3

best from it. Once I had mastered this, the SuperSCAF was a joy to use and I quickly saw why Bill said he never operated without it. I decided then and there that the G4BUE shack had to have one.

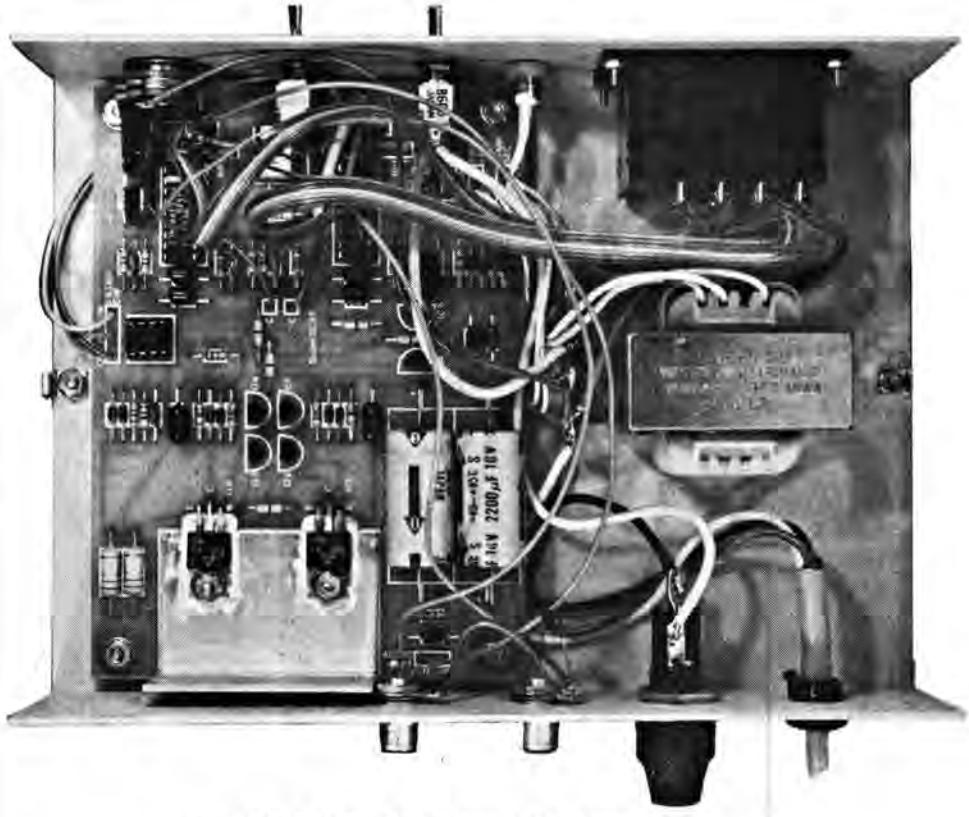
On my return to the UK I wrote to the manufacturers, AFtronics Inc, at PO Box 785, Longwood, FL, 32750, USA to ask the cost of the unit airmailed to the UK. The SuperSCAF is sold in kit form only which, in addition to keeping the price down, helps keep the construction side of amateur radio alive. The basic price of the kit was $136.96 and the airmail cost was another $26. Obviously surface mail would be a lot cheaper, but I was in a hurry to get mine built and working. N4AR was due to visit the UK at the end of September and I wanted to have it working by the time he visited me so he could compare it with his own.

A bank draft in US Dollars was obtained from my bank, (unfortunately AFtronics Inc. do not have credit card facilities), and the kit arrived almost by return of post. The assembly manual is first class and reminded me of the Heathkit manuals, as each step is set out separately. A quick check revealed all the components were present and correct, and this brings me to my only criticism of it.

As the SuperSCAF is manufactured primarily for the American market the transformer supplied with the kit is for 117 volts! The manual shows the transformer provides 12.6 volts a.c. at 1 amp and is centre tapped. Luck was on my side as I picked up the Tandy catalogue and saw their part number 273-7015, a 12.6 volt centre tapped transformer rated for 1.2A, price £4.89. More luck was to come as the mounting holes were the same size as those in the transformer supplied, and lined up exactly with the holes in the bottom of the cabinet. Although the Tandy transformer is slightly bigger in physical size, it fits easily inside the cabinet, as the photograph shows. I took this to be a good omen for the SuperSCAF's performance!

The filter was built in a couple of evenings and no snags were encountered. The assembly manual makes it very difficult to make a mistake if the instructions are followed. I switched on, adjusted the thumbwheels and the filter worked perfectly, just like N4AR's. The final test came in October when Bill visited my shack and gave my SuperSCAF his seal of approval!

This winter on the l.f. bands has been an excellent test for the SuperSCAF. My favourite DXing is on c.w. at the low end of 3.5 and 7MHz. A comparison with last year's log shows I have worked much more DX this winter, (1987/88) than last. During December and January on 80m I have had 78 JA QSOs, 33 W6's and 17 W7 QSOs, more than double last year's number. I am using exactly the same antenna and other amateurs tell me there is little to choose in conditions between the two years. Can the SuperSCAF have made the difference?



An inside view of the assembled SuperSCAF

The difficulty in working DX on the l.f. bands is hearing the other station. I have no doubts whatsoever that the SuperSCAF is a major cause in the big increase of DX worked this winter. With a setting of 04/04 you have a very narrow bandwidth and can copy stations very close to loud local stations.

An example of this was on 40m a few days ago at lunch time. A G4 and a DL were in QSO with each other, but were about 300Hz off each others frequency. They were both about 20dB over S9 with me, but despite this I was able to solidly copy a station on the island of Guam (KH2), who was only about S5, and occupying the frequency right in the middle of the two Europeans. I found it a unique, strange and satisfying experience to copy the DX station with the two very loud European signals immediately each side of me carrying on their QSO. It would have been quite impossible without the SuperSCAF.

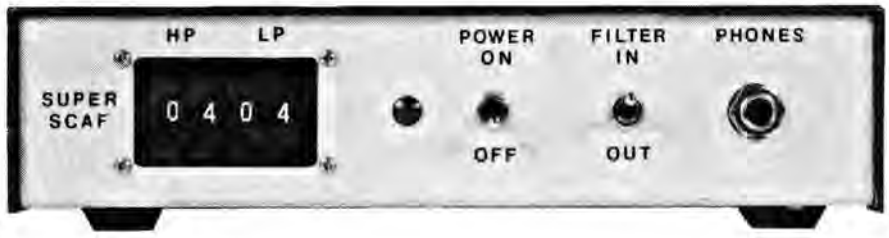
The unit takes a little getting used to with such narrow bandwidths as the 04/04 setting. The first thing you notice is the total absence of "ringing", the common complaint of standard audio filters when you narrow the bandwidth. A problem you encounter when in QSO is that you do not hear the local station who sends "QRL?" about 1kHz from you, and getting no reply from you proceeds to send a long CQ! Alternatively, (and worse) when you ask "QRL?" you have to remember to open the bandwidth (say 05/09) so that you hear a station just off your frequency tell you the frequency is occupied!! These are pleasant problems to deal with and a tribute to the efficiency of the SuperSCAF.

I have briefly used the SuperSCAF for s.s.b. and found it to be just as good. A setting of 03/30 is best for voice clarity but usually conditions are far from ideal and you have to narrow the bandwidth considerably. The extremely deep skirts help, and by adjusting the high-frequency end of the passband downward in steps of 100Hz you easily hear the best compromise between voice fidelity and noise rejection. Signals above cutoff vanish within a step or two. Voice quality gradually becomes more muffled as the cutoff frequency is decreased, but the noise and QRM rejection more than compensates for this loss. You may also gain a bit by increasing the low end as well, but the typical male voice will become pretty thin after a few clicks of the switch.

I use the SuperSCAF with a TS-930 which has the Trio YK-88C-1 and YG-455C-1 i.f. 500Hz crystal filters fitted. Using the TS-930 with just the i.f. filters or the SuperSCAF on their own is interesting. The SuperSCAF appears to be far superior to the i.f. filters, and I put this down to the fact it has a variable bandwidth, whereas the i.f. filters are fixed at 500Hz. Using both together make an excellent combination of filtering, but if you can only afford one, buy the SuperSCAF. It will do you a better job and will most probably be cheaper as well.

I work away from home most of the time and will shortly be setting up another station to keep me on the air during the week. I recently wrote to AFtronics to check on their current price, as I intend purchasing another SuperSCAF for my weekday QTH! I was pleased to find they have dealt with my criticism of the American transformer.

A European version of the Super-SCAF is now available. It is identical to the standard unit except for the transformer, which is not supplied. The specification of the transformer required is given as 12.6V a.c. at 1A and must be centre tapped. The primary should be rated for the mains supply voltage of your area. The physical size of the transformer should be 54 × 41 and 44mm high, and the two mounting holes are 58mm apart. The Tandy part number 273-7015 described above is perfect for the job. This has resulted in the price being reduced to $125 and the shipping price being reduced to $20 air and $12 by surface. With the current value of the US



Dollar against the Pound, the Super-SCAF is very competitively priced.

The SuperSCAF is available from **AFtronics Inc., PO Box 785, Longwood, FL, 32752-0785, USA,** (telephone 0101-305-331-9054 Joe) or 0101-305-323-5492 (Rich)—area code will change to 407 in April), from whom an information leaflet can also be obtained. I would like to acknowledge the kind permission given by Joe Fikes and Rich Amdt of AFtronics Inc. for allowing me to reproduce parts of their text and Figs. 1 to 3 and the table from their assembly manual.

PW

Constructional

Kitchen Konstruktion

This month Richard Q Marris G2BZQ, in No. 5 of his occasional series, shows us another cunning wrinkle designed to save you money with a quick rummage through the kitchen bin.

There's no doubt that a large diameter control knob, with or without a slow-motion drive, will always give you just that little extra finesse of adjustment. Yet somehow or other, probably for the most obscure reasons, they never seem to be available when you want one. Even if you find one in a supplier's catalogue, you will find that the postage involved plus VAT and any minimum order charges, far exceed the original price of the knob. And all you needed was just a plain and simple large control knob, one to make it just that little bit easier to tune across those crowded bands!

In every junk box there are old and battered knobs, probably salvaged from a long since dead valved radio. In every kitchen there are coffee or other container jars with 50 to 70mm diameter plastics screw-top lids. They come in lots of interesting colours with conveniently serrated edges, just right for a control knob I hear you say.

Quite correct. All you have to do is graft the old surplus knob on to the back of the screw-top lid and you have

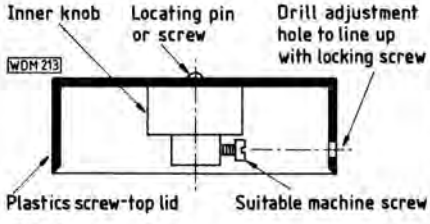


Fig. 1

produced a really useful diameter control knob. It's so easy.

Ideally, for the sake of easy construction, the surplus knob chosen should have a flat front surface. This surface must be roughened with glasspaper and then a very small location hole should be drilled in its centre. Next locate and drill the same size hole in the centre of the screw-top lid. Then remove any cardboard or paper from the lid's inside surface before roughening it with glasspaper. The two small holes are to ensure that both items locate centrally on each other while they are being glued together. Once both the items have been prepared, mix up a small quantity of epoxy resin and smear each of the roughened surfaces with it. Next firmly press the two surfaces together, carefully inserting the locating screw or pin, (Fig. 1). Finally place a small weight on top of the assembly, being careful not to disturb the joint and leave the whole thing for an hour. This will give plenty of time for the resin to harden. The pin can be dispensed with, if you think you're clever and quick enough to locate both items dead centre before the resin starts to set.

It is only then necessary to drill a suitable hole in the rim of the plastics screw-top, to line up with the inner knob's grub screw. If possible the grub screw should be replaced with a longer machine screw to facilitate easier adjustment. The result is a large diameter control knob made with only surplus bits and pieces which hasn't cost a penny.

If a cranked knob is required then reference to Fig. 3 of the Roller Coaster Turns Counter project (*PW* October 1987) may prove useful. ***PW***

TAKE ADVANTAGE OF THIS GREAT SUBSCRIPTION OFFER

Introducing

Two and three-year subscriptions for *Practical Wireless* readers in the UK

You can save money *and* avoid the inevitable cover-price increases over the next two or three years!

One Year — £14.00
Two Years — £26.00
Three Years — £36.00

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

Fill in the Order Form below and post it to: PW Publishing Ltd., FREEPOST, Subscriptions Dept., Enefco House, The Quay, Poole, Dorset BH15 1PP (no stamp required). Credit Card Orders taken on (0202) 678558.

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

Please indicate the type of subscription required:

☐ See above (UK)
☐ £18.50 (Overseas)
(Prices correct at February 1988)

☐ See SWM (April) for offer details

Special Joint Subscription

☐ £27.00 (UK)
☐ £30.00 (Overseas)

To commence with issue dated .....

To: PW Publishing Ltd., FREEPOST, Subscriptions Dept., Enefco House, The Quay, Poole, Dorset BH15 1PP (no stamp required).

Name .....

Address .....

.....

.....

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

☐ Charge to my Access/Visa Card the amount of £.....

Card No. ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

VISA ☐ ☐ Valid from to

Signature .....

On The Air
On The HF Bands

Reports to Paul Essery GW3KFE
287 Heol-y-Coleg, Voynor, Newlown, Powys SY16 1AR.

The signs so far this sunspot cycle all seem to suggest that the rise has been a bit faster than we could reasonably expect; so we must soon see some steadying up in the headlong rise. Nevertheless, eighteen months after the turn in September 1986, conditions have seen a dramatic change. I have some tape recordings of the bands; a few minutes at the same time of day once a month. When I compare with a year, or two, ago it proves not only very interesting in itself, but shows how one's memory can play tricks too!

On a different tack, for my museum I am still looking for some specimens of old-time gear; from the days of separates, say, an HRO and a Panda Cub, or an AR88D and KW Vespa. I haven't the room left for a "proper" OT station featuring a six-foot rack transmitter and 0-V-1 receiver alas.

The Bands

Here, the tribander is down and the rotator—an old AR22R—is sat in the workshop vice while I persuade the control unit to stop misbehaving. That reduces me to indoor antennas and a best bent wire, for the moment at least. However, others tell me what's happening, which leads to my next statement: for this column to be interesting, it needs to receive your reports on what you've worked and any news you hear of before my wordprocessor can even think of coming in to play! Hint, Hint!

What Gives?

Brought to you courtesy of W1WY (Contest Calendar), RSGB's DX News Sheet edited by G4DYO, The DX Bulletin of Chod Harris VP2ML, CARF's Canadian Amateur, your letters and of course me.

VR6 has been heard around 1700Z in the shape of Irma VR6ID, on 21MHz. Irma seems to like the general area around 21.3MHz plus-or-minus. YJ0APE on Vanuatu is giving his QSL address as "Achille, Port Vila, Vanuatu". I am assured that activity from PY0 Fernado do Noronha, ZK3 Tokelaus, 3Y0 Bouvet, P40 Aruba, JD1 Minami Torishima, KH1 Baker & Howland Is, Palmyra and Kingman Reef will be taking place. However, I can tell you that C53FV will be operational apart from a spell of leave, for the next 15 months. Another one you still have time to latch on to is OY, where DK9FE will sign /OY over the two middle weeks of May.

On the other hand I hear someone using 9K2DR who was a silent key quite a while back; either a rather nasty joke or the call has been re-issued.

Many amateurs and s.w.l.s will recall the part played by Miss Bharathi VU2RBI in getting the Andaman and Laccadive DXpedition up and running. Well, she was married on March 2 to Narasimha Prasad. Congratulations to them both.

There seems to be some confusion over the calls issued to the joint Canada/Russia Polar Ski-Trek by the Russians. However I believe the actual ski-party will sign UK0CI while in Russian jurisdiction and later CI8UA.

The position over S0RASD has partly clarified now; it is definitely acceptable for DXCC credit, but at the time of writing it was not known whether it would be as a new Western Sahara, or a re-activation of the old Rio de Oro. The continuing activity by S0RASD will be a counter and the prefix a valid multiplier in ARRL Contests.

Another one to be accepted is the Mount Athos operation by the SV2s.

On a different tack, one can't help but notice the difference in the Canadian approach to amateur radio and antennas. The Canadian DOC is preparing a paper which would enable municipalities "to make regulations that would satisfy property owners concerns about safety and appearance SO LONG AS THEY DO NOT FRUSTRATE RADIO COMMUNICATION" (my capitals). Further down and into the discussion, the DOC stated that municipalities cannot set a limit on tower height. Planning authorities in this country to please note and emulate!!

The 1.8MHz Band

Just two reporters. First, **GW0IER** (Milford Haven) who seems to prefer the midnight-0200Z period. Brian mentions W2OKM, W1JZ, W2SM, VE3EK, VE1AGG, UA1WEE, UQ2GQB, UV6LCQ, UZ9CWA, RW9HZZ, EA8QO, W2GD/OH0 (Aaland), RA4NBG, Y26ZN, LZ1XL, OL1BSP, UB5MTU, CT1AOZ and SP5GH.

