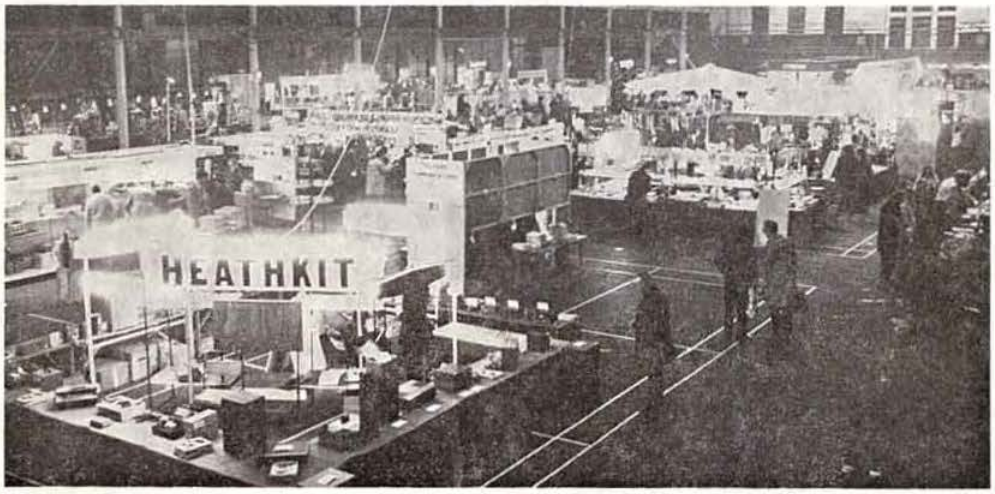
radio communication

December 1974

1974 ARRA Exhibition, Leicester



ABOVE
A general view of the exhibition

LEFT
The RSGB bookstall

journal of the Radio Society of Great Britain

radio communication

Volume 50 No 12 **December 1974** Price 40p

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South Midlands Communications Ltd
TOTTON SOUTHAMPTON

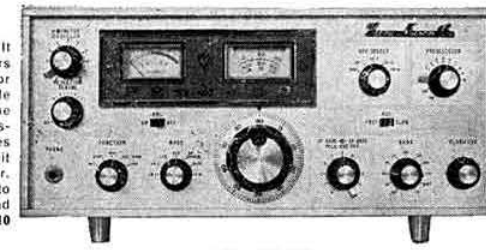
Happy Christmas from All Our Staff

MARY, SHE, DAPHNE, NIGEL, CHRIS, BARRY and those you seldom meet. Season's Greetings to all our New and Old customers whom we were pleased to serve through the previous section of our business known as Western Electronics, (although we now have no connection with the company now trading in succession to us with that name.)

IN STOCK AT TOTTON

YAESU

The FR400SDX (Super de luxe) receiver is ex-stock in Totton. It covers 160, 80, 40, 20, 15, 11, 4 and 2 metres. Four mechanical filters are fitted, for SSB 2·4kHz, for a.m. 5 kHz., for cw 600 Hz. and for FM an obese 24 kHz. Dial readout to 1000 cycles from super stable VFO. Rejection tuning to notch out unwanted heterodynes. The clarifier control permits adjustment of tone when working transceive with the matching FL400 transmitter. Monitor facility enables transmitted signal to be checked at all times. Squelch circuit silences receiver for noise free FM reception via the discriminator. A 25/100kHz. calibrator is fitted and a WWV band is provided to zero beat the internal crystal sub-standard. Switchable AGC and built in noise limiter. **£210**



(Ex stock)

YAESU PRICES (Carriage paid, by Securicor)

H.F. TRANSCEIVERS		LINEAR AMPLIFIERS		V.H.F. TRANSCEIVERS		TEST EQUIPMENT		H.F. RECEIVERS	
FT-101B	£330.00	FL2100B	£195.00	FT-220	£264.00	YO-100	£93.00	FR50B	£80.00
FT/FP200	£215.00	FL2500	£150.00	FT-2FB	£115.00	YC-355	£99.00	FR400SDX	£210.00
FT/FP501	£428.00	FL-2000	£195.00	FT-2AUTO	£157.00	YC-355D	£127.00	FR-101D	£330.00
FT-401	£310.00			Sigmasizer	£180.00			FR101S	£245.00

BELCOM LINER II (*Carriage extra*)
Ever Popular 2 metre SSB Fixed/Mobile Transceiver 10W p.e.p. 144·1 to 144·34 **£145.00**

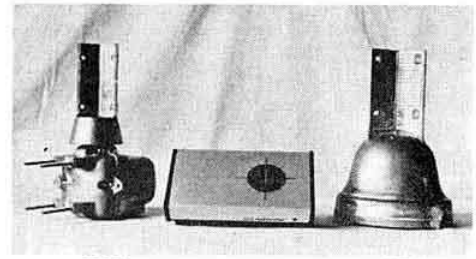
NEW 70cm TRANSVERTER (p. & p. 30p)
Microwave Modules 4W Linear output. High Quality Receiver converter **£62.00**

NEW CONTROL BOX CD44/HAM II

NEW CDE ROTATORS
(All ex stock in Totton)

Carriage (B.R.S.) Free Securicor delivery 50p. extra

AR30 for Stereo FM, T.V., and small VHF beams	£25.00
AR40 for Medium VHF arrays, Small HF beams	£30.00
CD44 Arrays up to 2½ sq. ft. of wind area	£60.00
Ham II Arrays up to 7½ sq. ft. of wind area	£90.00



AR30 **AR40**

MICROWAVE MODULES
(All 28-30 MHz IF: others to order)
Post and packing 30p.

144 MHz Converter All Mosfet (116 MHz crystal)	£15.20	432 MHz Converter Mosfet Mixer (101 MHz crystal)	£18.1
144 MHz Converter with local oscillator output	£16.30	1296 MHz Converter Schottky Mixer Mosfet Amp	£24.00
144 MHz Pre-Amp with two isolated outputs	£9.00	432 MHz Transverter 4W output	£62.00

SHURE (p. & p. 30p)

444—Desk Mic. **£15.30** 444T—444 with Amp **£17.20** 401B—Hand-Low Z **£7.20** 201—Hand-Hi Z **£6.00**

KW (Carriage extra) ANT switches **£5.50** Dummy Load **£8.50** KW107 **£60.00** KW103 **£13.00** EZ Match **£20.00**

SECONDHAND AND SHOP SOILED LIST—Phone 04216-2785 for latest

YAESU SHOP SOILED		YAESU SECONDHAND		TRIO		TELFORD		DRAKE	
FT-501	£375.00	FT-101 MkII	£270.00	JR5000S	£55.00	TC9	£65.00	R4C	£255.00
FT-401	£275.00	FR500SDX	£155.00	TS510	£155.00	TC5	£28.00	INOUE	
FT-2FB	£95.00	YC305D	£85.00	JR310	£75.00	NATIONAL		IC20	£60.00
FT2 Auto	£130.00	FT-501	£320.00	HEATH		NCX5	£180.00	EDDYSTONE	
FL2000B	£195.00	FL200B	£155.00	Mohican	£25.00	BC221	£15.00	888	£55.00

All secondhand items over £40 Guaranteed 3 months (labour) and free securicor delivery

Please Note in this advertisement prices DO NOT INCLUDE VAT (8%)

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BARCLAY CARD

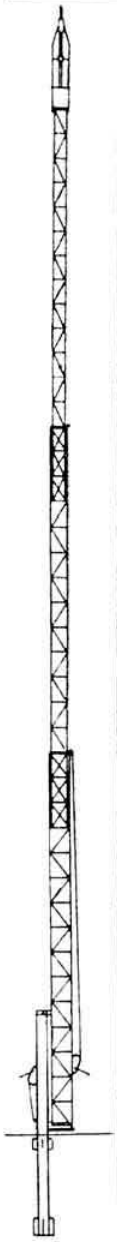
Just phone in your order for same day despatch of ex-stock items or if you prefer use:

TRICITY FINANCE

MASTS & ANTENNAS

AMATEUR & COMMERCIAL

SMC



NEVER BEFORE IN THE FIELD OF AMATEUR RADIO HAS SUCH A RANGE BEEN OFFERED!

VERSATOWERS Illustrated left. Tilting Telescopic 25-120'

HAM TOWERS Galvanised Lattice 10' Sections, 30' high.

TELOMASTS Galvanised Steel Telescopic 10' Sections, 30-50' high

ALIMASTS Aluminium Alloy Telescopic 1·5, 2, 3 metre sections, 6-21 metres high.