Now we turn to **G3BDQ** (Hastings). On s.s.b. John offers VE1ZZ, W8AH, WB9SNZ, W0ZV (Colorado) and K0ZZ (S. Dakota). There was rather more activity on c.w., which produced RV9CFU, UA9FAR, RA9CSV, UV9FM, UA9JEF, UD6DC, UD6DBN, UG6GCK, UO5OBT, a nice one in UI8DAN, DL1KD/EA8, EA8AK, W2GD/OH0, OY9JD, VE1AGG, UL7ACI, UF7FWO, EA8QO, UA9CBO, UZ9AYA, UA9MS, RV9CFA, RV9CFU, RA9CEG, UA0AG (Krasnoyarsk) and the same chap again as U0AG. A real snip was hooking VK5BC on two evenings around his dawn period. OX3CS was also a nice one, for country No.111 on Top Band.

The 3.5MHz Band

First, **G4XDJ** (Billingham). Brian's c.w. has worked out to G4NWU, G0CDQ, G4MDE, DL1NCT and GM4VPA.

On this band, the c.w. of GW0IER made the grade with VE3BCH, W4LQE, KA9UOM and PZ1AV; mostly 0730-0830Z, although the PZ1 was worked around 0900.

The QRP rig Drake 2B and W3EDP antenna at **GI0GDF** (Lisburn) have worked, on c.w., fellow QRP Club members GM3OXX/A in Edinburgh, G3YCC, G4HOM and ON5AG, of course there were in addition numerous contacts with QRO stations.

It was s.s.b. and the late evenings for G3NOF (Yeovil); Don made his number with JW8FG, OD5VT, PY0FZ and PZ5JR.

G3BDQ has been busily trying out his new fan antenna. Using c.w., he contacted C30LEV, JH6MHZ, UL7JCP, UA9OF, VK5KL, VK8AV, VS6UO (old friend G3FXA), UW9YW, JA2GBO and AX8AV (Alice Springs). Turning to s.s.b., it was N1CQ, N3AHF, WT4J, G4CKB/CT3, FY5EM, PY1RF, VK2AVA, VK2WU, ZL2BT and ZL1IIU.

The 7MHz Band

This band is becoming more and more interesting; some at least of the big BC stations are shifting out and things seem livelier anyway. G3NOF operates just a little on this band, around 2300Z onwards, yielding s.s.b. contact with KB7UP/KL7, N2EDF/NP1, OH0MB/OJ0, PY0FC, WP4AFG and 3A8E.

G3BDQ likes the band; his c.w. went out to VK2KM, VK3XB, AX8AV, VI88NT, F2JD/A6, JH1QOJ, ZS6QU, VU2ASH, EA5BS/EA8, TA2Q and best of all VK9LM on Lord Howe Is. On the other hand, s.s.b. made it to CJ1QF, VO1SA, VK2AVA, YB0SY, UL7EDC, UL8LWU, UI8QAZ, UI8LC and ZL7AA (Chatham Is).

GI0GDF supports QRP; a couple of watts output into a low, bent, W3EDP antenna is the thing. Interestingly enough, with his small garden, Ernie finds the W3EDP performs better than his previous dipole. It certainly managed to raise IK0FEA, PA0CCQ/A who dished out a 599 report FE6HEW, F3IU and numerous inter-G QSOs.

Next, GW0IER who found PZ1AV, W9IS, VE3MIK and W3BY on c.w. Brian has been trying c.w. by poking an a.f. generator up the audio socket of his FT-101E and getting thereby both instant QSY from s.s.b. to c.w. and plenty of QSOs. The only snag about the method is in the proportion of harmonic energy in the generator (few even claim to be better than 2 per cent and fewer still meet the claim!). This means that unless you put in an audio frequency greater than half the bandwidth of the s.s.b. filter you may find your c.w. signal has a baby brother generated by the generator second harmonic. In fact I used to use this very fact to determine how much of the "distortion" was down to the equipment and how much to the test gear!

G4XDJ mentions his crop as being ZC4EE, YU3CCD, ON5IU, PA3EWX, G4ITL, IS0LMM, W1KRV and SM6LJU.

New Bands

G3BDQ mentions the 10MHz band, IS0ESG and W1NV and VK5KL were contacted. GW0IER mentions a c.w. contact with YL OZ1KTD also on 10MHz.

Nobody shows any sign of interest in 18 and 24MHz this time at all.

The 14MHz Band

G3NOF notes that the morning long-path opening starts with JA at 0730, continues to ZL and then VK up to 1000, followed by short-path around 1100-1300Z. Some Asians, BY, HL and VU for example were heard short path around 0900. KH6IJ was heard over the Pole around 1835Z, but little was noted from Africa. The s.s.b. contacts included AX2AU, AX2HD, AX3NLG, BY4SZ, CH9ASJ (VE1), CP5LE, DU9RG, FK8KAB, FR0EH/J, HL9CU, KH6IJ, JD1AMA (Ogasawara), JG2FDF, JJ2BBJ, JR1DVB, KD7TI, N7GMN (Oregon), N7JWH, OH0MB/OJ0, OH0NA, PY0FC, PY0FZ, N2EDF/KP1, TV6DNF, VK3ETT (Lord Howe Is), VK9LF, VK9LM, VK0HI (Heard Is), VX6JD, VX6OCO (Winter Olympic station), ZB2IP, ZL1BYC,

ZL2APW, ZL4OD, ZL7AA, ZL9BQD, ZL0ACF (4X6TT in Auckland) and 4K0D (the North Pole Expedition).

G3BDQ had a bright idea for a new version of an antenna after his losses in the October gales. The new one, a mere 11m high, was really designed with 1.8 and 3.5MHz in mind, but has turned out a cracker on the h.f. bands; virtually non-directional. The VK path on 14MHz (which is really the acid test of any skywire) outperforms the majority of the beams when the band is fair. When the band is wide open, then John is level or just below the beams, but when the band is going out he is still hearing the stuff after the beams have dropped out. The c.w. on 14MHz yielded NL7GP and 3B8FQ, while the s.s.b. managed AP2P, A92EM, D44BC, EP2HZ, JY8VM, JY9LC, KD7TI, PR7RA, VE7DGI, VU2BEJ, VP8AEF (Halley Bay), VK3ZY, VK6BIL, VK6JJ, VK6PY, VK6SX, VK6WC, VK2PP, VK6LC, VI8BBC/P (on Mt. Buller), ZS3KC, XE1DDP, 3B8CF, 5N8BRC, VU2DNL, VU2BEJ, CN2AQ, VK6NF, VK6HI, JY8KL, CH9ASJ (Canada), ZL0ACF, FT5ZB (Amsterdam Is), BY1QH and S42LK.

G4XDJ is a fan of the Delta Loop arrangement, having three of them. The 14 and 21MHz loops are nested and hung from a line which runs from rooftop to a short mast. With these and an FT-200, Brian has had c.w. QSOs with EA7CMP, SV5TS, VE2ABK and VU2AVG.

Now to **GM4ELV (Glasgow)**, who offers VX3JPP, TV6GEN, KA1GG, IY4FGM, VX1CYL, VE8RCS, NK7U, 5T5CJ, Ws, PT7BZ, TP2CE (QSL via F6FQK), OH0NA, JW6EDA, 6W100ME, VK6 and VK2 on c.w., CN8ST and EA0ENA, all with his QRP set-up.

The 21MHz Band

Not surprisingly, quite an upsurge. G4XDJ offers c.w. to N3FCX, KE8HO, WB0X, N4UB, W9FD, NN3SI, SV4AAQ, K4WOI, PY0FZ, N4LZI, UM8MQ, HZ1AB, KI1K, N2HNE, N4KGN, KE2BA, W2AMS, VS6WA and W8NPF.

GW0IER mentions an s.s.b. QSO on this band with ZS6BHJ, plus c.w. to AB3E, PS7HMB and W4GKC, despite losing the wooden mast and guys on February 7. It snapped in two and the aluminium chimney mast was bent at an angle of 45 degrees.

Turning to G3BDQ's letters, I find John made one c.w. contact with ZD9BV, but on s.s.b. there seem to have been more with ZC4EE, ZL2APW (who was a pal of John's backalong when he was G2FTS in Eastbourne), NP4CC, AP2AC, AP2ZR, TA1A, TA2AB, VU2LT, A22FN, A15AB (Abu Ail), SV5TS, OD5IM, FR5AG, FR5DX, FR5EL, ZS3/DL8ZBL, YC0FEX, YC0DXJ, YC3DKN, VP2MDB, TI2JJP, TI2LCR, EL2BS, YC3DKN, HK6ISZ, HK0HEU (San Andres Is), 5T5RA, 5X5WD, Z21BA, JY5OL, A4XYT, C56/DL6NA, UI8AFN and UJ9XWA.

G3NOF mentions how he found the long path to JA, ZL and Asia often open around 0900Z, while the short path was lively 1100-1300Z, with additional signals from VK and YB/YC. Africans were noted 1100-1700Z and again at 1700-1900, Americans were noted between 1100 and 1700Z, with the West Coast Ws peaking about 1700. Contacts on s.s.b. were made with AX5AAG, AX6AI, AX8AV, C56/DL6NA, DK8JZ/J7, F2JD/A6, HH7GE, HH7PV, HK0HEU, HL1AIW, HP1XHT, J52US, JA8DOK/4S7, JI6BJQ, JI6BVR, JR6RAY, JW0B, KG6FG, KW7J (Montana), N2EDF/NP1, N4GNR/6Y, P40GD, PY0FC, PY0FZ, S92LB, S0RASD, TI2JJP, TR8JLD, TR8RLA, TU2QQ, UA0SKL, VS6GS, VU2XX, W6HBH, W6SJC, W7KCF (Oregon), W7ODP, WA6BMG, WE7D (Utah), XX9CT, XX9DN, YB0EZF, YC1QL, YC2CTW, YC0FCE, YC0KGP, ZD8MAC, 5B4TI, 5T5RA, 7P8DN, 8P9DX and 9Y4BK.

Next, we have a letter from **G1MEW** who found the band good on February 29, when he noted ZS5L, YC0SQT, VU2DVP, VE3NDO, KA200G, K2JFE, 9H1FBS and AC8K while using an R1000 and 21MHz dipole. Patrick wonders whether anyone has the QSL addresses for 9H1FBS, 9H1HB, ZS5L, YC0SQT and VU2DVP? One would have thought the best way would have been the Bureaux; but if anyone has more useful information perhaps they would get in touch with Patrick Travers G1MEW, 49 West Bank Drive, South Anston, Sheffield S31 7JG.

GM4ELV mentions TP2CE, a K3, KW3S, VK3XN and UI8ZAA.

The next three deadlines for copy are: April 26, June 1 and June 26

The 28MHz Band

No doubt whatever, the band has been hopping and demonstrating again that without activity nothing happens. I strongly recommend that when the band sounds to be dead, people should try a listen to the beacons and follow it up with a CQ call before coming to a firm decision to QSY. I hate the thought of bandplanning over and above the "c.w. and phone" segments, but there might be value in choosing a couple of frequencies (one for c.w. and one for phone) to use as calling channels ONLY WHEN THE BAND IS APPARENTLY DEAD, and with QSY immediately a contact is made. Obviously, once there are signs of the band being open, the need disappears.

First in on this band is GM4ELV, who offers SV0FE, PJ6/WA3ZBI, NP4CC, TR8JLD, TI8CBT, EA9IB, CT, I, EA, CU2, ZB2, 9H, 5H1K, EA8, OX3SG (QSL via LA3NM), OH, DL, 9J2AL (QSL via WD0HHM) UA6, 4X4JH, S0RASD, ZS6BQ and ZS2OM.

G3NOF found the band patchy and says you have to sit around listening for a long time to pick up an opening. Around 0900 the short path to Asia and YB/YC has something opened up, Africans around lunchtime and South Americans in the afternoons. A few East Coast Ws popped up at odd times in the range 1300-1700Z. QSOs using s.s.b. were made with FM4DN, FY4EE, J87CD, JT1BG, LU6AJ/F, N2EDP/NP1, PA3AXU/SU, PY0FZ (Fernando do Noronha), PZ1DK, S0RASD, TU2QU, VP8BPZ and YB0HZL.

G3BDQ mentions OD5KZ, Z21BA, Z21GU, 4X4SE, W3FYT/4X, 4X6KJ and 5B4QA, all on s.s.b.

VHF Up

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

Once again, had it not been for an excellent Aurora on February 22, there would have been little operating news to report. Tropospheric conditions have remained largely in the doldrums and there were no significant meteor showers to make use of in February.

The VHF Convention

One of the year's main v.h.f. events is the RSGB's National VHF Convention at the Sandown Park Racecourse, Esher in Surrey. The date is Sunday, May 1 which is the May Day Bank Holiday weekend.

The 1988 format is the same as in previous years with the doors opening at 1030. The exhibition part will feature many well-known companies and specialist groups including *PW* and *SWM*, of course.

The Six Metre Group will hold its annual general meeting at 1130. At 1330 RSGB President Sir Richard Davies KCVO CBE CEng FIEE G2XM will give the Convention address followed by the presentation of trophies.

There will be the usual set of lectures in three rooms. These start at 1415. In Room "A" Ray Flavell G3LTP will talk about "Trends in tropo. The best DX is yet to come." At 1515 Angus McKenzie G3OSS will cover, "The consideration of TVI from a 144MHz transmitter." From 1615 there will be a "Packet Working Group" meeting chaired by Mike Dennison G3XDV.

In Room "B" Peter Chadwick G3RZP starts off with "Measurements for the amateur station," followed by the NW Kent Beacon Group on "Building microwave beacons" and ending with "Portable microwave operation" by Peter Day G3PHO.

In Room "C" the "Morse test forum" is the first item with Robert McEwan Reid G4GTO in the chair. At 1515 there is the Remote Imaging Group's AGM with Henry Neale G3REH, followed by the VHF Contests Committee forum.

The lectures end at 1715 and the trade exhibition will finish at 1800. No advanced tickets, with over-18s paying £1 at the door. Under-18s will pay 50p and under-14s get in free.

The nearest railway station open on Sunday is Kingston with the 218, 537 and 715 bus services to Sandown Park from there. Car access is easy from the A307 Portsmouth Road/Esher High Street with ample car parking in the grounds.

Morse tests will be conducted during the day and an equipment test facility is being provided so that you can find out how good — or bad — your 430MHz pre-amp really is. I intend to be there all day so hope to meet some of you.

Repeater Notes

The Kent Repeater Group's Newsletter for February has been received outlining brief reports on its several repeaters. These seem to be functioning satisfactorily but GB3KS (R1) was suffering from noise which pops up at irregular intervals.

Erratic power output from GB3NK (RB4) was traced to a faulty pot on the TX drive board. Some hum is present on the signal due to the ". . . poor design of the power supply." For details of the KRG write to Kelvin Fay G0AMZ who is QTHR.

Fists CW Club

There is a number of clubs devoted to c.w. operation most of which are for those already skilled in sending and receiving c.w. at good speed using the proper procedures. **Angela Sitton G0HGA** (HFD) has sent details of the newly-formed Fists CW Club.

Its aims are: (a) To further the use of c.w. on the bands, (b) To encourage the newcomer to the mode and (c) To engender friendships within the membership. Newcomers are best encouraged by "veteran" operators so the club needs these folk.

The annual subscription is £4.00 for which members receive a minimum of six newsletters (currently it is one per month). The club's own callsign is G0IPX. For details contact G3ZQS at 119 Cemetery Road, Darwen, Lancs BB3 2LZ.

DXpedition News

C. N. Wilson G4VVZ, Secretary of the Derbyshire Hills Contest Group, has written about the group's proposed operation from the Isles of Scilly (WJ square). Dates are from Aug 8/9 to 14/15 with definite operation on 70 and 144MHz and probably 430MHz.

The personnel will include G6ABU, G6HKS and G4VVZ and anyone wishing to take part or wanting further details should contact G4VVZ at 9 Greythorn Drive, West Bridgford, Nottingham NG2 7GG.

Random s.s.b. m.s. operation on 144.444MHz between 2300 and 2400 each evening was very successful last year so will be adopted in 1988. Skeds will be arranged later.

Worked All Britain

WAB Publicity Officer John Fitzgerald G8XTJ (BKS) has sent me the group's March press release. This mentions that Jerry Russell G4SEU (WKS) has received the first 70MHz Islands Award for contacting ten islands on s.s.b. mode.

This year's Annual General Meeting will take place during the Drayton Manor Mobile Rally on May 8 and the group plans to be present at many of the summer rallies. For details of all WAB matters send an s.a.e. to G4KSQ at 22 Burdell Avenue, Sandhills Estate, Headington, Oxford OX3 8ED.

Contest Information

The first leg of this year's 10GHz Cumulatives is on April 17, the remaining five being on 15/5, 19/6, 10/7, 7/8 and 11/9, all 0900–2100. Three separately scored sections; wideband, narrowband and fast-scan TV at one point per kilometre, with half points for cross-band QSOs.

The May 7/8 weekend, 1400–1400, sees the u.h.f./s.h.f. contest with IARU and RSGB versions using the universal locator codes and the DUBUS event using the original E-QTHL system. The IARU/RSGB events are for 430MHz up, but the DUBUS one includes 144MHz as well.

There are two sections in the RSGB/IARU contests — Single-op and Multi-op. The RSGB one uses radial ring points scoring on 430 and 1296MHz and one point per kilometre on 2.3GHz and up. IARU scoring is 1pt/km throughout.

The DUBUS scoring is different. Each QSO is worth one point but on 144 and 430MHz contacts with stations in your own square and the four adjacent ones do not count. Final score is QSO points times the number of different squares worked.

Entries for 144MHz go to DK3UZ at PO Box 38, D-2358 Kaltenkirchen, German Federal Republic. The 432MHz and higher-band logs go to DL4EA at Koelner Strasse 133, D-4000 Duesseldorf 1, German Federal Republic, to arrive by May 31.

Entries for the RSGB/IARU contests should be sent to G4NBS at 10 Quince Road, The Limes, Hardwick, Cambridge CB3 7XJ. Latest postmark for entries is May 24.

Meteor Shower Data

Last month I gave some information about the Lyrids shower which should peak around April 22. There are a few quite useful showers from now through June, the next being The Eta Aquarids which is available in the May 3–5 period.

This shower is usable in UK latitudes between 0200 and about 1300UTC and with an hourly rate (ZHR) of about 50 reflections is well worth investigation. Best sked times are: NE/SW around 0600; E/W around 0800; NW/SE around 0900 while the N/S path has two equal, but lesser, peaks around 0500 and 1100, dropping out for a while at 0730. In previous years readers have reported "brief Sporadic-E" openings to Italy, for example, in the May 3–5 period, in the mornings. However, I suggest these events are more likely to have been long meteor trail reflections associated with the Eta Aquarids shower. For those with computer programs to feed, the RA/DEC figures are 336° and -1°.

The Halleyids shower peaks around May 8 and, as its RA/DEC are virtually the same as the Eta Aquarids, the same information applies. May 8 is a good day as the Piscids peaks then, too. Its RA/DEC figures are 12° and 19° and the shower is usable from 0230 to 1730.

Best times for NE/SW are around 0800; E/W around 1000; NW/SE around 1200 and N/S around 0630 and 1330 for the Piscids. Coupled with the Halleyids some useful skeds could be completed.

The 50MHz Band

Following the welcome news that certain French v.h.f. licensees may apply for 50MHz permits for very low power operation, I understand that moves are already afoot to get the power levels raised.

Geoff Brown GJ4ICD reports that French amateurs have pointed out that Jersey is only 20km from France and that GJs can run up to 100W e.r.p. yet have not caused any interference to French television Band I services. So they ask why they are being so severely restricted.

The restricted zones do seem to be very excessive so either the power levels could be kept the same and the "no-go" circles around Channel 2 transmitters substantially lessened, or the power levels could be increased. Perhaps a little of either solution could be adopted. In any case, the DTRE probably assumes that, whatever power levels are permitted, certain stations will exceed them ten-fold!

Hal Lund ZS6WB produces a very informative fortnightly sheet of v.h.f. news. I read that the UK Six Metre Group has provided a beacon for installation on Ascension Island to be looked after by ZD8MB, alias G4MAB. The QRG is 50.0255MHz and the callsign ZD8VHF. The QRB to ZD8 from London is about 6700km and the azimuth 197° in case anyone wants to monitor it.

Now that the 28.3 to 28.5MHz portion of the ten metre band is available to USA

QTH Locator Squares Table

Station	Band (MHz) 1296	430	144	Total
G8GXP	45	151	331	527
G3XDY	81	137	185	403
G4FRE	63	136	84	283
G3JXN	82	129	175	386
G1LSB	—	126	125	251
G3UVR	75	125	224	424
G3IMV	35	119	405	559
GJ4ICD	59	119	253	431
G6DER	76	110	183	369
G4TIF	—	107	187	294
G4RGK	38	106	260	404
G4XEN	—	106	251	357
G8HHI	31	106	148	285
G4NBS	59	103	102	264
G3COJ	44	102	186	332
G6HKM	27	101	177	305
G8PNN	62	97	128	287
G1EZF	32	93	241	366
G1KDF	32	91	148	271
G0DAZ	—	91	183	274
G4MUT	28	90	145	263
G6MGL	59	89	138	286
G8ATK	42	89	138	269
G8XVJ	18	88	236	342
G6DZH	—	87	149	236
G4KUX	—	80	345	425
HB9AOF	55	80	141	276
G4SSO	—	78	193	271
G3NAQ	—	75	154	229
G1EGC	—	74	171	245
G1GEY	—	68	158	226
G6XVV	25	64	211	300
G6STI	21	58	124	203
G8LHT	2	58	99	159
GM0BPY	—	57	129	186
G6AJE	5	57	95	157
G4CQM	—	52	100	152
G8MKD	—	49	137	186
GW8VHI	—	48	102	150
G4FVK	20	46	75	141
G8ZDS	—	43	129	172
G4AGQ	1	41	103	145
G4DEZ	44	38	246	328
G4YCD	—	36	155	191
G6MXL	10	36	66	112
EI5FK	—	35	137	172
G1DOX	28	34	53	115
G4MJC	—	33	184	217
GM4CXP	—	31	184	215
G4ZTR	29	29	37	95
G1VTR	—	23	32	55
PA3EUS	—	18	57	75
GM0GDL	—	17	54	71
G1IMM	—	13	94	107
GW6VZW	—	6	105	111
G8PYP	—	5	52	57
G2DHV	1	4	30	35
G0FEH	—	2	70	72
G4DHF	—	—	307	307
G4SWX	—	—	293	293
I4YNO	—	—	270	270
G3FPK	—	—	224	224
G4IGO	—	—	223	223
G4SFY	—	—	222	222
G4MEJ	—	—	211	211
G8LFB	—	—	202	202
G4XEK	—	—	178	178
G4YUZ	—	—	177	177
G4DOL	—	—	172	172
ON1CAK	—	—	167	167
GW4FRX	—	—	152	152
GI1JUS	—	—	149	149
G8TGK	—	—	118	118
G8XTJ	—	—	107	107
GI4OWA	—	—	78	78
G1SMD	—	—	77	77
G1CRH	—	—	62	62
G0HDZ	—	—	61	61
GU4HUY	—	—	54	54
G1NVB	—	—	49	49
GM8DFX	—	—	20	20

Starting date January 1 1975.
No satellite or repeater QSOs.
"Band of the month" 430MHz.

Technician Class Licensees, a second 50MHz coordination frequency has been recommended on 28.385MHz to supplement the established 28.885MHz one. Japanese and Pacific stations are already using .385 according to ZS6WB. The t.e.p. season extends through May so please listen to the south for African signals on 50.110MHz.

Welcome to **Etienne Swart ZS6CE** from Randburg (KG34) who reports an Es QSO in December with ZR1L in Capetown (JF96). Initially using 60W to a 6-el T.E.T. Yagi at 8.5m, he later went down to 0.3W to continue the QSO. He will be monitoring 50.115MHz from 1630UTC most evenings through May.

Dave Ackrill G0DJA (WMD) and **Peter O'Dowd G0HLT** (NOT) report a few c.w. QSOs for the 1988 ladder. How about some more 50MHz figures? **Gerry Schoof G1SWH** (MCH) has submitted his first table entry for 1988, as have **Philip Ruder G6MGL** (LDN) and **Colin Redwood G6MXL** (DOR) who is back on the band with a 3-ele Yagi.

John Palfrey G4XEN (NHM) was alerted to the Feb 22 Aurora by a phone call from G0GFW and worked G and GJ stations. Beacons GB3NHQ and GB3RMK were copied via Ar but GB3SIX was not heard at all. Since putting up a 4-ele Jaybeam Yagi, John has not heard the Anglesey beacon on tropo or m.s. so asks if it is QRV. Anyone know? On Feb 26 he worked GW3MHW (IO72XG) in Dyfed for a new square, county and country.

Steve Damon G8PYP (DOR) found conditions fairly average and worked GW3CBY (GNW) on the 19th. **Calum Macpherson GM0EWX** (WR49j) on the Isle of Skye (HLD) came on the band at the beginning of February using a Yaesu FT-726R running 6W to a 5-ele MET antenna. In the Ar on Feb 22 the Greenland beacon OX3VHF (GP60QQ) on 50.045MHz was S9A and was ". . . by far the strongest signal heard." The QRB is 2302km, much greater than what is normally expected on 144MHz.

Between 1725 and 2029 Calum made 37 contacts in 20 squares and seven countries, one third on c.w. He found it the most enjoyable Aurora of any so far and preferred 50MHz to 144MHz since everything he worked was new.

Paul Baker GW6VZW (GWT) has a Yaesu FT-690R and 15W amplifier plus a 2-ele beam, the latter yet to be erected. He asks if there are any "group activities" on the band and if so, their times and frequencies.

I have a note on my pad that TR8DX is QRV on 50MHz from Gabon in West Africa. Thanks to whoever passed this news; I forgot to record that.

The 70MHz Band

Mick Allmark G1EZF (YSW) is now on the band with 0.4W but has a 4CX250B amplifier under construction. With a dipole in the shack he has worked G8GXP, G4HGT and G6DER, all relatively local and heard stations further afield in the last contest.

John Jennings G4VOZ (LEC) has decided to concentrate on portable activity this year and hopes to operate from a few of the rarer areas. In the contest on Feb 14, his best DX was EI9FK/P the GMs being too weak to work.

The first notable event of 1988 was the Rugby Amateur Transmitting Society getting a new club callsign, G7APD on Feb 11, to supplement its G4APD. The call got its first airing on Feb 13 using John's portable gear and the club's 4-ele Yagi at the BTI Radio Station at Hillmorton. Only four stations were worked at the time but the equipment was used next day in the contest when 32 stations were contacted. This was likely the first time a G7 prefix has been heard on 70MHz.

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	
G4XEN	18	3	—	—	48	12	37	7	—	—	125
G1SWH	9	3	—	—	45	6	23	3	—	—	89
G1EZF	—	—	2	1	56	18	—	—	—	—	77
G3FPK	—	—	—	—	59	13	—	—	—	—	72
G1IMM	7	1	—	—	32	4	21	1	—	—	66
G6HKM	—	—	—	—	26	7	22	2	5	1	63
GW4FRX	—	—	—	—	46	16	—	—	—	—	62
G1KDF	3	3	—	—	26	8	6	4	5	3	58
GW6VZW	1	1	—	—	38	6	—	—	—	—	46
G6MGL	9	1	—	—	25	5	—	—	—	1	41
G4ZVS	—	—	—	—	34	5	—	—	—	—	39
G8XTJ	—	—	—	—	35	2	—	—	—	—	37
G8PYP	4	2	—	—	16	4	4	1	—	—	31
G0HDZ	—	—	—	—	25	4	—	—	—	—	29
G0HGA	—	—	—	—	21	3	—	—	—	—	24
G6MXL	1	1	5	1	4	1	5	2	—	—	20
G2DHV	—	—	2	1	13	1	2	1	—	—	20
ON1CAX	—	—	—	—	13	5	—	—	—	—	18
ON1CDQ	—	—	—	—	7	6	—	—	—	—	13

The 144MHz Band

Welcome to another new overseas contributor **Denis Goffaux ON1KPW** from Martelange (JN29WU). He runs a Yaesu FT-480R at 10W to a 9-ele Yagi. His QTH in CJ square is 550m a.s.l.

John Dowse G0GKN (CHS) has worked 52 c.w. stations up to Feb 14. He took part in the contest on the 7th but was only on for about a couple of hours in which period he contacted 20 stations. He reckons conditions ". . . were no more than fair . . ." but his 180m a.s.l. site is a great advantage when running only two watts.

He asks about the supposed Monday Night Activity period wondering where everyone is. Seems it is all very quiet till about 2100 when there is a flurry of activity for about half an hour, followed by silence.

As monitored from London, there is often more activity on c.w. than on s.s.b. when conditions are really flat. This applies to any night of the week and I have not noticed greatly increased activity on Mondays.

John analysed the prefixes worked and found that 40% were G0s, 21% G3s, 37% G4s and 2% G6s. **Ian Rose G0HDZ** (ESX) added ten more counties in February, best DX being GW1SMI/M in Powys and Dyfed, plus F6FLB. Pity you missed the big Aurora on the 22nd, Ian.

G0HGA is annoyed with me for not entering her final c.w. ladder score for last year. It was 244. Angela runs a very modest station and did not start on the ladder till April 1987, so her score is a very creditable one.

She hopes the more experienced c.w. operators will help the novices who usually come on rather late at night. She suggests they call "CQ FISTS" which will ensure a QRS reply.

In the c.w. contest, G0HGA made 21 contacts in what were flat conditions. Angela heard many stations in the Feb 22 Ar but did not manage any QSOs. She hopes things will improve when she gets her antenna up higher and fits a pre-amp since the RX side is rather deaf.

G0HLT managed a couple of GMs on c.w. in the Ar but had to QRT when visitors arrived. G1EZF completed an m.s. sked with HG7PL via sporadic meteors on Jan 27. In the afternoon of Feb 4, Mick completed with OE3UP (IH) in 15 mins.

In the Feb 22 Ar G1EZF started at 1345. Best DX were SL6DH and SM5CBN (HS), SM7FWZ (HR) and OZ6OL (GP) on c.w. On s.s.b. I4XCC (GD), OE3UP and LA9BM (EU) were Mick's prize QSOs. He also heard OE5OLL (GI) on s.s.b. Nearer home contacts included EI4EY (Limerick) and GM1RQD (OKE). In a very weak second phase after midnight, LA3WU (CU) was copied at S1A.

Adrian Gee G1IMM (CBE) uses an Icom IC-271E at 25W to an 8-ele Jaybeam Yagi at 6m a.g.l. He is very satisfied with his results so far. G1SWH has also done well so early in the year. Gerry's DX in February includes G1CSQ/A (CNL), GI4SAM (DWN), GW1SMI (DFD), G1GEY (TWR) and EI8EF (Donegal).

Welcome to **Alan Palmer G1UIY** (KNT) who took part in his first Ar event on Feb 22. His station comprises a Yaesu FT-726R running 10W to a 14-ele Parabeam at 8m a.g.l. He worked GM0EXN (IO88HP), GM0HBK (IO77BC) and GM4UPL (IO77XL) which is excellent for relatively low e.r.p.

Ian Cornes G4OUT (SFD) has passed his c.w. ladder century already and was on in the contest on Feb 7, making 37 QSOs. His IC-271E is still "in hospital" so he used a Yaesu FT-290.

G4XEN made 77 QSOs in the c.w. contest, best DX being F2GL at 585km. Points were down on last year though due to poor conditions. On Feb 17 John struggled to contact EI2GK (Wicklow) in what is a poor direction from Wellingborough.

In the ". . . massive aurora . . . the best since February 1986" he worked stations in DL, G, GM, LA, OE, ON, PA and SM. At 1730 he heard UR2RQ (MS) and OH2TI (MU). Between 1500 and 1600 strong reflections were received from a QTE of 60–65° and at 1525 John worked OE3UP on c.w. Beacons copied aurorally were DL0PR, GB3CTC, EI2WRB, GB3VHF, GB3LER and GB3ANG.

Colin Ford G4ZVS (WMD) operated in the c.w. contest using his FT-290 and 14-ele MET Yagi at 9m a.g.l. He borrowed a 100W amplifier from his local club and best DX was GM0FRT (IO87WB) in Grampian at 515km. Many Ar signals were heard on Feb 22 in LA, OH, SM, etc., but Colin only worked ON4YZ (JO20GG).

G8XTJ has been trying to work the last three WAB areas for his Diamond Award (1500). John also needs BG square in France.

GM0EWX runs 70W to a 14-ele Parabeam but he has a 400W amplifier which does not seem to be too reliable if I read

Photo Acoustics Ltd.