JAYBEAM THE COMPLETE RANGE (AND MORE!) (Carriage extra)

NEW 2 METRES Ready for January Lifts? The 14Y/2M, 14 element Skybeam. Long Yagi with 14·5dB gain from only a 17' 5" boom stacks at 132" Available only from S.M.C. **£14.00**

NEW 70 cms Set for Oscar 7? The 12XY/70, 12 element crossed Yagi, complete with phasing harness for circular polarised fade free space communications. Now in stock **£16.70**

OMNI-DIRECTIONAL				
HO/2M	Halo head only	−3bB	60 ohm	**£1.85**
HM/2M	Halo with mast	−3dB	60 ohm	**£2.20**
UGP/2M	Ground plane	0dB	60 ohm	**£4.15**
XD/2M	Crossed dipoles	−3dB	60 ohm	**£5.75**
CIRCULAR				
XD/2M	Crossed dipoles	0dB	60 ohm	**£5.75**
5XY/2M	5 element crossed	7·8dB	50 or 75 ohm	**£8.20**
8XY/2M	8 element crossed	10dB	50 or 75 ohm	**£10.20**
LLXY/2M	10 element crossed	13dB	50 or 75 ohm	**£14.10**
4 METRES				
4Y/4M	4 element	7dB	50 ohm	**£6.80**
BEARINGS				
RZ100	Alignment bearing			**£7.60**

YAGI'S				
5Y/2M	5 element Yagi	7·8dB	60 ohm	**£4.30**
8Y/2M	8 element Yagi	10dB	60 ohm	**£5.60**
10Y/2M	10 element long Yagi	13dB	50 or 75 ohm	**£11.00**
14Y/2M	14 element long Yagi	14·5dB	50 or 75 ohm	**£14.00**
SLOT-FED				
D5/2M	5 over 5	10·3dB	50 or 75 ohm	**£7.92**
D8/2M	8 over 8	12·6dB	50 or 75 ohm	**£10.50**
PARABEAM				
PBM14/2M	14 element parabeam	15·2dB	50 or 75 ohm	**£16.90**
70 CENTIMETRES				
D8/70	8 over 8	12·6dB	50 ohm	**£9.00**
PBM18/70	18 element parabeam	16·5dB	50 ohm	**£10.90**
MBM46/70	46 ele Multibeam	17.3dB	60 ohm	**£12.10**

PHASING AND MATCHING HARNESSES AVAILABLE

PMH/2C	Circular pole	144MHz	50 or 75 ohm	**£2.85**	PMH2/4M	2 way P/H	70MHz	50 ohm	**£5.30**
PMH2/2M	2 way P/H	144MHz	50 or 75 ohm	**£3.95**	PMH2/70	2 way P/H	432MHz	50 ohm	**£3.30**
PMH4/2M	4 way P/H	144MHz	50 or 75 ohm	**£9.15**	PMH4/70	2 way P/H	432MHz	50 ohm	**£6.85**

HY GAIN ANTENNAS

Hy Gain 18AVT/WB the great wide-band self supporting vertical (for 10-80 metres.) (ex stock). Take the wide band, omnidirectional performance of Hy Gain famous 14AVQ/WB add 80 mtrs. plus extra heavy duty construction and you have the new 18AVT/WB. True ¼ wave resonance on all bands + 52Ω IP + SWR of 2:1 or less at band edges + 1kW (AM) + Radiation pattern has an outstandingly low angle + Roof or ground mounting.

HY GAIN (carriage paid)

Hy Tower, 10-80m, Self supportingtower	**£132.00**	TH2 Mk. 3 10-20m. 3 element 600W	**£62.00**	103BA 10m. 3 element beam	**£35.00**
18V, 10-80m. Vertical self supporting	**£15.50**	Hy Quad 10-20m. 2 element 40m.	**£90.00**	LA 1 Lightning arrestor	**£17.50**
12AVQ, 10-20m. Vertical self supporting	**£20.00**	DB10-15A 10 and 15m. 3 element beam	**£69.00**	LA 2 Lightning arrestor	**£3.00**
14AVQ, 10-40m. Vertical self supporting	**£29.50**	DB24B, 3 element 20m. 2 element 40m.	**£129.00**	12RMQ Roof mounting kit	**£11.00**
LC80Q Loading coil for AVQ, 80m.	**£9.30**	402BA, 40m. 2 element	**£110.00**	14RMQ, Roof mounting kit	**£13.00**
18AVT/WB 10-80m. Vertical	**£42.50**	204BA 20m. 4 element beam	**£96.00**	400 Rotor	**£139.00**
TH6DXX 10-20m. 6 element beam	**£117.00**	203BA 20m. 3 element beam	**£87.00**	BN86 Balun	**£9.50**
TH3 MK3 10-20m 3 element beam	**£90.50**	153BA 15m. 3 element beam	**£44.00**	TH3 Jnr 10-20m. 3 element 600W	**£62.00**

G-WHIP The British mobile HF ANTENNA (carriage 75p)

TRI BANDER	10-20m. **£12.30** Base	**£1.85**
	Resonators LF 40-160 at	**£4.10**
	Whip for LF coil	**£1.10**
MULTIMOBILE 71	10-20m. **£14.30** Base	**£1.52**
	Resonators MM 40-160 at	**£4.10**
	Whip for MM coil	**£1.10**
FLEXIWHIP	10m **£9.50** (Base fitted)	
	Resonators FF 15-160	**£4.25**
RANGER	160m	**£7.50**

S.M.C. TRAPPED DIPOLES (carriage paid)
Standard 10-80m 14SWG hard drawn **£16.00**, High power as standard but 1kW p.e.p. **£18.50** Portable copper/terylene braid with coax **£17.25**

WIGHTRAPS (carriage 25p)
Standard, white, 10-80m, **£2.85** High power, blue, 10-80m **£4.10**

MOSLEY TRI BAND (10-15-20m) BEAMS (carriage £1.75)
TA33 Jnr E 3 ele, 200W RMS, **£39.80** TA32 Jnr E 2 ele, 300W AM, **£28.50**
Mustang 3 ele, 2kW PIP **£55.00** Mustang 2 ele, 1kW AM, **£42.00**

BANTEX FIBREGLASS VHF MOBILE ANTENNAS (carriage 75p)
B5 ⅝ 144MHz **£5.00**. BGA ½ 144MHz **£6.60**. B5U ⅝ 432MHz **£5.00**. 70/½ ¼ 70MHz **£3.00**. Magnetic Base Mount **£7.50**. Trunk Lip Mount **£5.10.** Note deduct 50p from price if standard base is not required.

R.F. CABLES (carriage up to 20m 40p over 50p less for lighter cables)

50 ohm RG8U/UR67	**33p/m**	75 ohm UR39	**25p/m**
75 ohm UR57	**33p/m**	75 ohm Economy	**10p/m**
75 ohm BICC 2378	**22p/m**	75 ohm Flat twin	**6p/m**
50 ohm UR43/UR76	**15p/m**	300 ohm Ribbon	**6p/m**

COAX PLUGS (p and p extra)
PL259 **42p**, UHF Chassis socket **33p**, N plugs PL259A **54p**, Reducers **12p** UHF Angle **90p**, VHF back to back **66p**.

VAT NOT INCLUDED (8%)

SOUTH MIDLANDS COMMUNICATIONS LTD

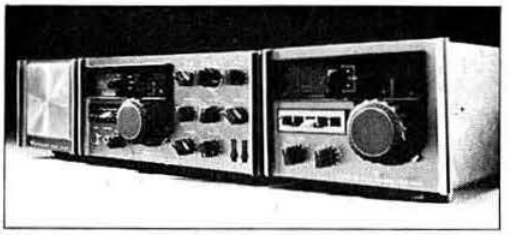
Formerly trading as South Midlands Construction Ltd. and Western Electronics (U.K.) Ltd.

OSBORNE ROAD, TOTTON, SOUTHAMPTON SO4 4DN. **TELEPHONE: TOTTON (04216) 4930 or 2785.**

A MEMBER OF THE ARRA
Agent: Brian G3ZUL, Droitwich (09057 4510).
Hours of business: 9-5.30 9-12.30 Sat.
CABLE: "AERIAL SOUTHAMPTON"

LOWE ELECTRONICS

TRIO FOR HF



TS900

Top of the line. 300W p.e.p. 0·1μV sensitivity. All modes including RTTY. Vox, mox, PTT. The rig with **everything**.

£480 (VAT exc)

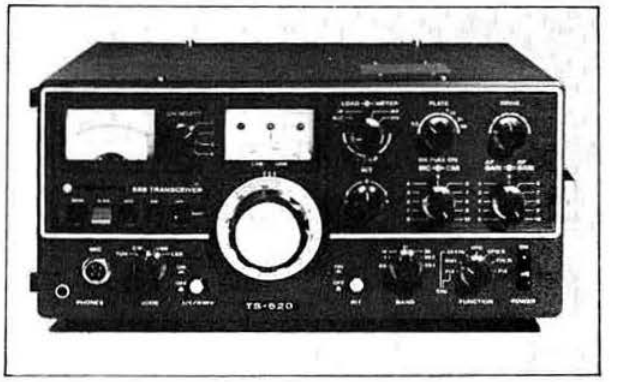
Optional remote VFO 900 available.

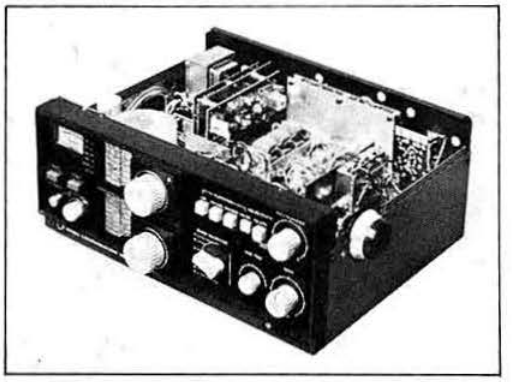
TS520

The go-anywhere rig. AC mains or 12v operation built-in. Speech compression built-in. Marker built-in. Vox built-in. Superb RX performance and unbeatable transmit voice quality.