Telephone 0908 610625

MAIL ORDER IS OUR SPECIALITY

58 High Street, Newport Pagnell, Bucks. MK16 8AQ.

Kenwood

SPECIAL OFFERS WHILE STOCKS LAST

			P&P
TS530SP	160-10M Amateur Band Transceiver	748.00	(10.00)
TW4100E	2M/70CMs Dual Band Transceiver	ONLY 499.00	(5.00)
TS440S	NEW Amateur band transceiver General coverage RX	1138.81	(7.00)
PS50	Heavy Duty PSU for TS440S	222.49	(5.00)
AT440	Auto ATU for TS440S	144.82	(3.00)
TS940S	9 Band TX General Cov RX	1995.00	(7.00)
AT940	Auto ATU for TS940S	244.88	(4.00)
TS930S	9 Band TX General Cov RX	1695.00	(7.00)
TS830S	160-10m Transceiver 9 Bands	1098.00	(7.00)
AT230	All Band ATU/Power Meter	208.67	(5.00)
SP230	External Speaker Unit	66.49	(5.00)
PS430	Matching Power Supply	173.78	(5.00)
SP430	Matching Speaker	40.81	(3.00)
MB430	Mobile Mounting Bracket	15.80	(2.50)
FM430	FM Board for TS430	48.05	(1.50)
LF30A	HF Low Pass Filter 1kW	32.26	(2.50)
YK88A	6KHz AM filter for TS430S/440S	49.37	(1.50)
YK88C	500Hz CW filter for TS430/440/830/530	46.08	(1.50)
YK88CN	270Hz CW filter for TS430/440/830/530	54.64	(1.50)
YK88SN	1.8KHz SSB filter for TS430/440/830/530	46.71	(1.50)
MC50	Dual Impedance Desk Microphone	46.08	(2.50)
MC35S	Fist Microphone 50K ohm IMP	21.72	(1.50)
MC85	Deluxe Desk Mic with Audio Compensator	107.59	(3.00)
MC43S	Up-Down Hand Mic 8-Pin 500 Ohm	22.22	(1.50)
MC40S	Up-Down Hand Mic 6-Pin 500 Ohm	19.07	(1.50)
MC60A	Desk Mic with built-in Pre-amp	88.22	(3.00)
MC55	Mobile Microphone with control box (up/down etc.) 6 or 8 pin	52.67	(2.50)
TR751E	2M Multimode (mobile)	599.00	(5.00)
MU1	DCL option for TR751E	30.95	(1.00)
TS711E	2M Base Stations	898.00	(7.00)
HS5	Deluxe Headphones	37.54	(2.50)
SP40	Mobile External Speaker	21.06	(2.00)
TS140S	HF General coverage RX/Amat Band TX	862.00	(7.00)
TH205E	2M Handheld Transceiver	215.26	(4.00)
TH215E	2M Handheld with Keypad Entry	252.13	(4.00)
PG2V	DC Power Cable for TH205E/215E	3.96	(1.50)
SMC31	Speaker Mic for TH21E/41E/2600/3600E	28.31	(2.00)
TM221E	2M FM Mobile Transceiver 45W	317.30	(5.00)
TM421E	70cms FM Mobile Transceiver 35W	372.08	(5.00)
TH405E	70cms Handheld Transceiver	273.18	(4.00)
TH415E	70cms Handheld with Keypad Entry	298.85	(4.00)
TR851E	70cms All Mode Transceiver	699.00	(5.00)

Yaesu

PA3	Car Adaptor/Charger	21.85	(2.00)
MH1B8	Hand 600 8pin mic	21.00	(1.50)
MD1B8	Desk 600 8pin mic	79.00	(3.00)
MF1A3B	Boom mobile mic	25.00	(2.00)
YH77	Lightweight phones	19.99	(2.00)
YH55	Padded phones	19.99	(2.00)
YH1	L/weight Mobile H/set-Boom mic	19.99	(1.50)
YH2	L/weight Mobile H/set-Boom mic	19.95	(1.50)
SB1	PTT Switch Box 208/708	22.00	(1.50)
SB2	PTT Switch Box 290/790	22.00	(1.50)
SB10	PTT Switch Box 270/2700	22.00	(1.50)
FT690RMKII	2.5W 6M multimode portable/mobile/base	399.00	(5.00)
FT211RH	2M 45W Mobile	309.00	(4.00)
FT767GX	HF Gen. Coverage trans. with optional VHF/UHF/6M modules	1550.00	(—)
FEX-767-2	2m module for FT767	169.00	(3.00)
FEX-767-7(B)	70cms module for FT767	215.00	(3.00)
FEX-767-6	6m module for FT767	169.00	(3.00)
FL7000	Solid State linear with built in auto ATU	1600.00	(—)
FT727R	Dual Band handheld transceiver 144-146MHz, 430-440MHz up to 5W on each band	425.00	(3.00)
FT290RMK II	2M multimode portable/mobile/base	429.00	(3.00)
FT23R/FNB10	2M mini handheld with LCD display 5W	249.00	(3.00)
FT73R/FNB10	70cms mini handheld with LCD display 5W	269.00	(3.00)

NEW

FT747GX	Gen coverage receiver, Ham Bands Transceiver	659.00	(7.00)
FT736R	Multimode VHF/UHF Base C/W 2M, 70 cms & Duplex	1450.00	(7.00)
FT212RH	2M Transceiver. FM. 45W	349.00	(5.00)
DVS1	Voice Memory Unit for FT212RH/FT712RH	79.00	(3.00)
FT712RH	70cms Transceiver, FM, 35W	375.00	(5.00)
FT790RMK II	70cms Multimode, Portable, 2.5W	499.00	(5.00)

Aerial Rotators

DAIWA MR750E	Heavy Duty rotator. Can have up to 4 motors	254.10	(5.00)
KR400	Med/H Duty	139.00	(5.00)
KR500	6 core Elevation	149.95	(5.00)
KR400RC	5 core Medium Duty	169.00	(5.00)
KR600RC	6 core Heavy Duty	219.00	(5.00)
KC038	lower mast clamps	17.45	(2.00)
KS065	Rotary Bearing	29.95	(2.50)
AR1002	Lightweight VHF Rotator	47.00	(4.00)

Second Hand List

		P&P
FDK 750X 2M Multimode 10W	225.00	(4.00)
ICOM IC-735 160-10M Amat. Band Trans. Gen. Cover RX	770.00	(7.00)
TEN-TEC Corsair with matching PSU, as new cond.	1050.00	(—)
YAESU FRG9600 VHF/UHF All Mode Scanner. Extd. coverage	399.00	(5.00)
YAESU FT209RH 2m Handheld. Demo model	205.00	(4.00)
TRIO TR3600E 70cms Handheld c/w speaker mic, charger & battery case with nicads	189.00	(4.00)
TRIO TR2600E 70m Handheld c/w case, desk charger, speaker mic, nicad, mobile stand/charger, mobile mic & 2 battery cases	259.00	(4.00)
Regency MX400 VHF/UHF Scanner, c/w charger, nicad demo model, 60-89MHz, 118-136MHz, 138-174MHz, 380-450MHz, 450-495MHz & 800-950MHz	295.00	(4.00)
WELZ SP15M SWR/Power Meter 1.8-150MHz	49.00	(3.00)
CP1-Computer Patch c/w CBM64 software. Capable of TX/RX of RTTY/AMTOR/CW/ASCII	189.00	(4.00)
IC-471A 70cms Multimode Base Station 25W. As new and complete	750.00	(7.00)
TR751E 2m Multimode 25w VGC. Probably the best 2m Multimode on the market	499.00	(5.00)
SW200 SWR/Power Meter 1.8-150MHz VGC	85.00	(3.00)
ALINCO ALM-203E 2m Handheld c/w 30w amplifier, spare nicad pack, DC converter, charger & case	205.00	(3.00)
ADONIS AM503G Desk mic with Compressor. Wired up for 8 pin Kenwood	49.00	(3.00)

Receivers

Trio R2000 HF general coverage receiver	595.00	(7.00)
Trio VC10 VHF converter for R2000 118-174MHz	161.94	(3.00)
Trio R5000 NEW HF general coverage receiver	875.00	(7.00)
Trio VC20 VHF converter for R5000 108-174MHz	167.21	(3.00)
Yaesu FRG8800 HF general coverage receiver	639.00	(7.00)
Yaesu FRV8800 VHF converter for FRG8800 118-175MHz	100.00	(3.00)
Icom R71E HF general coverage receiver	825.00	(7.00)
Icom RC11 remote control unit for ICR71E	62.00	(2.00)
AR2002 VHF/UHF scanner 25-550MHz and 800-1300MHz	487.00	(5.00)
FRG9600 VHF/UHF scanner 25-950MHz	509.00	(5.00)
Icom R7000 VHF/UHF scanner, all modes 25-2000MHz	957.00	(7.00)
Icom RC12 remote control unit for R7000	62.00	(2.00)
R537S Air band portable. Tunable 118-136MHz	69.51	(3.00)

NEW

R535 VHF/UHF Airband Receiver. 60 memory channels, memory scan, programmable scan with RS232 interface	249.00	(3.00)
Black Jaguar BJ200 MKII. Handheld VHF/UHF Scanner	225.00	(3.00)
HF125 HF general coverage receiver 30KHz-30MHz (Made in Britain)	375.00	(5.00)
WIN-108 Synthesised Airband Handheld Receiver 108-136 Mhz	175.00	(3.00)
Kenwood RZ-1 Wideband Receiver. 500Khz-905Mhz Car Radio size. AM/FM.	465.00	(4.00)

Icom

IC751A	HF Transceiver	1465.00	(—)
IC735	New HF Tranisceiver	949.00	(—)
PS15	P.S. Unit	158.00	(4.00)
PS30	Systems p.s.u. 25A	343.85	(—)
SM6	Base microphone for 751/745	46.00	(1.00)
IC290D	2m 25w M/Mode	542.00	(—)
IC505	10W/3W 6M multimode, portable/base	459.00	(5.00)
IC3200E	2m/70cms dual band mobile, with built in duplexer	556.00	(5.00)
IC02E	2m H/Held	269.00	(—)
IC04E	70cm handheld	299.00	(—)
BC35	Base Charger	70.15	(1.50)
HM9	Speaker mic	21.85	(1.50)
BP3	Std Battery Pack	29.90	(1.50)
BP4	Empty Battery Pack	9.20	(1.50)
BP5	High Power Battery Pack	60.95	(1.50)
CP1	Car Charging Lead	6.90	(1.50)
DC1	12v Adaptor	17.25	(1.50)
IC48E	10W 70cms FM mobile	449.00	(3.00)
IC28E	25W FM mobile (Tiny)	359.00	(3.00)
IC-Micro	2 mini hand portable LCD display 1W	239.00	(3.00)

NEW

IC-275E	2M Multimode Base Station inc. PSU. 25W	1039.00	(7.00)
IC-475E	70cms Multimode Base Station inc. PSU. 25W	1125.00	(7.00)
IC-1200	23cm FM Mobile, 10W output, style similar to 28E	559.00	(4.00)
ICOM 761	HF general coverage transciever with internal PSU and auto ATU	2459.00	(7.00)
ICOM IC575	6/10 metre Base Station	999.00	(10.00)
ICOM IC781	HFgeneral coverage trans. C/W internal psu, auto AW, built in VDU. (Send for details)	4500.00	(10.00)

Power Supplies

DRAE			BNOS		
4 amp	48.30	(3.00)	6 amp	78.20	(3.00)
6 amp	71.53	(3.00)	12 amp	129.95	(3.00)
12 amp	95.16	(3.00)	25 amp	193.20	(5.00)
24 amp	137.54	(5.00)	40 amp	423.20	(7.00)

BNOS NEW 'E' SERIES POWER SUPPLIES

12/5E 5Amp PSU	57.50	(3.00)
12/10E 10Amp PSU	97.50	(4.00)
12/20E 20Amp PSU	132.25	(5.00)
12/30E 30Amp PSU	195.50	(5.00)

Switches

Sigma	2 way SO239	20.20	(1.50)
Sigma	2 way 'n' Skts	22.95	(1.50)
Welz CH20A	2 way SO239	30.75	(1.50)
Welz CH20N	2 way 'n' Skts	54.00	(1.50)
Drae	3 way SO239	17.00	(1.50)
Drae	3 way 'n' Skts	21.95	(1.50)

CW/RTTY/Equipment

			P&P
BENCHER			
BY1	Squeeze Key, Black base	67.42	(3.00)
BY2	Squeeze Key, Chrome base	76.97	(3.00)
HI-MOUND MORSE KEYS			
HK708	Straight Key	21.50	(2.50)
HK702	Deluxe version of above on Marble Base	42.50	(3.00)
HK706	Straight key	23.00	(2.50)
HK707	Straight key	22.25	(2.50)
MK704	Squeeze paddle	20.00	(2.50)
MK705	Squeeze paddle on Marble Base	32.20	(3.00)

NEW

RTTY-EQUIPMENT			
PK-232	Packet, Amtor, RTTY, CW, ASCII, FAX transceive in one unit. Works with any computer equipped with an RS232 interface. 12V operated	269.95	(4.00)
NEW FAX option for existing PK232 users (includes new manual)		49.95	(2.00)
NEW PK-87 1200 Baud Amateur Packet Radio TNC		169.50	(4.00)
NEW PK-90 Commercial Packet Radio TNC		465.25	(4.00)
SOFTWARE PACKAGES			
PK232/C64/128 Cartridge, overlays, cable, handbook		69.00	(1.50)
PK232/BBC-B & Master. E-PROM, overlay, cable, handbook		35.00	(1.50)
PK232/IBM-PC & Compatibles. Disc, handbook		39.00	(2.50)
PK87/C64/128. Cartridge, overlays, cable, handbook		69.00	(1.50)
PK87/BBC-B & Master. E-PROM, overlay, cable, handbook		35.00	(1.50)
NEW FAX-1 Radio Facsimile Weather Map demodulator with double screened printer cable. Includes mounting bracket and NEW RTTY receive facility.		279.95	(4.00)
CD660	Data Receiver for CW/RTTY/TOR/AMTOR/ASCII	264.97	(5.00)
CD670	As above but with built in LCD display	327.77	(5.00)
KEYERS & ACCESSORIES			
Star Master Key	Electronic Keyer	54.70	(3.00)
Star Memory	Masterkey electronic CMOS memory keyer	95.00	(3.00)
TRX3	Morse Oscillator	13.65	(1.50)
Datong	D70 Morse Tutor	56.50	(3.00)

Howes Kits

SWB30	SWR Meter Kit	11.90	(1.50)
CV220	2M Receive Converter, for use with 20M RX	17.50	(1.50)
CV620	6M Receive Converter, for use with 20M RX	17.50	(1.50)
DCRX20	20M Amateur Band Receiver	15.30	(1.50)
DCRX40	40M Amateur Band Receiver	15.30	(1.50)
DCRX80	80M Amateur Band Receiver	15.30	(1.50)
DCRX160	160M Amateur Band Receiver	15.30	(1.50)
DCS2	'S' Meter Kit	6.30	(1.50)
CSL4	Dual Bandwidth Filter. Improves selectivity. Internal use.	9.90	(1.50)
ASL5	External Filter Unit. Improves selectivity on your receiver	14.90	(1.50)
TRF3	Shortwave Broadcast Receiver. 5-7 to 12.8MHz	14.50	(1.50)
MTX20	10W 20M CW Transmitter Crystal Controlled	21.90	(1.50)
CTX40	3W 40M CW Transmitter. Crystal Controlled	13.40	(1.50)
CTX80	3W 80M CW Transmitter. Crystal Controlled	13.40	(1.50)
CVF	20, 40 or 80M VFO's. Fully featured VFO units for use with the MTX or CTX range of transmitters, or a DCRX receiver for transceive operation	9.90	(1.50)
CTU30	Antenna Tuning Unit 1.8 to 30MHz. Up to 30W RF	24.90	(1.50)
AP3	Automatic Speech Processor	15.90	(1.50)
ST2	CW Side Tone or Practice Oscillator	8.60	(1.50)
XM1	Crystal Calibrator	16.80	(1.50)

NEW

HC266	2M to 6M Transverter, fully assembled and tested, 10W RF output	179.95	(3.00)

Aerials

6M HB9CV 2 ele beam		12.95	(4.00)
6M 3 ele Beam		29.00	(12.00)
6M 5 ele Beam		39.00	(12.00)
AH-7000	Wideband Discone Antenna. 25-2000 MHz	82.00	(4.00)
Revcone	Wideband Discone Antenna. 25-550 MHz	31.50	(4.00)
G5RV	Full size 102'	16.75	(3.00)
G5RV	Half size 51'	14.25	(3.00)
HB9CV	2 metres	3.95	(3.00)
HB9CV	70cms	3.95	(2.00)
2 metre	Slim Jim	6.95	(3.00)
7 ele ZL Special 2M		14.25	(5.00)
12 ele ZL Special 2M		38.00	(6.00)
Helo 2M		5.80	(3.50)
CAS-A2	Coaxial Masthead Antenna Switch. 'N' type sockets. Freq. range DC-1000MHz. RF Power 150W PEP.	59.95	(4.00)
AS-HF2	Coaxial Masthead Antenna Switch. PL259 type sockets. Freq. range DC-185MHz. RF Power 400W PEP.	39.95	(4.00)
40-80M	Trap Dipole Kit	16.25	(3.00)
80-160M	Trap Dipole Kit	14.25	(3.00)
DX Dipole	Approx 20M long	12.95	(3.00)
Multiband	Fan Dipole Array. Covers from 100-1300MHz. Ideal for scanners	24.95	(3.50)
1-1	Baluns	12.95	(2.00)
4-1	Baluns	12.95	(2.00)
3.7 and 7.1MHz	Traps (pair)	9.50	(2.00)
Copper wire	50M rolls hard drawn	7.95	(2.50)
BOOKS	Confidential Frequency List (NEW 1988 Edition)	5.95	(1.00)
	Air Traffic Radio	2.25	(0.75)
	The Complete guide to VHF/UHF frequencies 25-2000MHz (NEW) 1988 Update	5.95	(1.00)
	The International VHF FM guide	2.85	(0.75)
	Logbooks	3.75	(1.00)
	HF Oceanic Airband Communications	3.95	(1.00)

SPEND UP TO £1,200 INSTANTLY WITH A PHOTO ACOUSTICS LTD. CREDITCHARGE CARD — APPLY FOR DETAILS

PART EXCHANGE WELCOME, ASK FOR KERRY G6IZF OR ANDY G4YOW

RETAIL SHOWROOM OPEN TUESDAY–FRIDAY 9.30–5.30, SATURDAY 9.30–4.30

Goods normally despatched within 24 hours. Please allow 7 banking days for cheque clearance. Prices correct at time of going to press — E&OE

BARCLAYCARD VISA

his comments correctly. Nevertheless, during an Ar opening GM0EWX is usually one of the loudest DX signals at G3FPK.

John Eden GM0EXN (HLD) worked 70 stations on s.s.b. and c.w. in the Feb 22 Ar. Beacons heard were GB3VHF, SK4MPI, GB3LER, DL0PR, Y41B and DK0OE (JO30DU) which is on the same frequency at GB3CTC. The event was a more southerly one than usual so no OH or U stations were heard at Dunnet Head.

John comments, "The polar arc seemed complete at this latitude and reflections could be obtained around from East and South of it, over North up to 290°." By contrast, GM4ILS in Elgin, about 115km to the south, was hearing and working Russians. Once again he advises those in the south to call "CQ" on c.w. well away from 144.050MHz since the QRM at his end is horrendous thereabouts.

Another new correspondent is **John Lincoln GM8DFX** (HLD) from Bettyhill in Caithness and XS square. He has been active again since August 1987 but his path to the south is difficult, but this is where Ar events help. John's station is an FT-290R, 40W amplifier with pre-amp and an old style, 75 ohms impedance, 6-ele Jaybeam 8m a.g.l. rotated by hand.

In the Feb 22 Ar he worked many stations on s.s.b. at a QTE of 35° best DX being ON1CDQ (JO20) at 1005km. Later in the evening he went on c.w. pointing due north. Although he has worked 20 squares he has never worked his own, XS.

From Powys, **John Nelson GW4FRX** did very well in the Feb 22 Ar working 14 countries. Best DX to date was OH2TI (KP20KE) at 1890km. John was very loud at G3FPK and I played him a recording of our QSO over the phone, the first time he had ever heard his own signals.

I was alerted to the Ar by a phone call at 1225 from Eddi Ramm DK3UZ. Later GM0EXN and others telephoned me with information. My first contact was LA8AK (DS80b) at 1411, followed by assorted EI, G, GM, GW, LA, OZ and SMs on the key. QTEs were between 350° and 50° mostly I went QRT at 1700 and it was still in full swing but I could not hear any Ar signals at 1820 when I came on again.

Countries "on offer" also included OK, SP and YU so this was a rather southerly event, as some Fs in central France were worked too.

GW6VZW's best tropo QSOs so far this year are GU2FRO (SRK), G1EZF (YSW) and GW6UXT (GDD). Paul operated in the Ar and worked GM0HBK (XR71a) in Highlands, GI6ATZ (DWN), GM6LNM (SCD) and G1GEY. He called GM1RLV (IO86EF) for an hour without success. The event was copied from 1400 to 1725 approximately in Cwmbran.

The 430MHz Band

ON1KPW is active on the band from CJ square using 10W and a 19-ele Yagi. Denis will be QRV from Luxembourg as LX/ON1KPW/P in the July and October IARU contests with 50W and two 19-ele Yagis on 432.260MHz plus/minus QRM.

G1IMM took part in the contest on Feb 21 making 27 QSOs. G1SWH also used this event to add a further 14 counties for 1988. Gerry's best DX were G0FRR (DOR), G3OSS (LDN), G4BWG (SRY) and G1GEY.

G4XEN found the contest conditions not very good as the high pressure area was not really in the right place. John made 91 QSOs, five more than last year, in 21 counties. About GI6ATZ's county, John, GW6VZW claims it as Down.

G6HKM has a 23-ele Cue-Dee Yagi on the Altron mast and has 22 counties for this year's table so far.

G8PYP has not been on the band very long and picked up three new squares in the Fixed contest. Steve thinks most participants were using high gain, narrow beams making them difficult to contact initially. Why don't people say where they are and where they are beaming when calling "CQ contest?" At least those hearing them would be able to beam in the right direction.

The Microwave Bands

Very little news this month. On Jan 31 G0DJA went out for an hour to Frankley Beeches to try out his 10GHz equipment. Dave says that the Leicester beacon GB3LEX on 10.4GHz is always a good signal to that area. He worked G3MZU/P on Lickey Hill four km away and G1RLR/P on Barr Beacon 18.5km distant.

In the near future there are plans to attempt the 110km path from Barr Beacon to Lake Vyrnwy, near Bala, weather and work permitting. He would like to put a beacon for 24GHz on the air in 1988/9 somewhere in the West Midlands and has written to the RSGB about the idea. He has started to collect components for the project.

The new counties for **G6HKM** on 1.3GHz were G3IMV (BKS) on Jan 18 and G6UWO (NOT) on Feb 15. Both since confirmed, Ela has been able to claim her first RSGB Counties Award for the band and the Supreme Award for 144/430/1296MHz. She is currently using a 44-ele antenna on the Altron mast for the band.

The 144/432MHz Contest

Conditions for this event on March 5/6 were quite flat. On 144MHz the level of activity was much less than usual with some of the "big stations" missing. Scores seemed down and with about 15 minutes or less to go I noted the following calls/serial numbers: G1KAR/P 510, G3CKR/P 698, G3XBY/P 485, G4XUM/P 510, G6HH/P 425 and GW6APZ/P 640. G4VCO/P, in a first attempt from IO91PS, made 502 QSOs.

As usual, most signals were acceptable but one or two left something to be desired. I suspect that, with prolonged use, some amplifiers go off tune due to the heat generated and inadequate cooling. Also some seemed to be tuned for maximum output rather than best linearity. It is amazing how much a wide signal can be improved by a small adjustment of the loading control, provided the amplifier has one, of course.

From the few comments I have heard, it was hard going on 432MHz, many stations being prepared only to make a token effort so as to justify an entry on 144MHz.

The next three deadlines are: April 26, June 1 and June 26

Annual c.w. ladder

Station	Band (MHz) 50	70	144	430	Points
G4ZEC	—	—	207	—	207
G0HGA	—	—	126	—	126
G4OUT	—	—	101	—	101
G0HLT	3	—	89	—	92
G4ZVS	—	—	80	—	80
G3FPK	—	—	59	—	59
G0GKN	—	—	52	—	52
G0DJA	4	—	41	—	45
G2DHV	—	—	20	—	20
GU4HUY	—	—	3	—	3

Number of different stations worked since January 1.

Final Miscellany

G0DJA comments on the "policemen" who have invaded 50MHz. He spends hours on 50.09MHz calling on c.w. to no avail, but dare to put out a c.w. call on 50.200MHz and some loud s.s.b. operator will tell you where to go. Must we have this ludicrous spot calling frequency nonsense on this band ?

After writing to me, GM8DFX kindly telephoned to report two new stations in XS square. GM7ASN on f.m. only and GM7AUN who uses an FT-290R. Thanks for the information John.

G4XEN has commented upon G4XEK's query in the March VHF Up about the gain of 19-ele MET Yagis. John found a reference in the January 1985 VHF/UHF Newsletter to a claim of 14.2dBd whereas the Kraus figure — never realised because of the inevitable side lobes — is 13.8dBd. The Kraus figures for the Tonna 17-ele and Jaybeam 14-ele Parabeam are 13.6dBd each. In other words, they are all about the same. My advice, choose on the criteria of cost versus required robustness.

Now a final plea. When writing please remember to put your callsign and name somewhere. It makes my task a bit easier!

RTTY

Reports to Mike Richards G4WNC
200 Christchurch Road, Ringwood, Hants BH24 3AS.

First of all this month a plea from **Joe Grima** (Malta) who is having problems finding software for his Atari 800XL computer. Joe is interested in receiving RTTY/AMTOR/SSTV and c.w. but has been unable to find any software for this model.

My own suggestion would be to consider buying an intelligent terminal unit (PK-232 or Kantronics KAM) providing of course that the Atari has a serial port.

If you know of any programs to help Joe then please drop me a line and I will pass on the information.

If you are using a more unusual computer to receive the data modes, where did you get the software from? By unusual I mean not Spectrum, BBC, Commodore, Dragon and the like, you know the ones we always see in the software adverts. I'm sure that there are many people who have computers gathering dust for the sake of the software, so if you can help on this matter—drop me a line.

RTTY and AMTOR

Band conditions this month have been really very bad, one evening I even checked my antenna as I couldn't believe that the band could be that quiet!

John Barber G4SKA reports that he is still busy re-building his shack, the latest

project being the construction of solid state power controllers for his main p.a., the object being to optimise the p.a. h.t. voltage for the power level in use. John is hoping to have his station complete in time for the BARTG Spring h.f. contest.

He's not the only one building their shack as I've been forced to relocate. The new shack is going to be much bigger, quieter, and this time I'm getting a decent tilt-over mast. This should improve my v.h.f. and u.h.f. capabilities, despite this QTH being just below sea level between two large hills!

In one of John's letters he reports hearing a large pile-up calling A15AC on 21MHz. The station was worked by TG9VT and K8NLD though later that evening everyone was calling A51 as opposed to A15 so we are not sure which was correct. A5 is known to be Bhutan but neither I nor John know where A15 is! If you know please write and put us out of suspense!

As for AMTOR this month, at the end of February I was so convinced my station had died that I called-up the G3PLX mailbox on 3.5MHz just to prove all was ok. Other than that all I heard was the usual IT, KA, SM, SV and W prefixes. Who said that we were heading for a sunspot maxima, perhaps that doesn't apply to the data modes.

Why RYs?

I was recently asked why RTTY operators send RYs at the beginning of their transmissions. This innocent question gives me a chance not only to explain the background to the use of RYs, but also to make a plea for a more sensible use of RYs.

I suspect that a lot of operators would answer the question by stating that RYs are used as a convenient tuning signal. This is basically true but doesn't explain why RYs in particular are used. Neither does it explain why some operators feel the need to send 30 seconds or more of RYs before each and every over. To find the origins of the use of RYs we need to go back to the early days of teleprinters.

The prime use for teleprinters was sending messages over land lines. The telegraph signal comprises serial data where a positive voltage is called a space and a negative voltage a mark. The teleprinter at the distant end of the land line used these voltages to drive the printer mechanism. To enable transmission over greater distances various regeneration techniques were added to the land lines.

The next problem was the need to devise a measurement system to check the performance of the land line. As the telegraph signal consists of combinations of marks and spaces the worst type of signal would be alternate mark and space. This particular type of test signal could be described as giving current reversals and in fact the common name for this test was, and still is, REVS.

The alternate mark and space test signal, if viewed on an oscilloscope, would show a perfect squarewave. When this test signal is applied to a land line or other transmission system, the measured result at the distant end is usually expressed as a distortion percentage.

The measurement of this distortion is remarkably simple as it comprises a centre-zero meter with a sensitivity that gives full scale deflection in the appropriate direction if either a mark or space is applied. This meter is then calibrated with a scale showing ±100%. When a test signal (REVS) is measured using a meter of this type a perfect result would be displayed as a zero reading. A distorted signal would cause the meter pointer to be offset either towards the mark or space, the amount of offset representing the distortion. This offset or distortion is commonly called bias.

Now I'm sure many of you will have seen RTTY terminal units with a centre zero meter fitted as a tuning indicator. In order for this type of meter to give an accurate reading it first needs to be calibrated on a squarewave test signal. Then you really need to receive squarewave RTTY signals at the start of a transmission to align your station. As you can imagine this is rather impractical as sending squarewave test signals would soon lose its novelty value. So what is really required, is a simple way of sending a squarewave from a teleprinter keyboard or even a computer RTTY program without having to disconnect everything and set-up a test signal. This is where RY's come in as the combination of mark and space used for these characters is as follows:

R Y
SMSMS MSMSM
Where S=space and M=mark.

As you can see the two characters R and Y, when combined, produce an alternate mark and space test signal—which is just what is required.

Of course, there is always a snag. In this case the problem is that the RTTY is transmitted as asynchronous data. This means that start and stop bits are added to each R and Y so that the final waveform is not quite a perfect squarewave but it's certainly good enough as a tuning guide.

This brings me onto the problem of operators who send dozens and dozens of RYs each over. Perhaps they are just gaining thinking time as any two-fingered typist can send loads of RYs without too much trouble. That way they give themselves time to think about where to find the next keys and start their message. In these days of type-ahead buffers on the majority of computer based stations, there doesn't seem to be the need for this as you can start preparing your message before the other station has finished.

It is also very irritating for the station listening around to stumble across a string of RYs and have to sit there for ages waiting for the callsigns to appear. If stations, especially DX stations, send their callsigns over and over again and not RYs I'm sure many listeners would find that far more use.

RTTY Receivers

I am asked by many newcomers what receiver should I buy? Although this is a very simple question there is usually the added problem of keeping the cost to a minimum. I'm sure some of you have managed to set-up simple and cheap RTTY stations, so why not drop me a line and perhaps I can use the information to encourage some new blood into the hobby.

The next three deadlines are: April 26, June 1 and June 26

Prefix (Country)	Band (MHz) 3·5	7	10	14	21
A,K,W (USA)				APR	PR
CE (Chile)				R	
CT (Portugal)				P	
C5 (Gambia)					R
DA,F, J,K,L (W. Germany)	R	R		P	P
D4 (Cape Verde)				R	
EA,C (Spain)				PR	
EA8 (Canary Is.)					R
F (France)				P	R
G (England)	APR	AR		APR	
GI (N. Ireland)		R			
GM (Scotland)	R			R	
GU (Guernsey)				P	
HA (Hungary)				P	
HB (Switzerland)				P	
I (Italy)				AP	P
IT9 (Sicily)				R	
JA,G (Japan)				R	
LA (Norway)				P	
LU (Argentina)				R	
LZ (Bulgaria)				R	
OE (Austria)				PR	
OH (Finland)				R	R
OK (Czechoslovakia)				R	
ON (Belgium)				R	
PP,Y (Brazil)				R	
SG,K,L,M (Sweden)	R			PR	
SO,P (Poland)				R	
SV (Greece)				R	AR
TA (Turkey)					R
TG (Guatemala)					R
UA,V (USSR)				R	
VE (Canada)				R	P
XE (Mexico)					P
YB (Indonesia)				R	
Y (East Germany)				R	
ZS (South Africa)				R	
5B4 (Cyprus)				R	

FAX

Not a lot of FAX reports this month probably due to the poor conditions. **E. C. Norfolk** has written with a selection of amateur FAX reports including: OE1HAB (Austria), EA8EV (Spain) and LE5ZNO (Norway). Mr Norfolk uses the G4IDE FAX program on his Spectrum computer, but sadly this very good program is no longer available.

Those of you who are able to resolve FAX signals using 120 r.p.m. and an IOC of 576 may find some of the commercial weather charts useful. From the amateur radio point of view these charts can be very useful for spotting enhanced propagation conditions particularly on the v.h.f. bands. One of the most useful stations for European information is Offenbach (DCF54) on 134.2kHz. This station transmits surface pressure charts at the following times: 0137, 0420, 0721, 1020, 1319, 1617, 1921 and 2221UTC. Another useful station is Northwood which also transmits surface analysis charts on 4.248MHz, 6.436MHz, 8.495MHz and 12.742MHz. The transmission times are: 0315, 0630, 0940, 1500 and 1800UTC. The h.f. transmissions use the normal frequency shift of ±800Hz whilst the l.f. transmissions use the narrower shift of ±150Hz.

One important point to note is that a licence is required to receive this information which can be obtained on application to the Met Office at Bracknell. Those of you who are paid up members of RIG (Remote Imaging Group) will not need a licence as they are covered by RIGs agreement with the DTI.

If you have used weather information received using FAX for amateur radio then please drop me a line with the details.

OSCAR-10

Although the exact date has yet to be defined, it is to be hoped that transponder employment will commence again in late April or early May. Hopefully the satellite will have come through the period of power insufficiency due to poor sun alignment on the solar panels unscathed. The precise date for the re-start and the Mean Anomaly values relating will be announced on the various AMSAT nets, which will carry the tidings long before our next column is due for reading.

ARIANE & Phase III-c

The last Ariane launch V-20 of November 23 last year, although totally successful, resulted in a lost TV-DBS satellite as one solar panel on TV-SAT-1 failed to deploy. The system would have had enough power to run two of the intended four channels, but the panel remained firmly folded in position obscuring the uplink receiving dish antenna, and no ammount of nudging and budging would shake it from that position. Efforts have now been dropped and a very expensive and useless piece of hardware is now in geostationary orbit.

The *Ariane V-21* launch carrying Spacenet 3-R and Telecom 1-C has, at the time of writing this column, again been postponed now to March 11. This further delay is not because of the old third stage problem, but due to modifications and a few finishing touches being needing to be applied to the cargo, and is undoubtedly related to the V-20 payload problem. Telecom 1-C in particular is anxiously awaited, as its predecessor Telecom 1-B went out of control in January after only two years of a seven year expected lifetime.

The *Ariane-IV V-22* launch has again been further delayed from that mid-May date published in our last column to what is now currently scheduled as a fairly firm May 31. This date was given to Dr. Karl Meinzer DJ4ZC by the European Space Agency. AMSAT-DL has produced the graphics shown in Fig. 1. This shows how the 58.5m tall *Ariane-IV* will carry and deploy the three satellite launches from the third stage. The left hand picture Fig. 1 (a) shows *Ariane-IV,* Fig. 1 (b) shows the third stage with AMSAT-Phase III-c nestling between Meteosat P-2 (the first satellite to be put out to orbit and the last to be released, Panamsat. The first inset (1) shows the third stage fairings removal, (2) the Meteosat deployment, (3) AMSAT-Phase III-c put out still in its "SYLDA" protective container. The removal of the top of the Panamsat cover is depicted by (4), (5) shows the ejection of Panamsat from its SYLDA, and (6) the final release of Phase III-c from its container. All of these serialised events will be broadcast on the amateur bands, so devotees will be able to follow each stage of this exciting new venture on 3.780, 14.282, 21.280 and even 28MHz too according to one's QTH and propagation conditions at the time.

Also from AMSAT-DL come the latest pictures of Phase III-c during its final testing stages. Horst Wagner DB2ZB (left) and Konrad Muller are seen installing the flight fitting on the table in Fig. 2, whilst Fig. 3 shows Dick Daniels W4PUJ (left) and Werner Haas DJ5KQ busy working on the pressurised tanks that propel the on-board kick motor.