£290 (VAT exc)

Optional remote VFO 520 and speaker SP 520 available.





QR666

New general coverage receiver. 3 way power supply, AC mains, 12v external supply or built-in batteries. 170kHz-30MHz coverage. Product detector. 2 position selectivity.

£130 (VAT exc)

Optional broadcast FM unit and marker unit available.

SPECIAL CHRISTMAS OFFER

The following equipment, outside our new product line, is to be cleared at unrepeatable prices.

LIMITED STOCKS ONLY

FTdx401 (latest model with AM)	£260.00
FT501 with PSU (latest model)	£380.00
FV401	£35.00
SP401	£10.00
FV200	£30.00
DC200	£30.00
FV50B	£20.00
Sigmasizer	£130.00
FT-2 Auto	£120.00
FT220	£220.00
Multi-2000	£230.00
Inoue IC210	£216.00

ANTENNAS

Asahi AS21 15m 3 element small beam	£20.00
AS23 15 and 10m 3 element small beam	£25.00
AS153W full size 3 element 15m beam	£20.00
AS154W full size 4 element 15m beam	£30.00
AS203W full size 3 element 20m beam	£40.00
AS104W full size 4 element 10m beam	£20.00
Diamond DP-KB103 80 and 40m verticals	£20.00

CASH AND CARRY OR £2.20 EXTRA SECURICOR

TRADE-INS WELCOME EASY TERMS PRICES INCLUDE VAT

LOWE ELECTRONICS

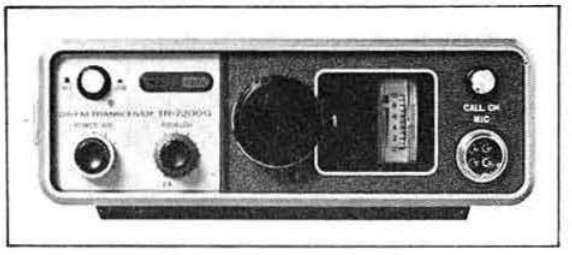
TRIO FOR VHF

TS700 Specification

FREQUENCY RANGE	*144–146MHz*
MODES	*usb, lsb, cw, am, fm*
VFO COVERAGE	*144–145 and 145–146 MHz*
CRYSTAL OUTPUT	*22 Channel capability*
POWER OUTPUT	*10W minimum*
ANTENNA IMPEDANCE	*50 ohms*
CARRIER SUPPRESSION	*50dB*
SIDEBAND SUPPRESSION	*Greater than 40dB*
SPURIOUS RADIATION	*Better than — 60dB down in all modes*
DEVIATION	*± 10KHz or ± 3KHz*
REPEATER TONE	*750–Hz Tuning Fork Oscillator*
IF	*10·7MHz for ssb, am, cw, single Conversion* *10·7MHz and 455KHz for fm, double Conversion*
SENSITIVITY	*0·5V for 10dB S ÷ N/N*
IMAGE REJECTION	*Greater than 60dB*
IF REJECTION	*Greater than 60dB*
IF SHAPE FACTOR	*Better than 2·1 all modes*
AF OUTPUT	*Greater than 2W into 8 ohms*
STABILITY	*Better than 200Hz in any 30 min. period after warm-up*
REPEATER SHIFT	*Standard 600KHz transmit downshift provided*
CALIBRATOR	*Built-in 1MHz Calibration points*
DIAL READOUT	*To better than 1KHz all modes*
R.I.T.	*4KHz shift of receiver with respect to transmit frequency*
NOISE BLANKER	*Advanced circuitry noise blanker for noise free mobile or fixed operation*
ALC INPUT	*Socket provided for ALC input from linear*
AUX RELAY	*Socket provided for switching external linear*

POWER REQUIREMENTS	*120/240V 50/60Hz ac ; 12–16V dc negative earth*
CONSUMPTION	*Receive 45 watts ac ; 800 ma dc* *Transmit 95 watts ac ; 4A dc*
DIMENSIONS (mm)	*278 wide × 124 high × 320 deep*
WEIGHT	*11kg 24·2 lb*

Price £300 (VAT excl)



TR7200G 2m Mobile Transceiver

22 Switch selected transmitting and receiving frequencies in the 2m FM band between 144MHz and 146MHz, five of which are factory-equipped with TX and RX crystals. Illuminated channel indication.

Channels Fitted 145·50 Simplex 145·15/75 Duplex
145·525 Simplex 145·175/775 Duplex
145·55 Simplex

Price £125 (VAT excl)

TR2200G

The world's most popular 2 metre handy transceiver now comes complete with tuning fork controlled repeater access tone and facilities for 12 channels. With the advent of repeater operation in this country, it is now possible to work long distances with low power equipment and the sudden popularity of portable 2 metre equipment testifies to this fact. The TRIO TR2200G is a high performance transceiver with features not found in other rigs. Supplied with 3 channels fitted:

145·50 Simplex
145·55 Simplex
145·175/775 Duplex

Most other I.A.R.U. channels available.

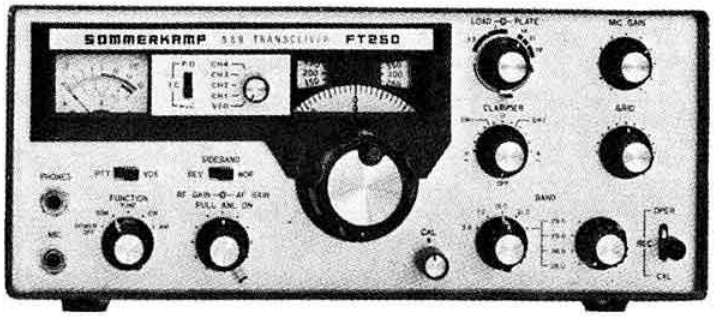
Price £80 (VAT excl)

REMEMBER! IC210 STILL AVAILABLE AT £200 (VAT EXC.)
2 METRE FULLY TUNABLE. PHASE LOCK VFO. AC/12V OPERATION

HEAD OFFICE **119 Cavendish Road, Matlock, Derbyshire. Tel. 2817 or 2430**
BRANCH OFFICES Goring Road, Steyning, Sussex. Tel. Steyning 814466
Soho House, 362-4 Soho Road, Handsworth, Birmingham Tel. 021-554 0708
AGENTS Alan GW3YSA. 35 Pen-Y-Waun, Efail Isaf, Nr. Pontypridd. Tel. Newton Llantwit 3809
John G3JYG. 16 Harvard Road, Ringmer, Lewes, Sussex. Tel. Ringmer 812071
Sim GM3SAN. 19 Ellismuir Road, Baillieston, Nr. Glasgow. Tel. 041-771 0364

MANY MORE EXCITING TRIO MODELS AVAILABLE. JUST ASK US!

73 from BILL G3UBO/VE8DP, ALAN G3MME, JOHN G3PCY/5N2AAC, IAN G3ZYC



FT250

Power Input SSB 240W PEP

Receiver Sensitivity: 0·5μV at 10dB S/N

Selectivity: SSB 2·3kHz at 6dB Crystal Filter MOX-VOX-PTT operation

Covers 80m-10m

WE ARE ABLE TO OFFER THIS EXCEPTIONAL TRANSCEIVER AT ONLY £150.00

LOOK BELOW FOR OUR SPECIAL PRICES

HF TRANSCEIVERS		**VFO's & SPEAKERS etc.**	
FT201	N/A until January	FP250/200	£45.00
FT250	£150.00	FV401	£41.00
FT505	£255.00	SP401	£10.00
FT277B/101B	£295.00	FV277/101	£42.00
FT501D	£350.00	SP277/101	£12.00
TS288A	£325.00	FP501D	£48.00
FT200	£150.00	SP277P	£30.00
HF RECEIVERS		**HF TRANSMITTERS**	
FR101DL	£305.00	FL101	N/A until January
FRDX500	£188.00	FLDX500	£205.00
TEST EQUIPMENT		**MICROPHONES**	
YC355D 200MHz	£130.00	YD844 TABLE MIKE	£15.00
Y0100	£90.00	YD846	£5.50
LINEAR AMPLIFIERS		**VHF TRANSCEIVERS**	
FL2277	£180.00	FT220	£245.00

All prices are exclusive of VAT *FREE DELIVERY*

NEW! 2m Transverter in matching cabinet for FT101/277 150w available soon. Reserve your unit now!

ALSO RTTY converters and slow scan TV systems to match FT101/277. Available shortly.

AGENTS: T.M.P. Electronics (North Wales) Tel. Pontybodkin 846
Lee Electronics, 400 Edgware Road, London W2. Tel. 01-723 5521

Communique

129/131 PARK ROAD, LONDON, NW8
Tel: 01-262 6669. Callers welcome

Communique Antennae Division

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High Quality German Aerials

Guaranteed light metal alloys without traces of lead, copper and zinc. These provide high resistance for corrosion even in smog and salty air areas. All threaded hardware is stainless steel and will resist salt water spray.

FRITZEL beams are easy to assemble. All holes are pre-drilled, all critical parts are marked and a tape measure is not required.