Fig. 1

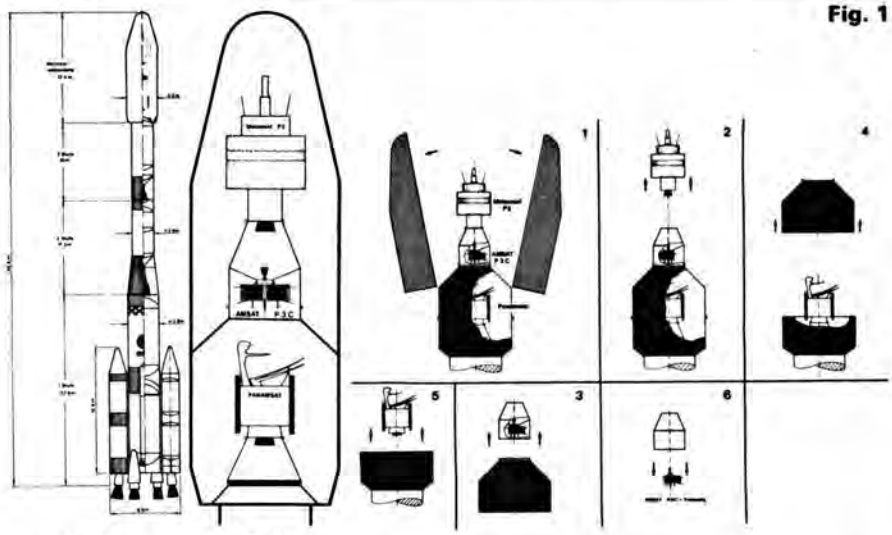


Figure 1a Figure 1b

Fig. 2

Fig. 3 ▶

The initial Phase III-c telemetry values are continued below, as insufficient space was available last month for completion.

Channel	Function	Equation	Units
1E	Main battery temperature	(n-127)/1.82	°C
1F	Solar panel 6 current	(n-15)x4.128	mA
20	2m TX average power output	$(200\text{-}n)^2/2000$	W
21	Helium tank temperature	(n-127)/1.82	°C
22	Solar panel 1 temperature	(n-127)/1.82	°C
23	Solar panel 5 current	(n-15)x4.128	mA
24	70cm RX a.g.c.	$(n\text{-}83)^2/1000$	dB
25	70cm TX p.a. temperature	(n-127)/1.82	°C
26	Solar panel 3 temperature	(n-127)/1.82	°C
27	Solar panel 4 current	(n-15)x4.128	mA
28	Special purpose		
29	24cm RX temperature	(n-127)/1.82	°C
2A	Solar panel 5 temperature	(n-127)/1.82	°C
2B	Solar panel 3 current	(n-15)x4.128	mA
2C	+14 volt regulator voltage	(n-10)x61.5	mV
2D	RUDAK temperature	(n-127)/1.82	°C
2E	Top (+Z) skin temperature of arm 1	(n-127)/1.82	°C
2F	Solar panel 2 current	(n-15)x4.128	mA
30	Mode B transponder +9V supply voltage	(n-10)x50	mV
31	Wall temperature in arm 2	(n-127)/1.82	°C
32	Bottom (-Z) skin temperature of arm	1(n-127)/1.82	°C
33	Solar panel 1 current	(n-15)x4.128	mA
34	Special purpose		
35	Wall temperature in arm 1	(n-127)/1.82	°C
36	N204 tank temperature	(n-127)/1.82	°C
37	Reserved channel		
38	Auxiliary battery voltage	(n-10)x75	mV
39	Mode S transponder temperature	(n-127)/1.82	°C
3A	+Z platform temperature (SERI exp)	(n-127)/1.82	°C
3B	Reserved		
3C	Mode L transponder +9V supply voltage	(n-10)+50	mV
3D	UDMH tank temperature	(n-127)/1.82	°C
3E	Nutation damper temperature	(n-127)/1.82	°C
3F	Reserved		

The next three deadlines are: April 26, June 1 and June 26

RS-10 & 11

The past month has seen considerable activity on RS-11, with an ever growing number of new stations using both the 21MHz and 145MHz uplinks to good effect. Your scribe managed to work several passes, mainly during the week when the attenuation is reduced and the following were recorded in the G3IOR log-book.
F6HST, GM3NHQ, HG5AM, IV3LCZ, LA5AAD, OE1LM, OH1HD, SM0KV/0, RA9CZZ, RS3A, UA1NA, UA3UBN, UA9DC, UA9FB, UA0BDW, UC2CBB, UC2OH, UC2WWT, UK3A, UK0QCG, UL7CCY, UL7GBD, UL8CWW, UV1AP, UV9FB, UZ0ZLN, VE1BB, VE2LI, W2JV and Y22UL.

All QSOs were made with 50 watts to a ground plane on 145MHz and with an RA33 to an IC-720A for reception, mainly using c.w.

Using the same set-up, **Ray Soifer W2RS** spent a couple of days with G3IOR (and a couple of orbits on RS-11) operating under the call G0/W2RS/A, which really confused the contacts. Despite having to repeat the unlikely callsign many times over, Ray was rewarded with QSOs from DJ8FS, G4GIR, OK3CVU, SM7BYU, SM0KV/0, UA1NA and YU2SB. "The level of activity," said Ray, enamoured at the response, but staggered at the QRM, "is enormous compared with that in North America."

Tom Harrison GM3NHQ, is another RS-10/11 enthusiast and has worked four continents and nineteen countries on the satellite pair to date. As can be seen in Fig. 4, which shows Tom in his station, he uses an FT-757 for reception and for transmitting a very old Icom 202 with a 15 watt p.a. feeding a 5-element Yagi also in the house loft. Tom says, "My best DX is W8 to the west, UA9 to the east, and EA8 to the south, but my most surprising QSO was with W3, when I was using the IC-202 barefoot to a 145MHz dipole."

RS-5 & 7

Whilst the combined RS10/11 pair continues to provide excellent service, with ever enlarging numbers of users, it would appear that the return of RS5 and RS7 pathfinders is as far away as ever. The dedication of the single command station at RS3A to the new satellite has meant that the resources needed to cover the control equipment for the earlier birds is now missing. Now, if an interested and technically minded reader were to write to Box 88 in Moscow with a proposal and offer, it could just be . . .

Fig. 4

Project Nordski-Com

The joint Canadian-Soviet north pole crossing expedition party of 13 set out after mutually translated speeches at 0740UTC on March 3, in high winds and a temperature of –45 degrees Celsius. By 1124UTC they had reached 81 degrees 21.2 minutes north and 96 degrees 12.8 minutes east. UoSAT-OSCAR-11 is giving the updated position by its "digitalker" which is being copied at excellent strength by Laurie Dexter VE8LD. He is part of the travelling team using a tiny Icom hand-held transceiver.

By the following day, March 4, at 1113UTC, the intrepid travellers had reached 81 degrees 32.3 minutes north, 97 degrees 00.0 minutes east, as reported over 14.182MHz by **Leonid Labutin UA3CR** using his special polar camp callsign of EX0CR. "It is very warm here," said Leo, "38 degrees today." Leo could hardly operate for laughing when your writer asked if he meant MINUS 38 C, which he confirmed by pointing out that they were not maritime mobile. Leo will be active as EX0CR on packet radio and RS10/11 transponder until the middle of April, when he will move his station to the Canadian base using the call CI8C.

UoSAT OSCAR-14

UoSAT-3 planning and work is now rapidly going ahead at the University of Surrey to meet a late 1988 launch agreed with NASA. This is to put the UoSAT-C satellite into a 43 degree inclination 500km circular orbit by a Delta launcher from the USA. It will complement the OSCAR, RS and Fuji OSCAR programmes by providing a space science and engineering facility readily available to both amateur and professional experiments, and will be supported by international collaboration with AMSAT, AMSAT-UK, VITA, Quadron, NASA, the British National Space Centre and the European Space Agency.

It will carry an advanced store and forward PACSAT digital communications system available to all amateurs with Mode "J" (435 up, 145 down) capability.

A range of satellite technology experiments will be carried dealing with power systems, on-board data handling, attitude determination, control and stabilisation, etc. Radiation studies will be accomplished using a large array of large *pin* diodes to detect single event energetic cosmic rays, an enclosed charge coupled device array to detect and evaluate the effect of single event upsets on star sensors and imagers, and special f.e.t.s located throughout the spacecraft to measure the total radiation dose accumulated by the onboard subsystems.

Like its predecessors, UoSAT-1 and 2, alias OSCAR-9 and 11, it will carry on-board computers running diary software, attitude determination, r.f. modulation, plus important control and stabilisation. As the satellite will be at a new inclination, and non-sun-sychronous, improved analogue and digital sun and earth horizon sensors will be incorporated.

Power will come from the new highly efficient GaAs solar cells and the panel will include patches of experimental GaAs, InPe and Si solar cells with a variety of newly developed cover-slides that will permit long term evaluation of differing material qualities and methods of solar power production.

The users, as with the earlier UoSAT devotees, will consist of a world wide network of engineers, educators, scientists and communicators, giving an excellent basis for active radio amateurs and short wave listeners to participate in some valuable research, or even to design their own experiments in an area of interest or expertise. The University of Surrey would be pleased to hear from those interested in collaborating on UoSAT-C, especially in the area of ground station support, to join those international teams already set up and active.

If resources permit, a digital signal processing experiment will be included that will evaluate modulation and demodulation schemes. It is hoped that the new UoSAT will provide spacecraft telemetry whole orbit data, experiment results, news bulletins and communications facilities on a single downlink using packet-radio techniques.

The structure will be a new concept in highly modular construction, that should result in improved utilisation of the available spacecraft envelope, greater ease of assembly, and therefore a more rapid response to future launch opportunities.

Propagation

Reports to Ron Ham
Faraday, Greyfriars, Storrington, West Sussex RH20 4HE.

"The monthly mean sunspot number for January was 59.6 with a high of 124 on the 14th and 15th and a low of 25 on the 2nd," wrote **Neil Clarke G0CAS** (Ferrybridge). He enclosed his computer print out, Fig. 1, of the solar flux for January showing a sharp climb to its peak of 127 s.f.u. between the 10th and 15th. This coincides well with the massive aurora borealis discussed later on.

In Edinburgh, **Ron Livesey,** using a 2.5in refracting telescope with a 4in solar projection unit, located 2 sunspots on January 20, 21 and 22 and 3 spots on the 17th and 31st.

At the other end of the UK in Selsey, **Patrick Moore** watched the progress of a string of sunspots which were visible on the sun's disc between January 31 and February 8. His drawing, Fig. 2, indicates their position at 1215 on February 1. Around 0840 on the 15th Patrick observed a large spot, Fig. 3 and remarked, "plenty of faculae, this could be an active one!" By the 19th it had grown, Fig. 4 and looked very impressive near the central meridian.

"This spot was 'naked eye' and was declining in size by the 23rd," remarked **Cmdr Henry Hatfield.** His solar log for the period January 31 to February 23 is the subject of Fig. 5. In addition, Henry, using his spectrohelioscope, witnessed three small flares at 1156 on February 7 and with his 136MHz radio-telescope recorded noise from the sun on February 3, 19, 20 and 26 and a medium sized burst, lasting 7 minutes, began at 1038 on the 28th.

I would like to extend my congratulations to Cmdr Hatfield on his election to the office of President of the British Astronomical Association, a post recently held by Patrick Moore. I have known these two expert and dedicated astronomers for many years and I am delighted to have their observational reports in this column for the benefit of readers.

Aurora

"The aurora on January 14/15 was observed right down to the Midlands,"

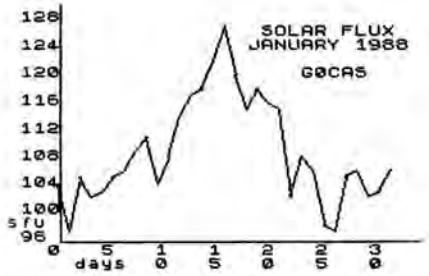


Fig. 1

Fig. 2

Fig. 3

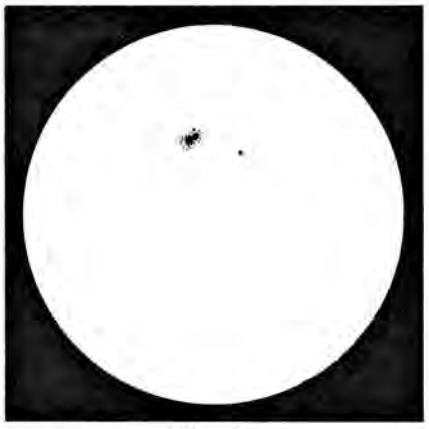


Fig. 4

Fig. 5

Date	Time	Spots	Groups	Filaments
21.1.88	1128	5	2 doubles	11
07.2.88	1132	5	1 triple	16
08.2.88	1111	5	1 triple	14
09.2.88	1440	3	1 double	15
12.2.88	1102	1	0	14
15.2.88	1101	2	1 double	16
16.2.88	1112	4	2 doubles	18
18.2.88	1220	6	1 double 1 triple	16
19.2.88	1053	6	3 doubes	16
22.2.88	1115	1	0	10
23.3.88	1437	1	0	not observed

Fig. 6

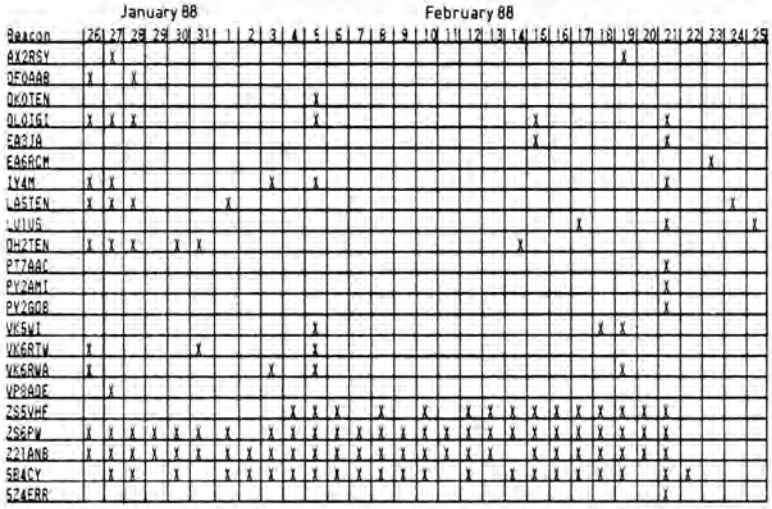
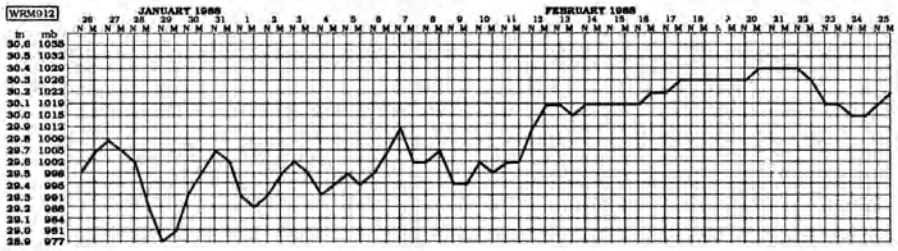


Fig. 7 ▼



wrote Ron Livesey (Edinburgh) in his section report for the BAA. He continued, "Activity was seen from dusk right through to dawn with half of the sky covered north of Inverness, coronal structures seen from Orkney and was "all-sky" north of Wick." This aurora was the finest display seen in Shetland for some years and was reported in the *Shetland Times* and the *Orkney Press* and *Journal*.

"The display was photographed throughout the night by Dr Soper (Isle of Man) showing rayed arcs and bands and similar information also come from Paul Irons (The Wirral) and R. Heathcote in Grantham," said Ron. By February 13, he had received 26 comprehensive reports of glows, rayed arcs, bands and bundles seen during the event by volunteer observers and meteorological officers.

I was not surprised to learn from Ron that marine radio operator, Andy Steven, found that this aurora affected terrestrial radio signals on the 14th and 15th. Some form of aurora was sighted on at least 12 nights during January.

"There were several auroral events in January with some signals heard on the 50MHz band," wrote **Ian Galpin G1SMD** (Poole).

While on the subject of 50MHz, I learnt from a report in the IARU's *Region 1 News* that Dutch amateurs have temporary permission to experiment within the frequency range of 50,000 to 50.450MHz, using AMTOR, c.w., Packet and RTTY modes only, from 1.3.1988 to 31.12.1993. This is good news because they will have use of this interesting band around 1991 when sunspot activity could be at its peak.

Karl Cooper (Kirkwall), tells me that the auroral reports used periodically in the weekly DXers programme (Tuesdays 2115-2130) from Radio Sweden, emanate from the Stockholm Amateur Radio Society.

Magnetic Disturbance

The magnetometer operated by Karl Lewis in Saltash was unsettled on January 2, 5, 7, 8, 11, 14, 15, 17 and 18; very unsettled on the 26th; storm periods between 0915 and 2100 on the 2nd, after 2100 on the 4th; from 1620 to 2130 on the 6th and 0845 to 2100 on the 12th. Karl's instrument went to severe storm after 1600 on the 14th and by 1900 it was exceptional.

Severe magnetic storm conditions were logged by the NOAA Observatory, Boulder, Colorado, for the 14th and 15th.

The fluxgate and jam-jar magnetometers used by David Pettitt (Carlisle) and Owen Pearson in Edinburgh behaved violently in keeping with the intensity of the disturbance.

Propagation Beacons

"9H1AQ, the Immediate Past President of MARL, was instrumental in assisting GW3LDH bring to fruition the idea of a 50MHz beacon in 9H1," says a report in the February issue of *Region 1 News*. This beacon, now operational as 9H1SIX, was presented to MARL last September by Allan and Maureen Wright on behalf of the G . . . Land Six and Four Metre Groups. To mark this fine effort, keep an ear open on 50.085MHz for it's signal and your reports will be welcome in this column and by 9H1ES, Amateur Radio League Malta, P.O. Box 575, Valletta, Malta.

As usual, my thanks are due to **Chris van den Berg** (The Hague), Henry Hatfield, **Don Hodgkinson G0EZL** (Hanworth), **Greg Lovelock G3III** (Shipston-on Stour), **Ted Owen** (Maldon) and **Fred Pallant G3RNM** (Storrington) for their 28MHz beacon logs which enabled me to compile the chart seen in Fig. 6.

Ted Owen logged OH2TEN (28.248MHz) and VK5WI (28.26MHz) for the first time on January 27 and February

19 respectively. Greg Lovelock chalked up 3 new ones, ZD8MB (28.29MHz), ZS5VHF (28.2025MHz) and 5Z4ERR (28.24MHz), on the 21st. "The 5Z4 signal was very brief in appearance at 59+++ and is operated by the Radio Society of Kenya, P.O. Box 45681, Nairobi, from the QTH of 5Z4RT," said Greg.

Excitement this time for Don Hodgkinson when he heard VK6RTW (28.266MHz) on January 26, AX2RSY transmitting "AX2RSY—AUSTRALIA BICENTENARY" on the 27th and February 19 and ZS5VHF, VK5WI, ZD8MB and PT7AAC (28.29MHz) being first heard on February 4, 5, 14 and 21 respectively).

At 1300 on February 5, Fred Pallant heard a transmitter sending "DE SPB" followed by rapid bursts of mark/space on 28.31MHz; "it was like a teleprinter ticking over," said Fred.

Tropospheric

Ian Galpin found the 144MHz band "quite lifty" on January 15, which often happens for a few hours when the atmospheric pressure has rapidly risen above 30.0in and continues to rise.

The atmospheric pressure, recorded at my QTH twice daily, for the period January 26 to February 25 is shown in Fig. 7. Similar results came from Ted Owen who logged a peak of 1034mb on February 21 and a low of 990mb on the 9th. "The barometer has been moving around with those storms," commented Ted.

The next three deadlines are: April 26, June 1 and June 26

Broadcast Round-up

Peter Shore

The frequency change season for 1988 has started: March now has the rather frustrating habit of two changes, one at the beginning and another when the majority of the world's clocks change at the end of the month. This means that it is exceedingly difficult to keep fully abreast of every station's movements around the bands, but in this month's column and next, we'll endeavour to paint as full a picture as possible.

Jamming came to the new 21m or 13MHz band at the beginning of March, when Radio Liberty decided to use 13.69MHz for its transmissions between 0800 and 1300UTC; from March 27, the usage will be between 0700 and 1400UTC. It is doubtful how productive this will be for the station, as it seems that few radio sets in the Soviet Union, to which Radio Liberty broadcasts in Russian and Soviet regional languages, cover this new band. Perhaps Radio Liberty will alter their policy to use this band in the not too distant future, for the benefit of all. Incidentally, 13.69MHz has been used by Radio Moscow's World Service for some months now during the morning period . . .

Meanwhile, Radio Moscow is becoming more adventurous, and now has jingles in its North American service—they need to be heard to be believed. Also on the North American service's *Reviewing Your Letters*, listeners were invited to offer critical comments on the station's output. One Canadian listener's letter was broadcast, which accused the station's news of being biased "when one considers that one can tune in to the BBC or Radio Netherland, and hear news that you haven't heard of". This is a most valid comment, especially if one compares the news output of Moscow with Radio Beijing, which gives a reasonable round-up of international news without perceptible bias of a communist viewpoint.

A historical series is to be heard on Moscow in the 2000UTC transmission, looking at the station during World War Two.

In the unofficial scene, Radio Caroline has been heard testing on 6.21MHz in parallel with 558kHz medium wave in recent weeks, putting in reasonable signals in the west of the UK, and penetrating the European mainland.

A question mark is hanging over the future operation of Radio Australia, as a Government paper has suggested that there is no reason why the station should be part of the Australian Broadcasting Corporation. The station will undoubtedly continue, and quite probably in its present format, but perhaps as a government department.

Another new North American short wave station may start transmitting during 1988—WWCR. World Wide Christian Radio, with a 100kW h.f. transmitter hopes to be on the air in the next few months. Watch this space.

Europe

Radio Tirana appears to have dropped one frequency for its 2230 European English service. This cast is now heard on 9.48 and 1.395MHz.

BRT's new schedule from March 27 for the "Radio World" programme hosted by Frans Vossen is:

Saturday	1330 on 15.59 and 15.51MHz (to Asia)
	1630 on 21.81 and 17.595MHz (to Africa)
	1730 on 11.695, 5.91 and 1.512MHz (to Europe)
	2100 on 9.925, 5.91 and 1.512MHz (N America/ Europe)
	2330 on 11.695 and 9.925MHz (N America and S America)
Monday	0800 on 11.695 and 15.51MHz (Asia and Australasia)

Radio Prague in English at 1430 uses 21.505, 17.705, 15.155, 15.11, 13.715, 11.685 and 9.605MHz, whilst at 1730, the station uses 21.505, 15.11, 13.715, 11.99, 11.685 and 9.605MHz.

The West German station of Deutschlandfunk, heard on 1.269 at 1815UTC, has some interesting features during April and May: on April 12, "Senior Expert Service" looks at the contribution made by retired people to developing countries; on April 26, there'll be a report from the famous Hanover Fair, whilst on May 10, Toby Charles goes up, up and away, visiting the Hanover International Air Show.

From May 2, Radio Budapest will have a new structure for its English service: To Europe 1830 daily, 2000 daily; to North America 2000 six days a week, 0030 daily.

Greece domestic programmes can be heard at 1430 on the new channel of 9.905MHz.

Radio Sweden's s.s.b transmissions which consist in the main of a relay of the domestic P1 programme may end on July 1 as a result of a lack of funds. At present, the programmes are heard:

0200–0300 on 11.95MHz (External service; English 0230)
0600–0930 on 17.77MHz (to 0800 weekdays)
0930–1600 on 21.555MHz
1600–1800 on 15.435MHz
1800–2130 on 11.925MHz
2330–2400 on 11.95MHz (External service)

Radio Moscow World Service at 1700 can prove difficult to hear—one good frequency to try is 9.865MHz until 1800.

With a certain amount of unrest occurring in some regions of the USSR, it might be interesting to listen to the external services of these areas:

Radio Yerevan, Armenia has English to North America at 0355 on 13.645, 11.86, 11.79 and 7.165MHz.

French on Sundays at 0850 on 15.51, 15.485, 15.455 and Monday–Saturday at 2150 on 7.3MHz.

Radio Tashkent has English to Asia at 1200 and at 1330 on 11.785, 9.60, 9.54, 7.275 and 5.945MHz.

Radio Baku in Azerbaijan broadcasts have no English or other European languages, but may be heard from 1200 until 1700 in Turkish, Azeri and Arabic on 6.135 and 6.11MHz.

Africa

The clandestine station Radio Bardai returned to the airwaves at the end of February, using the long-established frequency of 6.009MHz. Casts are heard at 1100 and 1800, with programmes in French, Arabic and vernacular languages. The station is believed to emanate from transmitters in Libya, which backs the rebels fighting the government in Chad, and programmes urge resistance to the government. The station seems not to identify as Radio Bardai any more, but as "Radio Chad, Voix de la Revolution". The reappearance of this station may see an upsurge in fighting in this part of North Africa.

Algeria has English programming at 1900 on 17.745, 15.215, 9.64, 9.51MHz and 981kHz medium wave.

Libya's Arabic programmes from the Voice of the Greater Arab Homeland have been noted using three 19 metre band frequencies during the day: 15.235, 15.415 and 15.45MHz. Usage tends to be irregular, but reception can be good in the UK.

Mali has been heard clearly at 1700 on 11.96, 7.285 and 7.11MHz. In the summer months, the 31m band channel of 9.635MHz may be reactivated by the station.

The frequency of 5.965MHz carries a station in Jos, Nigeria, heard from 0430 with English and Hausa.

A new schedule for Radio RSA was introduced on March 6 with some major changes. The 0200UTC cast to North America is now one hour longer, ending at 0400, whilst the programme for the Middle East and Africa is half an hour shorter, starting at 0400–0430. The 0630 Europe, Middle East and Africa programme has been dropped, whilst the afternoon programme now runs from 1400 until 1600. The evening broadcast at 2100 has been replaced by two separate programmes, one at 1800–1900 for Europe, on 17.88 only, the other at 1900–2100 for Africa. There have been further changes to foreign language programmes as well. The South African station Radio Five was moved to 9.665 during the day, 0530–1530.

Middle East

Kol Israel's new English schedule from March 6:
0000, 0100, 0200 on 9.815, 9.435 and 7.46MHz
0500 on 17.685, 17.62, 13.75, 11.7, 11.655, 11.605, 9.815, 9.435 and 9.01MHz
1100 on 21.625, 17.685, 17.63, 15.65, 15.64, 15.485 and 11.7MHz
1800 on 11.655, 11.585, 9.925 and 9.46MHz
2000 on 13.75, 12.077, 12.025, 11.7, 11.605, 9.815, 9.435 and 9.01MHz
2300 on 15.585, 13.75, 12.077, 11.605, 9.815 and 9.435MHz
2300 Easy Hebrew programme on 12.077, 11.605 and 9.435MHz
The programme will be heard one hour earlier from April 10 when the Israeli clocks change.

Radio Damascus, Syria now uses 9.95 and 11.625MHz for the 1835 German programme, and presumably through to the English broadcasts at 2005 and 2105.

UAE Radio Dubai at 1630 now uses 17.865, 15.32, 11.955 and 11.73MHz for English, with a frequency change at 1645 when 9.64 replaces 17.865MHz.

Asia and the Pacific

Radio Bangladesh in English is heard at 1230 on 17.87MHz and at 1815–1915 on 6.24 and 7.505MHz. Voice of Islam in English from Bangladesh is broadast on 17.87MHz at 0800.

A new service from India in Tamil, directed to the Peace Keeping Forces in Sri Lanka is heard 0700–0930 on 7.205MHz.

English programmes from the Sri Lanka Broadcasting Corporation are heard at 0030–0430 on 15.425, 9.72 and 6.005MHz; 1230–1730 on 9.72 and 6.075MHz and between 1500–1730 on the additional channel on 15.425MHz.

RRI from Indonesia heard via Sri Lanka on 9.551MHz at 0200–0755. Voices of Indonesia transmits in English on 11.788 from 1530. Radio Veritas Asia in English 0130–0155 on 15.365 and 15.33, with the 1500–1530 programme on 9.77 and 15.215.

TWR Guam broadasts:
0805–1100 on 11.805MHz
1500–1620 on 9.82MHz (closing time varies)
The DX programme from TWR is heard Fridays at 0925, Saturday 1515 and Sunday 0845.

The Voices of Vietnam in English at 1600 now uses 15.01 with 9.84MHz in parallel.

South and North America

HCJB has introduced a new progrmme for radio amateurs, *Ham Radio Today,* heard to Europe at 2130 on Wednesdays, with other placings at 0800, 1030, 1206 and Thursdays 0230 and 0630.

WCSN from Boston has its full broadcast schedule transmitted 33 minutes into the second hour segment of its two hour programmes. Alternatively, there is a recorded message with the schedule on 0101 617 450 2060.

The full schedule for KUSW from the USA is Monday–Friday:
0000 on 11.68MHz; 0300 on 9.755MHz
1800 on 15.225MHz; 1900 on 17.715MHz; 2200 on 15.58MHz.
Saturday and Sunday:
0600 on 6.135MHz; 1100 on 9.85MHz; 1600 on 15.225MHz.
WMLK from Bethel, Pennsylvania, has a 50kW transmitter on 9.455, and has been heard with a very weak signal in the UK between 1700 and 2000. There is an additional broadcast at 0400–0700 on the same frequency.

United Nations Radio

Programmes from UN Radio are heard on a number of stations world-wide, including:
Radio Beijing, Saturday 1200 on 15.28, 11.755 and 11.6MHz. All India Radio, Saturday 1345 on 15.335, 11.81 and 9.545MHz. Radio Cairo, Sunday on 11.66 and 9.70MHz. Voice of Congolese Revolution, Tuesday 2015 on 15.19, 9.71 and 7.105MHz; Saturday at 2300 at 15.19, 9.71 and 7.105MHz.

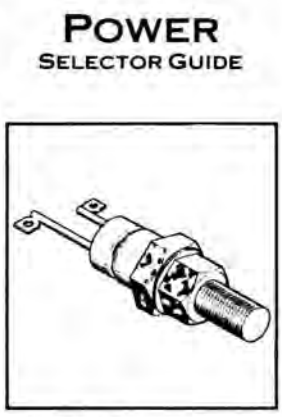
BOOKSHELF

SCANNERS 2 International VHF/UHF Communications Guide
by Peter Rouse GU1DKD
Published by Argus Books
Available from the Practical Wireless Book Service
152 x 233mm, 261 pages. Price £9.95 plus 75p P&P
ISBN 0 85242 924 X

This book is a companion to Scanners. It provides even more information on the use of v.h.f. and u.h.f. communication bands and gives details on how to construct accessories to improve the performance of scanning equipment.

The book is international in scope and contains frequency allocations for all three ITU regions including country by country variations. Also included are international callsigns series, marine allocations, spot frequencies of major world airports, repeaters and beacons. The technical section covers construction of broad band antennas and signal boosters, power supplies, chargers and even a complete 10-channel scanner! Hints are provided on servicing, modifications and useful solid-state devices for experimental circuits.

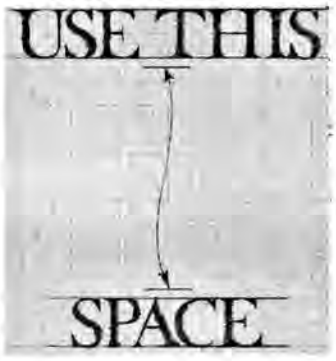
POWER SELECTION GUIDE BP235
by J. C. J. Van de Ven
Published by Bernard Babani (Publishing) Ltd
Available from the Practical Wireless Book Service
130 x 178mm, 160 pages. Price £4.95 plus 75p P&P
ISBN 0 85934 180 1



This book comprises a range of selection tables compiled so as to be of maximum use to all electronics engineers, designers and hobbyists. Section 1 serves as a detailed introduction covering component markings, codings and standards, as well as explaining the symbols used and how the tables are arranged.

Section 2 tabulates in alpha-numeric sequence the technical specifications of over 1000 power handling devices. Section 3 tabulated the technical specifications of diodes according to voltage and current handling capabilities and also considers bridge rectifiers. Section 4 tabulated the technical specifications of thyristors according to voltage and current handling capabilities and also by gate current requirements.

Section 5 is similar to section 4 but deals with triacs. Section 6 tabulates the technical specifications of transistors according to their voltage and current handling capabilities. Section 7 is similar to section 6 but deals with f.e.t.s. Finally Section 8 illustrates the cases, packing outlines and leadouts of the devices.



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.

CONVERT MULTICHANNEL CB to 10m cheaply. Send £2.50 for instructions. A.C.E., 99 Greenheath, Hednesford, Staffs. WS12 4AU.

500 MIXED COMPONENTS. Includes resistors, capacitors, diodes, transistors, etc. £3.50. J. N. KARAJOS, 42 Priory Road, Peterborough PE3 6ED.

RADIO CANADA, Peking, Australia, Voice of America. A Vega 206 (MW/LW/6 × SW) pulls these and dozens more £21.49. Steepletone FM/MW/AIR band pocket radio £9.95. B.F.O. kit resolves SSB signals on nearly any radio £9.95. Year's guarantee. Return despatch. CORRIGAN-RADIOWATCH, Building 109, Prestwick Airport KA9 2RT.

SCANNER MODIFICATIONS., Specialist reception equipment. Extensive frequency listings. For FREE catalogue send large SAE to: S.S.C. PO Box 71, Bournemouth, Dorset BH9 1DL.

FJP KITS COMPONENTS NO V.A.T. ON OUR KITS

Kits at sensible prices. RF.1 Linears for 6-4-2 mtres. A very stable and easy to tune circuit with full constructional details. Spec. 0.5-1.5 watts in for 15 watts/out with heat sink supplied. Gain on 6 mtre 12 db+ with filtering. Fits in Meon box, kit prices all parts unbuilt **£27 & £35** built tested but not boxed. box **£2** extra add **£4.50** if RF switched required 25-35 watt version for 2.5-6 watts input kit **£35.** Built **£40** as above. Intended for FT 290-690 or similar rigs. Postage on linears **£1.00. R.F. preamps** with RF activated switching min gain 15 db low noise uses low noise devise available for 6-4-2 mtres, not boxed, box available as above. Kit **£17.50,** full const details. **R.F. switching** unit with RF attenuation to enable rigs to transvert facility to be used on the Meon or similar transverters up to 10 watts attenuation, also provides PTT switching for external units. Small size. Full constrtn details on P.C.B. Kit **£4.75** built **£6.50.** Post 50p. **Package deals on the P.W. Meon** with **FREE** reprints. 2 mtre IF Meon with the 12 db linear as a kit, inc box, relay switcher P.C.B., RF attenuator, state rig, for 6 mtre only **£73** post paid. Med. Wave RX, two versions, send s.a.e.