Baluns are built in, giving additional BCI and TVI protection.
FRITZEL beams can be expanded from the simple rotary dipole FB13 to the 5-element beam FB53, as your budget allows.

2KW 10-15-20m BEAMS	
FB33 3-ELEMENTS	£95.00
FB53 5-ELEMENTS	£119.00
FB23 2-ELEMENTS	£64.00
FB13 ROTARY DIPOLE	£36.00

VERTICAL TRAPPED ANTENNAS	
GPA 3V 20-15-10m	£20.95
GP4A 40-20-15-10m	£29.10
GPA5 80-40-20-15-10m	£35.95
Set of radials for all verticals	£2.50
Stand Off Brackets	£3.55

2 METRE BEAMS & 136MHz	
4-ELEMENT BEAM	£5.20
8-ELEMENT BEAM	£8.25
10-ELEMENT BEAM	£11.50
UYOY FOLDED DIPOLE	£4.00

5kW 10-15-20m BEAMS	
FB333 5-ELEMENT BEAM	£130.00
FB73 7-ELEMENT BEAM	£151.00
FB233 4-ELEMENT BEAM	£81.00
FB133 3-ELEMENT ROTARY DIPOLES	£55.00

HORIZONTAL ANTENNAS	
W3022 500W DIPOLE & BALUN	£15.95
W3022 2kW DIPOLE & BALUN	£19.95
FD4 80-40-20-10m DIPOLE	£2.75
FD3 40-20-10m DIPOLE	£11.25
80-40m DOUBLET DIPOLE	£14.25

BALUN & LIGHTNING ARRESTERS	
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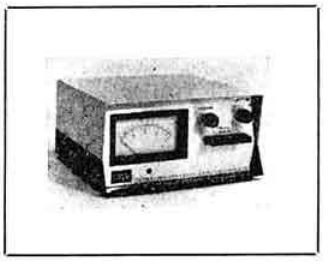

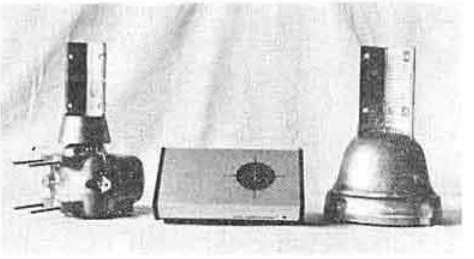

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A Seasonal Message From The President

It is a pleasure for me at the end of the year to address a Christmas and New Year message to members of the Society.

The year has been marked by more than an average number of Official Regional Meetings; at Belfast, Lancaster, Southampton, Swansea and Dundee, and for the first time the Membership & Representation Committee has met in the provinces; at Bristol, Manchester and Peterborough. At all these meetings it has been evident to me that there is enthusiastic support for the Society.

During the year a number of new ideas have been proposed, some have been accepted and others are still under review.

We are now a year nearer the 1979 WARC and we should all do as much as possible to ensure that amateurs obtain and retain a fair frequency allocation for their future needs.

May I encourage all of you to enlist as many of the licensed non-members as possible to support the Society for our common good.

I wish you all, friends new and old, a happy Christmas and a successful New Year.

G. R. Jessop, G6JP

CURRENT COMMENT

"Future of the Society"

Several letters have been received concerning the Council minute "Future of the Society" published in the November issue. This was not a statement of Council policy but was an example of the type of discussion that takes place at Council meetings but normally published in abbreviated form in "Council Proceedings".

The Council is very pleased at this response and invites further constructive proposals with regard to the issues raised and other matters important to the future of the Society and amateur radio.

The following members are particularly thanked for their letters: G3XIW, G8GGP, G8EQT, G8ECO, G8JAH, G8CGA, G8EUX, G3VYZ, G8AZM, G4BGP, G8BAM, GM8BBA, GC8GGC, G8AGO, G3SWP, GM8FHK and G8CZW.

QTC AMATEUR RADIO NEWS

The 1974 ARRA Exhibition

The Society again participated in the exhibition held at the Granby Halls, Leicester, on 31 October-2 November when, it is understood, the paid attendance approached 6,000. The three latest RSGB publications, the *1975 Amateur Radio Callbook*, the *NBFM Manual*, and the fifth edition of *Amateur Radio Techniques*, were in great demand, and overall book sales were highly satisfactory. A section of the stand was devoted to membership matters and a large number of new members were enrolled.

The sales activities were under the direction of the Mobile & Exhibition Committee and those present included G3GJW, G3ICI, G3MVV, G3VPK, G3VZV, G8AXA (and Mrs Wallace) and G8CBN. The membership section was staffed by Assistant General Manager G3BWC and a number of visiting Council members.

Society awards

The following awards, recommended by the Technical & Publications Committee, have been made for the period July 1973-June 1974:

The **Norman Keith Adams Prize,** for the most original article published in *Radio Communication* during the period, to L. V. Mayhead, G3AQC, for "Loop aerials close to ground".

The **Bevan Swift Memorial Prize,** for the most meritorious article published in *Radio Communication* during the period, to L. A. Moxon, G6XN, for "Gains and losses in hf aerials";

The **Wortley-Talbot Trophy,** for outstanding experimental work in the field of amateur radio during the period, to A. M. Pomfret, G3LZZ, for work on the reception of GB3SX (28MHz) in Malawi;

The **Ostermeyer Trophy** for the most meritorious description of a piece of home-constructed radio or electronic equipment published in *Radio Communication* during the period, to the Rev P. W. Sollom, G3BGL, for "The 'Squeak Box' or tone dip oscillator".

The committeee was unable to make any recommendation for the **Courtenay Price Trophy** for outstanding technical development in the field of amateur radio during the period.

Science Museum Christmas Lecture

The Society's Education Committee will be presenting its lecture/demonstration "The world of amateur radio" at the Science Museum on Saturday 4 January 1975 at 11am and 3pm. The lecture is intended primarily for young people and their teachers and gives a broad introduction to the hobby.

Applications for tickets should be made direct to Mr J. D. Freeborn, Lecture Service, Science Museum, South Kensington, London SW7 2DD, stating the time of the lecture for which tickets are required and enclosing a stamped addressed envelope.

World Radio Club

From 4 January 1975 the transmission times of World Radio Club broadcast in the BBC Overseas Service will be: 0815-0830, Sunday; 1330-1345, Wednesday; 2030-2045, Friday; 2315-2330, Wednesday; all times gmt.

Manchester area luncheon dates

Mr. P. Swann, G3WWX, "Cob's Corner", Church Street, Old Glossop, Derby SK13 9RN, would like to hear from any members in the Manchester area who would like to meet socially at lunch-time once or twice a month.

G QRP Club

The Rev G. C. Dobbs G3RJV, 61 Park Street, Cleethorpes, South Humberside, is considering with other members the formation of a G QRP club. It is suggested that QRP for the purposes of the club should be 5W or under.

Anyone interested is asked to write to G3RJV enclosing an sae.

"FT Newsletter"

The October issue of the USA publication *FT Newsletter* carried a review of the Holdings clipper for use with the FT101. Any members who wish to obtain a free copy of this issue should send an sae to G3LLL, Holdings Photo Audio Centre, 39/41 Mincing Lane, Blackburn, Lancs BB2 2AF, marking the sae "FT Newsletter".

Attention club secretaries

Guild Sound & Vision Ltd, which operates one of the largest sponsored film libraries in the world, has available more than 1,000 16mm films—many on free loan, including several on electronic subjects. Among these are *One step ahead* by Group 4 Total Security Ltd; *Industrial tube making* by Phillips Electrical Ltd; *Day of precision* by English Electric Valve, and *TD1A the satellite* by European Space Research Organisation.

For details of these and other films contact Guild Sound & Vision Ltd, Woodston House, Oundle Road, Peterborough PE2 9PZ.

New club

It is proposed to form an amateur radio club on board *HMS Belfast*, sponsored by the RNARS. An inaugural meeting will be held on Saturday 11 January 1975 at 1900. Any interested licensed amateur and SWLs are invited to attend; they do not have to be members of the RNARS.

For further details contact D. Walmsley, G3HZL, QTHR, tel 01-892 3239 evenings, or 01-759 5511 ext 5726 during working hours.

Presidential Inauguration 1975

Mr C. H. Parsons, GW8NP, as President for 1975, will receive the chain of office at a social occasion to be held in

Cardiff Castle

on

Friday 17 January 1975

As accommodation is limited, regretfully it will only be possible to consider applications for tickets from members of the RSGB and their ladies.

Will members who wish to attend please apply to RSGB headquarters **on or after 15 November 1974.**

Civil airways group

A tentative grouping of licensed amateurs and SWLs within British Airways has taken place, and it is proposed to start a civil airways net on 3,680kHz at 11am on Sundays. Official date of commencement of this net will be 5 January 1975, but it was intended to start on a local basis on 3 November 1974.

Anyone connected with or interested in civil aviation is invited to join this net; net control stations will alternate between G3BEA and G3NAF. For information contact D. A. Evans, Westerleigh, Chestnut Close, Amersham, Bucks, or D. F. J. Walmsley, 153 Worple Road, Isleworth, Middx TW7 7HT, tel 01-892 3239.

RAE class

Fleetwood Nautical College is starting an RAE class in January 1975 for the December 1975 examination, subject to sufficient applications.

Anyone interested in joining the class is asked to contact G4BWX, QTHR, or Fleetwood Nautical College, Broadwater, Fleetwood, as soon as possible.

WAMRAC

WAMRAC—the World Association of Methodist Radio Amateurs and Clubs, was founded in 1957 by the Rev Arthur W. Shepherd, G3NGF. The aim and purpose of the association is to promote and encourage world-wide Christian friendship and fellowship through the use of amateur radio. The death of the Rev Shepherd in April was a severe shock for the membership; his zeal and enthusiasm for WAMRAC, and the hard work he put into it as secretary and administrator, will not be forgotten.

There has now been some re-organization within WAM RAC. An executive committee has been formed, consisting of the secretary, Mr L. D. Colley, G3AGX; the treasurer, Mrs Olive Shepherd; and Mr Arthur Kettlety, G8HTN, QTHR. Regular WAMRAC nets are held on the hf bands, and also on 3,665kHz at 1400 on Sundays. Bi-monthly newsletters are sent to all members.

Although the title WAMRAC includes the word Methodist, membership is open to all Christian radio amateurs and SWLs, whatever their denomination. Details can be obtained from the secretary, L. D. Colley, G3AGX, 13 Ferry Road, Wawne, nr Hull HU7 5XU.

The Cambridge on 2m

by R. G. BROWN, G8CXV* and T. A. GARDNER, G3XUA

THE Pye Cambridge is rapidly becoming established in amateur circles as a mobile and, in some cases, fixed station. As a result of the increasing availability of these units, the authors felt it might be useful to publicise a modification used by themselves for some years.

The main problem when employing any radiotelephone on an amateur band is that of making the receiver tunable over the required range, preferably with stability approaching that of the original crystal-controlled mode. At the same time the ability to maintain fixed-channel operation without the use of crystals or complication is very desirable. It was felt advantageous to make no modification to the existing boards while maintaining full utilization of this equipment.

Two designs are suggested, the first and simpler does not provide for fixed channels and offers less rejection of spurious mixing products or "birdies". The second provides switchable fixed channels set on miniature 10-turn "trimpots", and very low "birdy" content due to balancing in the mixer and increased stability. Auto scanning is also possible with little extra complication [1].

This article deals, therefore, mainly with the receiver section, and where no reference is made to the contrary, description is of the band A (148–179MHz) equipment, a.m. or fm. While no such modification has been tried by the authors, there seems no reason why the second modification method should not be applied to the boot-mount version.

Before modification

The block diagram of the original Cambridge receiver is shown in Fig 1. The rf board consists of two stages of signal frequency amplification which are bandpass coupled, giving good rejection from out-of-band signals. This feeds the diode mixer together with the local oscillator frequency which usually runs on the low side of the signal frequency. The first local oscillator uses crystals in the 40–55MHz region, and the collector is tuned to the third harmonic.

Thus the crystal frequency f_{xtal} in megahertz is given by

$$f_{xtal} = \frac{f_{sig} - 10{\cdot}7}{3} \text{MHz}.$$

The first i.f. is 10·7MHz, which is amplified and then mixed with the second oscillator on 11·155MHz to give the 455kHz second i.f. The mixer is followed by a 455kHz bandpass filter which is of an LC nature and determines the overall bandwidth of the receiver. Amplification at 455kHz, detection and af amplification, not forgetting agc, follow, but this end of the receiver is not of great interest as it is far removed from the point at which the modification takes place.

After modification

Fig 2 shows the block diagram applicable to both modifications described below.

The crystal frequency of the first local oscillator is chosen to give a first i.f. from the rf board of 22·5–24·5MHz (ie 40·5MHz). The only modification to the original circuitry is at the output from the rf board. The connection from the rf board pin 3 to the 10·7MHz i.f. board pin 1 is removed, and the new i.f. is fed off to the extra mixer and local oscillator. This section is shown inside the broken line on Fig 2. Here the 22·5–24·5MHz i.f. is mixed with the new local oscillator which runs on 11·8–13·8MHz to produce the second i.f. of 10·7MHz. This is now fed back to pin 1 of the 10·7MHz i.f. amplifier and the signal continues as in the original receiver.

It may be seen, therefore, that the design criteria can be realized using this method, viz good stability by using a relatively low frequency vfo, full utilization of circuitry and the minimum of modification.

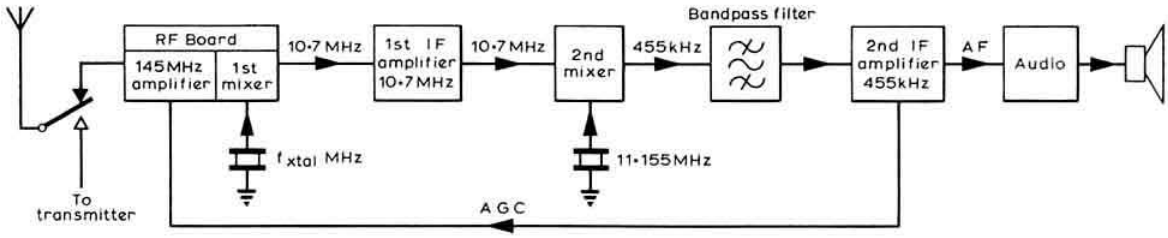


Fig 1. Block diagram of original Cambridge receiver

A simple solution

This employs a dual-gate mosfet mixer using a 40601 device. The signal at 23MHz is applied to g1 and a bipolar vfo running at 13MHz is applied to g2 in the usual manner. The difference frequency is extracted by L3 which is resonated at 10·7MHz. L2 is tuned to approximately 23MHz and serves to attenuate out-of-band signals before the mixer.

The vfo is a Colpitts circuit with the dc working points defined by two zener diodes.

Construction notes

In the prototype the crystal holder sub-chassis was removed and replaced with a piece of double-sided pcb. The vfo was then built onto this as an earth plane, on the lower side, and the mixer above. Power is led through the pcb using feed-through capacitors.

* 15 Dale View Road, Bakersfield, Nottingham.

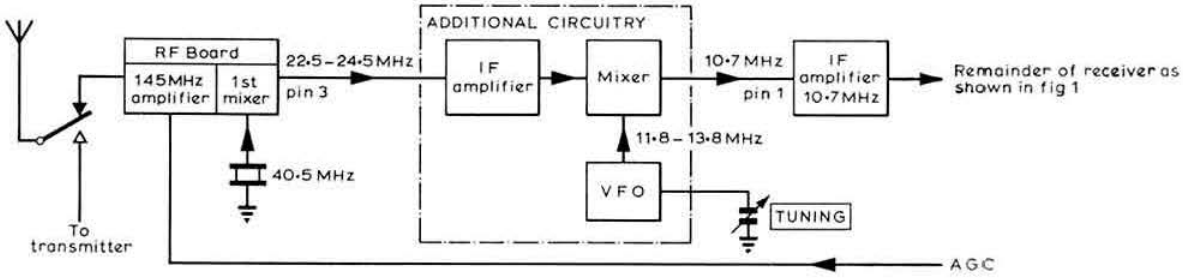


Fig 2. Block diagram of modified receiver

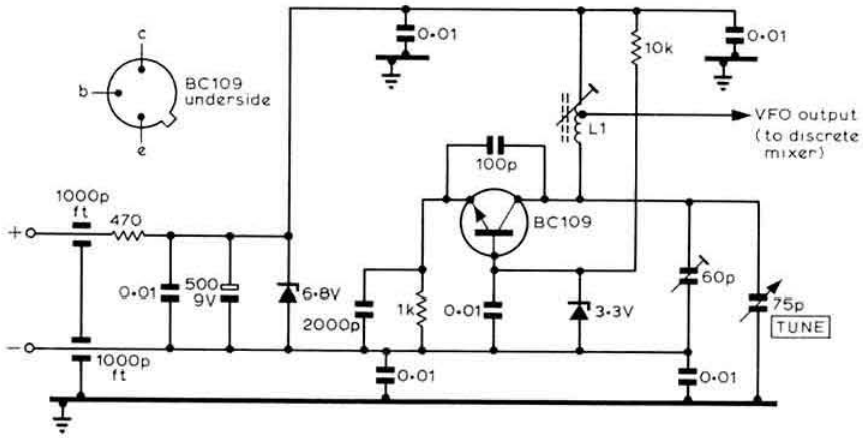


Fig 3. The bipolar vfo

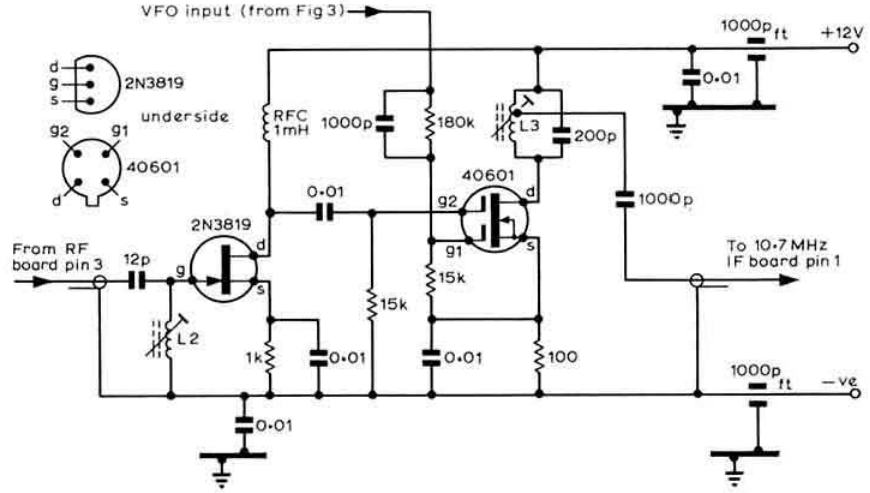


Fig 4. The discrete mixer. A 1mH choke should be inserted between rf board pin 3 and the positive rail

The squelch control may be moved to the spare position near the volume control, and in the original squelch position a reduction drive and dial are mounted.