PW. Meon for 6-4 mtre with 28-30MHz IF up to 10 watts in state rig and whether PTT switched with above RF1 linear £79.50, post paid. Built units ready to go with all connectors **£110** post paid. Delivery 7-12 working days. Kits same day dispatch on Visa, 7 working days. We are pleased to announce we are able to offer lattice towers for antennas up to 60 ft high and made to your spec. with full wind up facilities and also tilt over full details S.A.E. **P.W. kits phone or write** examples P.W. otter Jan 88 **£48.25,** post 75p. P.W. Dig oscillator Oct 85 **£19** post paid. Med wave RX all parts **£79.50** post paid. Older kits 1979 onwards welcome. SAE A4 Educational kits, enquiries always welcome on simple radio kits at very attractive prices.

Terms cash, cheque/P.O., Visa, Barclaycard. Orders 10am-7pm. Overseas P/P extra. **Telephone 05435-6487.**

FJP KITS COMPONENTS, 63 PRINCESS STREET, CHADSMOOR, CANNOCK, STAFFS, WS11 2JT ENGLAND

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.

CIRCUIT DIAGRAMS

Most Makes, Models, Types, Audio, Music Systems, Colour, Mono Televisions, Amateur Radio, Test Equipment, Vintage etc. £3.50 plus LSAE.
State Make/Model/Type with order.
Full Workshop Manual prices on request with LSAE.

MAURITRON (PW), 8 Cherry Tree Road, Chinnor, Oxfordshire, OX9 4QY.

TECHNICAL MANUALS AR88, CR100, R210, SX28, £4 each. Thousands s.a.e. lists. Bentley, 27 De Vere Gardens, Ilford, Essex IG1 3EB. Phone 01-554 6631.

THE VALVE DATAMAN

1914-1960. For circuits, service sheets, manuals, handbooks on all valve and early transistor equipment including audio, military (British & foreign), radio and T/V. Quotation by return via 'phone or letter (S.A.E.), brochure supplied with S.A.E. Credit card orders taken over the 'phone.

THE DATAMAN, TUDOR HOUSE, COSSHAM STREET, MANGOTSFIELD, BRISTOL BS17 3EN. PHONE: 0272 565472.

Educational

COURSE FOR CITY & GUILDS, Radio Amateurs Examination. Pass this important examination and obtain your licence, with an RCC 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. JX22, Tuition House, London, SW19 4DS. Tel. 01-947 7272 (9am-5pm) or use our 24hr Recordacall Service: 01-946 1102 quoting Dept. JX22.

Wanted

FOR TX RESTORATION, Geloso Miniphase V7M Xtal mixer v.f.o. Tel. 0234 782443.

VALVES TRANSISTORS I.C.s PURCHASED, especially valves type PX4, PX25, KT66, KT88 and equivalents. BILLINGTON VALVES, see our ad under Valves.

For Sale

RARE BITS FOR YAESU. FT401/FT200 breaking up spares – phone. CW filters FT101E/ZD 707 etc. phone. FT101 MK1 – E Ware kit or DBM £20 p.p. S.A.E. details. FM units FT101ZD approx April? Original valves N.E.C. 12BY7A £15 p.p. – 6JS6C NEC £38 matched pair p.p. – 6146B G.E. £27 matched pair p.p. – FT101's repaired and upgraded callers only – Black Star Super 600MHz counters £140 cash/cheque. HOLDINGS AMATEUR ELECTRONICS (G3LLL), 45 Johnston Street, Blackburn, BB2 1EF. (0254) 59595.

USED AMATEUR EQUIPMENT bought, sold, exchanged. SAE for latest list. Secondhand price guide updated monthly. Useful guide for buying/selling, £2. ATU mods add top band to SEM KW, etc £6.50. Call MARTYN G4SUI-GEEFOR ENTERPRISES, 112 Leeds Road, Mirfield, West Yorks. WF14 0JE. Tel: 0924 495916. Personal callers by arrangement.

"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.

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. 5/88

CLEARANCE SALE – Components half price. Transformers, toggle switches, neons, din plugs/sockets etc. SAE to SCHOFIELD, 28 St Albans Road, Lytham St Annes, Lancs. FY8 1TH.

SONY CRF230 World-wide Receiver, 23 wave bands, mint condition, £270.00. 0532 715348 anytime.

Situations Vacant

A.R.E. COMMUNICATIONS LTD.

Due to continued expansion in the field of Amateur Radio Cellular Radio and PMR, **A.R.E. Communications** urgently require a –

SALES EXECUTIVE

The successful applicant must be energetic, of smart appearance, have an electronic background and aged between 22-28 years. Training where necessary will be given. Interested?

Write in the first instance to –

Martin Lynch
Sales & Marketing Director
A.R.E. Communications Ltd.
6 Royal Parade,
Hanger Lane,
Ealing,
London W5A 1ET

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.

Masts & Antennas

250 × 12ft EX-W.D. TANK AERIALS. £250. Buyer collects. Telephone (0473 88276 (Suffolk).

Valves

BILLINGTON VALVES

VALVES, KLYSTRONS, TRANSISTORS

Usually the lowest prices anywhere! Rarities our speciality. Overseas enquiries welcome.

HUGE STOCKS – TRADE/WHOLESALE ENQUIRIES MOST WELCOME

6BZ6 £2.30. 6JB6A £6.25 (matched pair £14). 6JE6C £7.20 (matched pair £16). 6JS6C £7.20 (matched pair £16). Please add VAT @ 15% and £1 P&P.

We wish to purchase valves types PX4, PX25, DA30, KT66, KT88, valve collections, transistors, RF plugs + sockets, shop clearance etc.

For quotations contact Martin Billington

BILLINGTON VALVES, 39 Highlands Road, Horsham, West Sussex RH13 5LP
Phone 0403 864086. Fax 0403 210108. Telex: 87271
Please phone to check office is attended before calling in person.

Software

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.

SSTV FOR ATARI 520/1040 ST

BEYOND DOUBT THE FINEST COMPUTER DECODING OF SSTV WE HAVE SEEN!!

For the first time we offer a programme not written by ourselves. We always said that it would need an exceptional programme for us to take this step, and this programme is exceptional.

The detail and clarity of the display has to be seen. This programme is a must for **ATARI ST** owners.

The programme features 10 picture stores as well as the facility of saving screens to disc, inverse pictures, change greys, etc. etc.

Supplied on disc complete with interface and ready to go. Simply connect to the extension speaker socket on your receiver.

Inc Leads **£35.00**
Programme only: on disc. **£10.00**

Full details of this and other products forwarded on receipt of large S.A.E.

J.B.P. ELECTRONICS LTD.

New Road Complex, New Road, Kidderminster, DY10 1AL. Tel: (0562) 753893

Miscellaneous

G2VF LOOP ANTENNAS COMPLETE WITH ATU FOR HIGH FREQUENCY HAM BAND TRANSMISSION (SWR One to One 40, 15 and 10 and One Point Five to One 80 and 20) **AND 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.** Morse Code Practice Unit **£2.** SAE for details.

F. G. Rylands, 39 Parkside Avenue, Millbrook, Southampton SO1 9AF
Tel. (0703) 775064

HRO RECEIVER MANUALS £4 small supply. F. RYLANDS, 39 Parkside Avenue, Southampton SO1 9AF.

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 Fluxcore Solder	3.97	2.41	1.39	0.94
	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.

MICROWAVE TRANSISTORS and Devices for Industrial use. Quotation sent on request. TSUTOM YOSHIHARA, C1-105, Deguchi-cho 34, Suita-shi, Osaka 564, Japan.

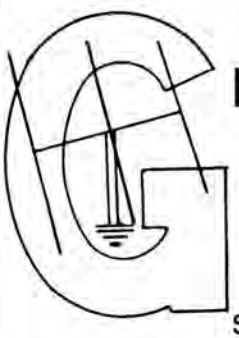
50 CIRCUIT DIAGRAMS, transmitters, receivers, test equipment, power supplies, metal detector etc., £5.00 including p&p. O.H.C. ENTERPRISES, Donamon, Co. Roscommon, Eire.

HEATHKIT U.K. Spares and Service Centre. CEDAR ELECTRONICS, Unit 12, Station Drive, Bredon, Tewkesbury, Glos. Tel. (0684) 73127.

SUSSEX MOBILE RALLY, Brighton Racecourse. Sunday 10th July. Family Fun Day starts 10.30. (04446) 3757 Evenings.

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.

INDEX TO ADVERTISERS



USED AMATEUR EQUIPMENT?

I Buy, Sell & Exchange!

Whether SELLING or BUYING, if you're talking TOP QUALITY USED AMATEUR EQUIPMENT.

Phone G4TNY for the BEST deals around !!

Phone Dave on 04024 57722 or 0836 201530, 9am to 7pm, Mon to Sat

Ask about our new 'RIGSEARCH' services.

Send SAE for lists. Personal callers by appointment, please.

G4TNY AMATEUR RADIO

MAIL ORDER **132, Albany Road, Hornchurch, Essex RM12 4AQ** **PART EXCHANGE**

YOUR LOCAL DEALERS

STOKE ON TRENT

MRZ COMMUNICATIONS LTD

ICOM – Amateur/PMR/Marine/Air.
YAESU – Amateur MRZ Desk PSU for ICOM/YAESU Portables.
UK and EXPORT

Tel: (0782) 619658

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

Telecomms

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

LONDON

D & D ELECTRONICS (Kennington)

The sort of shop you used to see in Lisle St. All sorts of surplus supplies, so come along and browse or send SAE for info. sheets.

3a Braganza Street
London SE17 3RD
Tel: 01-793 0054
(Open 6 days a week)

LONDON

AMCOMM OF LONDON

Approved dealer for Yaesu and Icom

373 Uxbridge Road, London W3 9RN
Tel: 01-992 5765

(Mail order a speciality)

DERBYSHIRE

Lowe Electronics

The official importer of the Kenwood range of equipment (See main ad. for the full list of all our shops)

Chesterfield Road, Matlock, Derbyshire, DE4 5LE
Tel: 0629 2817/2430/4057

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)

PLEASE MENTION PRACTICAL WIRELESS WHEN REPLYING TO ADVERTISEMENTS

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

RADIO SHACK *FOR SCANNERS – AND AMATEUR EQUIPMENT*

SPECIAL OFFER ON

MILLIONS OF FREQUENCIES!

★ ★ ★

FREE WITH EVERY SCANNER

★ ★ ★

★ The complete VHF/UHF frequency guide
★ VHF/UHF airband frequency guide
★ Batteries
★ Carriage
★ DC lead with Pro 2004

Bearcat BC-200FB 16 channel	**£159.00**
Pro 20/21 200 channel mains/mobile	**£219.95**
Pro 32 200 channel hand-held	**£249.95**
Pro 2004 300 channel, 10 search range, AC/DC	**£349.95**

Immediate despatch from stock.

MAIN AGENTS FOR

ICOM KENWOOD YAESU

ICOM
TANDY COMPUTERS AND PRODUCTS

APPROVED KENWOOD DEALER

PSION ORGANISERS

AND ALL LEADING MAKES

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.

ICOM

Count on us!

IC-735 Compact HF.

As predicted the Icom IC-735 has rapidly gained the reputation it deserves. This compact transceiver is ideal for mobile, portable or base station operation. It has a general coverage receiver from 0.1Mhz to 30Mhz with superb sensitivity in all modes, SSB, CW, AM and FM. Spectacular specifications are also achieved on RF Intercept, Dynamic Range, Reciprocal Mixing and I.F. Blocking. As HF conditions improve over the next few years it is equipment like the IC-735 that will provide clear reception even under the worst pile-ups.

The IC-735 has a built-in receiver attenuator, preamp, noise blanker and RIT passband tuning and a sharp IF notch filter ensures clear reception. The twin VFO's and 12 memories can store mode and frequency. Scanning functions include program scan, memory scan and frequency scan. The HM12 scanning microphone is supplied.

RF output is approximately 100 watts and can be continuously adjusted down to 10 watts. The IC-735 is one of the first HF transceivers to use a liquid crystal display, which is easily visible under difficult conditions. Controls that require rare adjustment are situated behind the front cover but are immediately accessible.

Options include the PS-55 AC Power Supply, AT150 Automatic Antenna Tuner, AH2a Automatic Antenna Tuner, SM6 and SM8 Desk Mics, SP7 External Loudspeaker. Why not find out more about the IC-735 contact your local ICOM dealer or contact ICOM (UK) LIMITED.

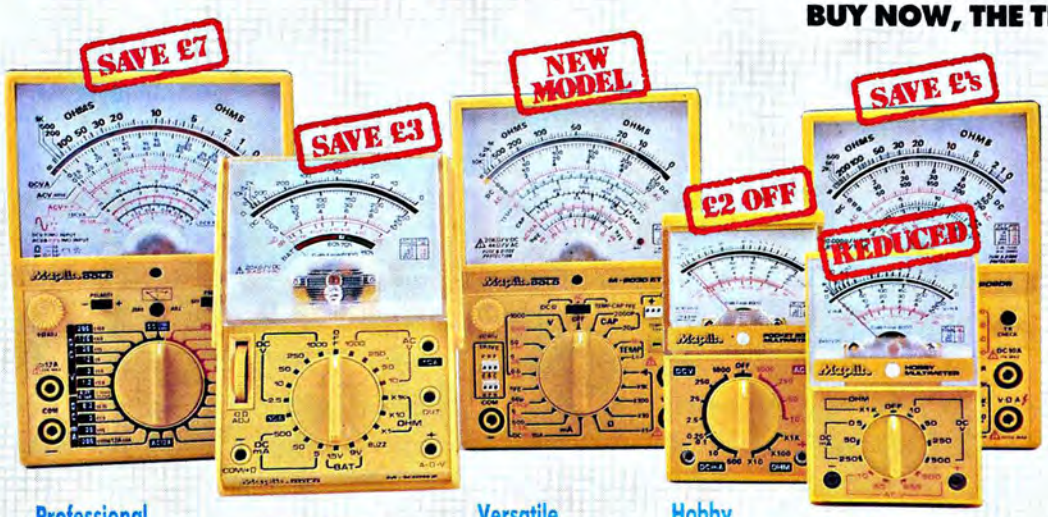
Icom (UK) Ltd.
Dept PW, Sea Street, Herne Bay, Kent CT6 8LD. Tel: 0227 363859. 24 Hour.

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

The Dollar has fallen... and so have our Prices!!

PRECISION GOLD MULTIMETERS-OUTSTANDING VALUE FOR MONEY!

BUY NOW, THE TIME IS RIGHT!



Professional
Has all the ranges!
YJ09K ~~£34.95~~
£27.95

Wide Range
With battery tester.
YJ07H ~~£14.95~~
£11.95

Versatile
Measures temperature and capacitance.
YP23A
£24.95

Hobby
Ideal for beginners.
YJ76H ~~£8.95~~
£6.95

Pocket
Rugged, general purpose.
YJ06G ~~£6.95~~
£5.45

Comprehensive
With transistor, diode and LED tester.
YJ08J ~~£19.95~~
£16.95

All prices include VAT. Please add 50p towards postage. All items subject to availability.

Precision
High sensitivity on AC current & resistance.
YJ10L ~~£41.95~~
£36.95

Auto Ranging
Top selling digital.
YJ80B ~~£39.95~~
£35.95

Practical
Includes temperature probe.
YJ79L ~~£64.95~~
£54.95

Feature Packed
Auto-ranging with transistor tester.
YM64U ~~£44.95~~
£37.95

4½ Digit
Superb multi-featured multimeter.
YJ81C ~~£69.95~~
£59.95

Hobby
Enthusiasts meter.
YM63T ~~£28.95~~
£25.95

Push Button
Comprehensive range of features.
YJ78K ~~£39.95~~
£35.95

Low Cost
Push button digital.
YJ77J ~~£26.95~~
£21.95

Plus ORDER NOW AND GET A ***FREE*** CARRYING CASE WITH YOUR METER (WORTH UP TO £3.95)

Maplin ELECTRONICS

P.O. Box 3, Rayleigh, Essex. Telephone Sales (0702) 554161.

Shops at: Birmingham. Sutton New Road, Erdington. Tel: 021 384 8411.
Bristol. 302 Gloucester Road. Tel: 0272 232014.
London. 159-161 King Street, Hammersmith W6. Tel: 01 748 0926.
Manchester. 8 Oxford Road. Tel: 061 236 0281.
Southampton. 46-48 Bevois Valley Road. Tel: 0703 225831.
Southend-on-Sea. 282-284 London Road, Westcliff-on-Sea, Essex. Tel: 0702 554000.

Pick up a copy of our 1988 catalogue from any branch of **WHSMITH** for just £1.60. Or to receive your copy by post send £1.60 + 40p p&p to our P.O. Box address. If you live outside the U.K. please send £2.75 or 12 International Reply Coupons.

We're passing on our exchange rate saving to you!