Stability is limited by the vfo, and while this is more than satisfactory using a 25kHz spacing filter (viz switch on to infinity without the signal going out of receiver passband) an improvement may be gained from a fet (Vackar) vfo.

Such a design is shown in Fig 7. This circuit is also tuned mechanically using a small 30pF air-spaced tuning capacitor. Layout of the vfo and mixer is as described above.

The overall gain of the receiver should be somewhat greater after the addition of this mixer, but if required the gain of the 455kHz i.f. board may be increased by reducing or shorting the emitter feedback resistors R338, R311,

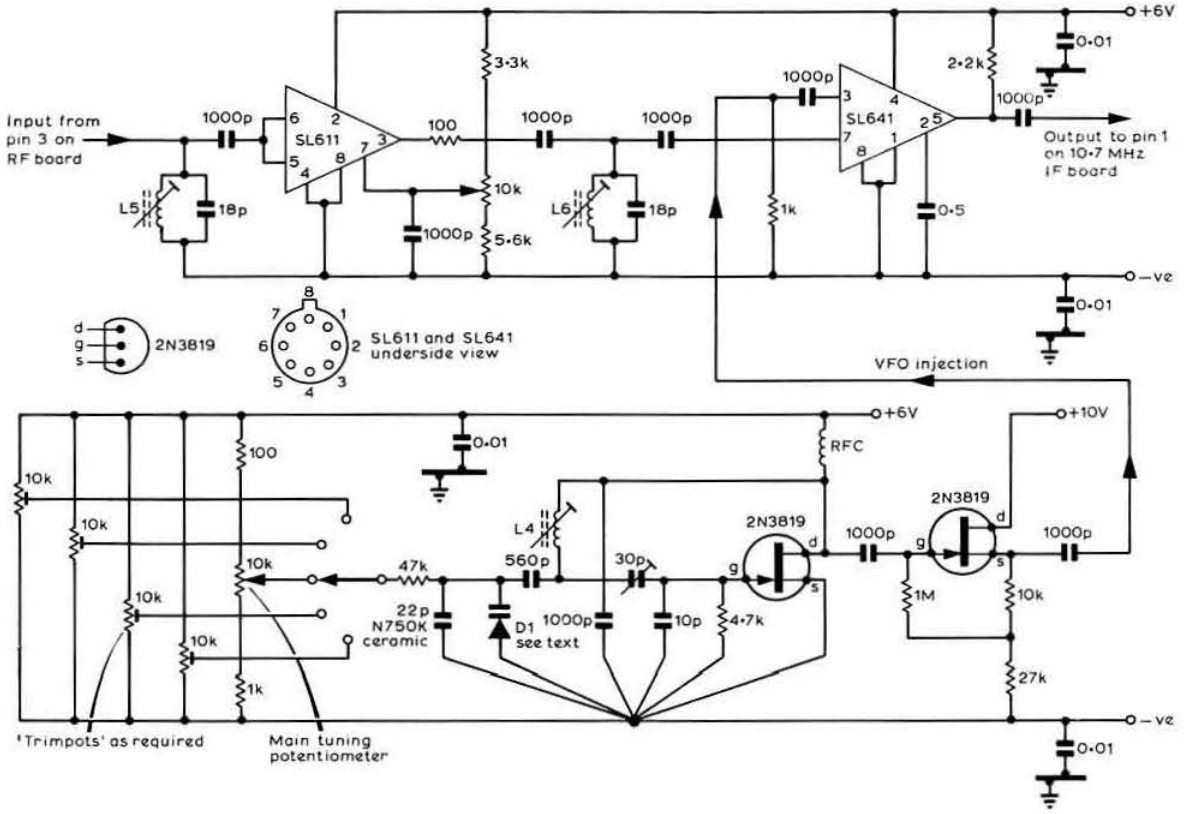


Fig 5. The ic mixer and fet vfo

R318(22Ω). Alternatively the gain of the 10·7MHz amplifier may be increased by by-passing R109 or R133. Note, however, that these modifications liberate large amounts of latent gain, designed into the circuit with large amounts of negative feedback to achieve stability. Therefore the gain should only be increased if necessary, as no improvement in noise factor may be achieved, while strong signal performance and stability are sacrificed.

Alignment

It will be seen that as only the vfo is adjusted to select the incoming frequency, 455kHz image rejection is not very good. However, it is more than adequate and in some three years of operation has never caused inconvenience of any kind.

The vfo requires to be adjusted to cover the correct range of 11·8–13·8MHz. This job is very easy if a digital frequency meter is available or may be begged/borrowed. However, it is by no means mandatory. A general coverage receiver makes a good substitute providing it is capable of tuning the required range. The trimmer and L1 core are adjusted until the vfo swings plus 100kHz at either end of the range, ie 11·7–13·9MHz. If the mixer and rf board are now connected up with the 40·5MHz crystal in the rf board, the front end may then be lined up.

First, peak the mixer injection. The diode current may be sampled across R14 (1kΩ) and T2 is tuned for maximum. The series crystal inductance may then be tuned for maximum injection (approximately 200mV) across R14. At this point a source of 2m rf is required: the station transmitter, a co-operative local, or even a signal-generator if available. A large signal is fed to the aerial, via a piece of wire inserted in the socket while the station transmitter is in use, and, if all is well, as the vfo is tuned the signal should be detected. Connect a meter with scale 2–5V between pin 5 on the rf board and the positive rail to read the agc voltage, and starting with L2 tune for a dip in voltage. The resonance of L1 is frequently very broad, so if this is not obvious continue to the next coil. As the circuits are brought to resonance, decrease the input signal until all circuits are peaked. It is useful to stagger tune the various circuits across the band.

A more elegant solution

This method employs an SL611 ic as a broadband i.f. amplifier at 22–24MHz which feeds into an SL641 double-balanced mixer. The vfo is a Vackar circuit using a fet, again running at 11·8–13·8MHz but tuned electronically via D1.

The use of the SL641 mixer considerably reduces the number of "birdies" to be found within the tuning range. The double-balanced configuration produces only the sum and difference frequencies at its output.

The SL611 was included to alleviate matching problems between the diode mixer and the input of the SL641 and also provides a means of varying the i.f. gain of the receiver as necessary.

The vfo

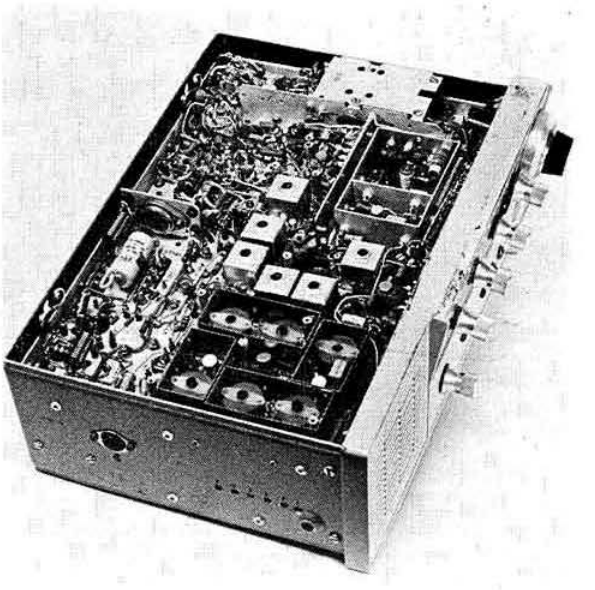
The Vackar vfo is followed by a fet buffer using a 2N3819 to reduce the loading on the vfo and to give the required output to the SL641.

The varicap vfo had several features which were appealing, eg the use of a 10-turn helipot and dial would give more than adequate bandspread at reasonable cost; the provision of a number of fixed channels, should they be required; and the provision at a later date of some form of auto band-scanning arrangement [1]. Remote tuning is also possible.

However, if these facilities are not required then the circuit of Fig 7 may be used with this design and built into the mixer box in place of the varicap tuned version. The tuning dial and its mounting are then as described in the "simple solution".

The varicap vfo

Having decided to build a prototype varicap diode vfo using one of the common varicap diodes (BA110) it was found impossible to tune more than a few hundred kilohertz at 11MHz, and putting two or more in parallel did not significantly improve the vfo coverage. It is well known that any diode will operate to some extent as a varicap diode, the amount of capacitance swing being dependent upon the type of diode, so a number of tests were carried out on a selection of diodes. A simple battery and potentiometer were used to bias the diode and an LCR bridge used to measure the capacitance swing. It was found that a number of diodes



Underside view of modified Cambridge, showing access to "trimpots" and mic socket on the near side

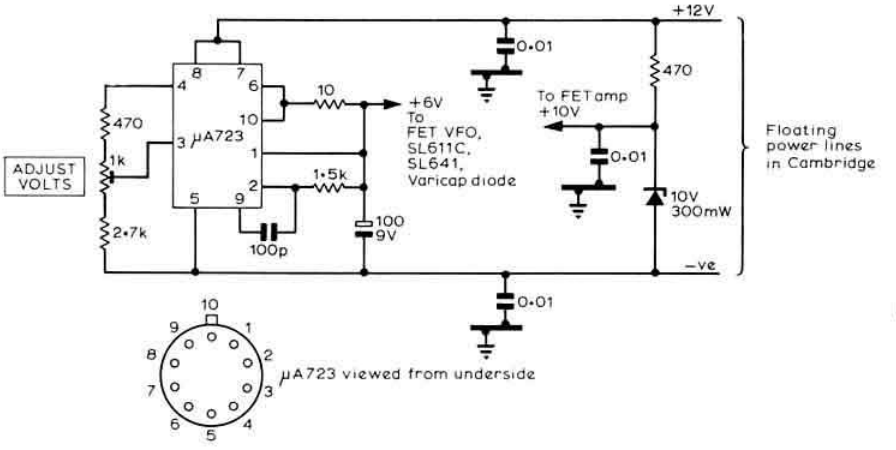


Fig 6. The 723 regulator

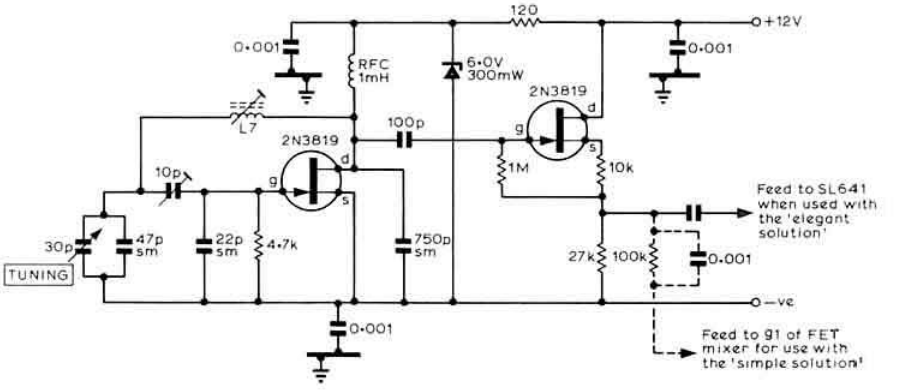
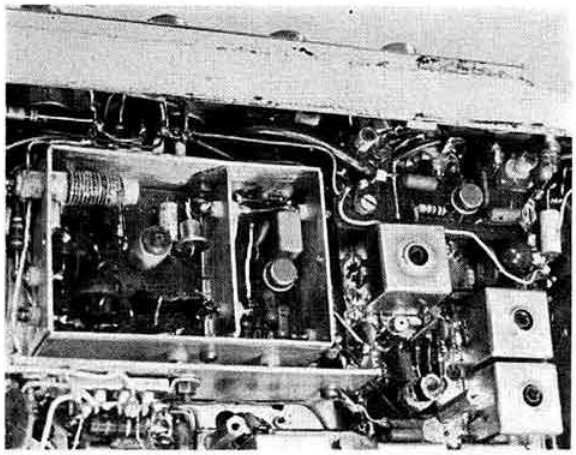


Fig 7. The alternative mechanically tuned fet vfo



Close up view of the mixer/vfo box. The vfo is on the left-hand side of the box and the 641 mixer on the right. The SL611 i.f. amplifier is shown at top right. Note the crystal peaking inductor has been moved onto the rf board, bottom right of centre

exhibited comparatively large capacitance swings although the ratio of minimum to maximum capacitance was not very great. These diodes were set on one side for use in the prototype vfo: they consisted mainly of zener type diodes which were bought from one of the surplus suppliers at minimal cost.

The vfo was then rebuilt using a mechanical capacitor to ensure that it operated before putting the new varicap diode into circuit. The vfo operated with no problems and the varicap diode was then put in circuit and component values altered so that it covered approximately 11·7–13·9MHz. This operation was carried out using a general coverage receiver.

Consideration was next given to the stability of the vfo and after numerous soak tests it was rebuilt using polystyrene capacitors. A small amount of temperature compensation was provided by using a negative temperature coefficient ceramic capacitor. When this had been done the vfo stability was found to be more than adequate for the bandwidth of the receiver. This is not generally the case for

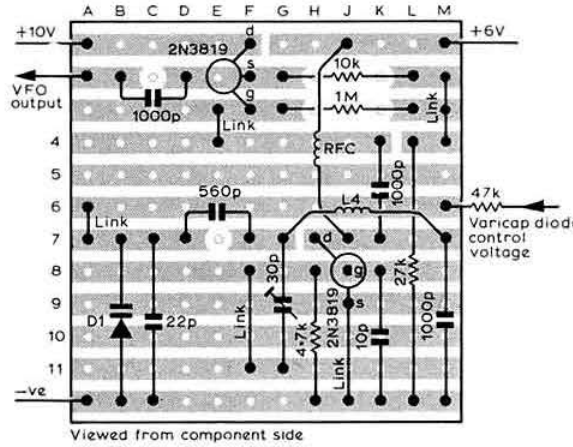


Fig 8. VFO and buffer amplifier

those modifications which make the first oscillator in the equipment tunable.

The final vfo was constructed on Veroboard along with the SL641 and housed in a readily available small aluminium box as shown in the illustrations. This box is then mounted in place of the original crystal sub-chassis, the sub-chassis being replaced by an aluminium blank.

The i.f. amplifier

The SL611 amplifier was also constructed on a small piece of Veroboard which was mounted on pillars above the rf board to keep the interconnecting leads as short as possible.

The regulator

An ic regulator is also used in this modification to ensure that the voltage fed to the vfo and tuning pots is held constant. The circuit diagram of this is shown in Fig 6, and it also was constructed on Veroboard. The regulator is positioned above the squelch board on the existing pillars.

Panel modifications

The mounting of the front panel controls was the next consideration. The chassis of the Cambridge has five control mounting holes cut as standard, so the re-positioning of the controls was decided upon as follows.

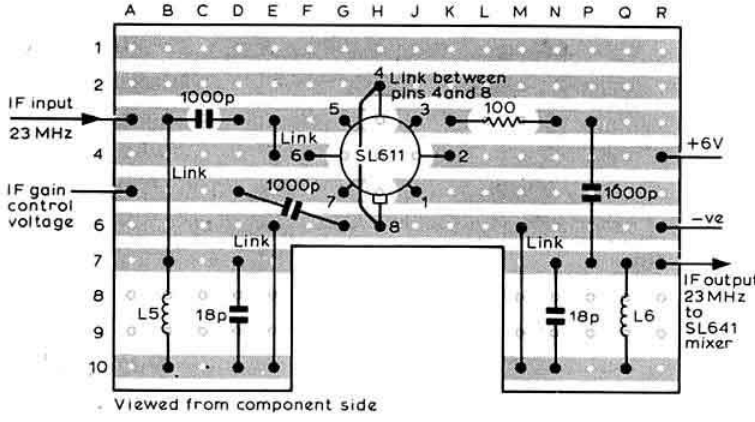


Fig 9. SL611 i.f. amplifier

Coil details

L1. 11 turns, close wound 20 swg on ¼in dia former with core, tap at 1·5 turns
L2. 30 turns, 28 swg close wound on ¼in dia former with core
L3. 12 turns, 20 swg, close wound on ¼in dia former, with core, tap at 2 turns
L4. 10 turns, 26 swg on ⅞in ceramic former with slug close wound
L5, L6. 18 turns, 30 swg on 0·3in dia former close wound over length of ¼in with slug
L7. ¼in dia ¾in long Aladdin former with dust core, filled with 24 swg ecw close wound

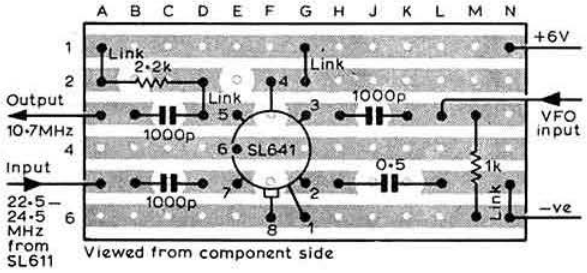


Fig 10. SL641 mixer

The 10-turn pot was mounted in the first hole, in place of the original volume control. The volume and squelch controls were moved into the second and third holes respectively. The power switch was left in its original position but the microphone cord was removed. A din socket was positioned on the right-hand side of the Cambridge so that the microphone could be removed when not in use at the fixed station.

The original microphone position was filled by a wafer switch. This provides the switching for the selection of fixed channels or vfo. If fixed channels are not required then the microphone lead may remain on the front panel.

The 10-turn trimpots for the fixed channels were glued on top of the 455kHz filter. Holes drilled through the side of the chassis provide access to them for tuning purposes. See photographs.

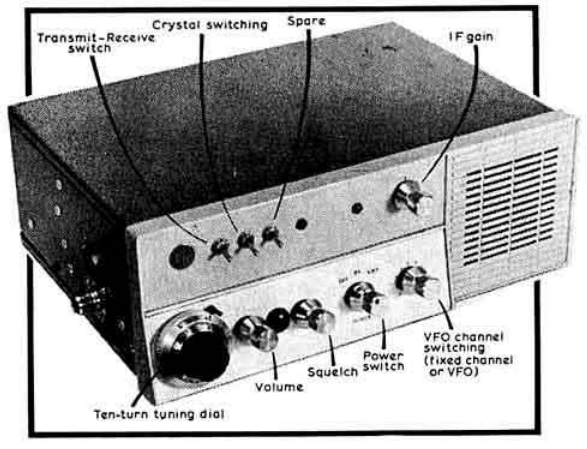


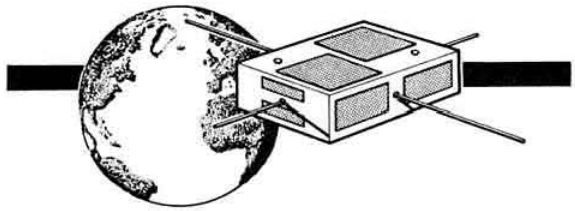
Fig 11. Front panel of modified Cambridge

A further modification was made which involved the removal of the polarity protection diode, in order to facilitate the mounting of three small toggle switches. The first of these switches is a manual transmit switch, which overrides the ptt. The second operates a miniature reed relay which switches transmitter crystals; while the third is reserved for the fitting of an fm discriminator at some later date. The removal of this diode does mean, of course, that the equipment is not reverse polarity protected. However, it may be replaced by a modern stud mounting germanium diode conveniently sited elsewhere in the equipment.

When all these modifications are completed and the transmitter aligned as described in an earlier article [2], possibly with a mains power supply, a reliable, compact, and above all, cheap mobile or fixed station will be the result; the cost all told being a small fraction of a commercial counterpart.

References

[1] *Radio Communication*, Vol 48, June 1972, page 372.
[2] *Radio Communication*, Vol 48, January 1972, page 10.



Oscar 7 launch

Oscar 7 was due to be launched from the NAASA western test range on 31 October but due to an electrical fault in the Thor-Delta vehicle, lift-off was put back. The launch eventually took place at 1711 on 15 November into an orbit similar to that of Oscar 6. The AMSAT satellite was a secondary payload with the ITOS-G meteorological satellite and the Spanish Intastat spacecraft.

Oscar 6 orbits

Reference equatorial crossing times and longitudes for December are:

14 December orbit 9894 1905ut 334°W
15 December orbit 9902 1025ut 204°W
16 December orbit 9919 1900ut 333°W
19 December orbit 9957 1950ut 345°W

The orbit of Oscar 6 is such that the data repeats every 263 orbits but 3·6min later and 0·9° farther west.

AMSAT subscriptions

Arrangements have been made with the Radio Amateur Satellite Corporation for subscriptions to be accepted in the UK thus avoiding the necessity for individual membership applications (or renewals) to be accompanied by a dollar remittance. AMSAT subscriptions become renewable on 31 December annually and the amount (at the existing exchange rate) is £2.15. Membership includes the quarterly *AMSAT Newsletter* and application forms are obtainable from G2BVN, QTHR.

An outline of pulse code modulation

by C. BUDD, A7884*

IF it is required to send a signal over any transmission path there will be advantages, from the viewpoint of discriminating against random noise, in coding the signal into a series of binary numbers and transmitting those numbers as a pulse train (Fig 1) and then decoding the pulse train at the receiver to recover the original signal.

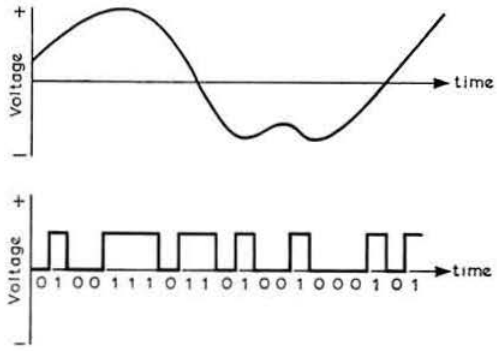


Fig 1. A possible signal waveform and its binary-coded equivalent

Suppose that the pulse train in Fig 1 was sent along the cable and that the waveform received at the other end was as shown in Fig 2, complete with noise and distortion. Now, in spite of the noise, it is quite possible to perceive from the waveform of Fig 2 the approximate periods during which pulses were and were not present. This information is all that is needed at the receiving end, provided that all the pulse-periods (ie periods during which pulses may or may not be present) are of equal length, to reconstruct the original pulse-train perfectly and hence to decode a noise-free and distortion-free copy of the original signal. If, on the other hand, the original signal had been sent along the cable just as it was, no amount of processing could have effectively removed the noise and distortion so introduced. Thus, unless the amplitude of the noise is at least comparable to that of the pulses, no significant impairment will result to the signal which is finally decoded from the pulse train; a pulse-coded signal will tolerate a much greater level of noise and other ill-treatment than a directly transmitted signal will before the end-product becomes useless.

This method of coding a signal into a series of pulses is known as pulse code modulation (pcm), and the method of generating and decoding these signals is described below.

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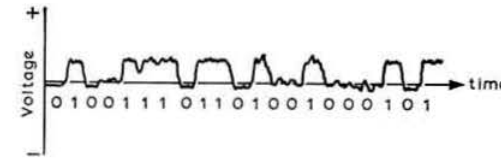

Fig 2. The pulse train of Fig 1 with attenuation, noise and distortion after transmission over an imperfect signal path

Sampling and bandwidth

A signal such as that represented by the waveform of Fig 3(a) may be partly represented by measuring its amplitude at intervals and recording the successive amplitudes. This process is called sampling and if the samples (measurements) are taken at regular intervals the number per second is called the sampling rate. It may be shown mathematically that if the signal contains no components with frequencies greater than half the sampling rate, no information will be lost by representing the signal by a series of samples as described. In other words, the original signal may be perfectly reconstructed from the samples, provided that the sampling rate is greater than twice the highest frequency contained in the signal. Human speech can be understood sufficiently well for communication purposes if all the frequency components above 3·4kHz are omitted, therefore speech may be adequately represented by taking samples at a rate of 8,000/s which is the standard sampling rate for communications purposes.

Quantization and coding

Supposing that the signal to be transmitted is speech and that it is sampled at the points marked "s" in Fig 3(a) separated by 125μs (8,000 samples/s). The sample amplitudes could be transmitted, and hence all the information required to reconstruct an understandable version of the original signal, as a series of brief pulses (Fig 3(b)). The amplitude of each pulse would be proportional to that of the corresponding

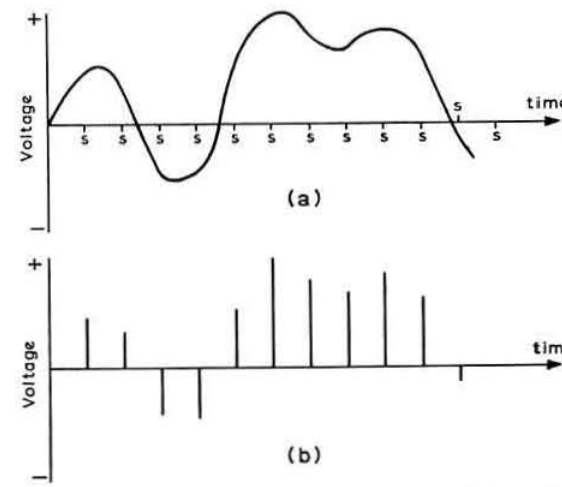

Fig 3. (a) A possible signal waveform, sampling points marked "s". (b) A train of brief, variable-amplitude pulses representing the sample amplitudes in (a)

sample and the original signal could be recovered at the receiving end simply by passing the train of pulses through a low-pass filter. However, this would not be an improvement over direct transmission of the signal waveform; in fact, it would be a step backwards, since the bandwidth required for transmission would be greater. What is needed is a way of representing each sample by a series of pulses of equal amplitude rather than by a single pulse of variable amplitude in order to obtain the advantages of pulse transmission mentioned earlier.

The simplest way to do this is to assign to each possible sample amplitude a binary number and to transmit that number as a series of pulses whenever that particular sample amplitude arises. The pulse train corresponding to the binary number 11010, which corresponds to 26 in decimal numbers, is shown in Fig 4. However, in the system described so far the sample amplitude is a continuous variable, ie it can take an infinite number of possible values within the range of the sample signal amplitude. Clearly an infinite variety of binary numbers is unacceptable, since some of them would then be infinitely long, so the number of values which the sample amplitude may take must be restricted. This process is called quantization and could be carried out in a practical system as follows.

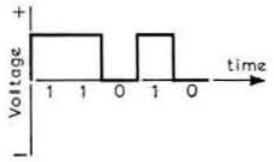

Fig 4. Pulse train corresponding to the binary number 11010

Each sample amplitude is compared with a set of "standard" levels and the nearest of these standard levels is taken as an approximation to the sample amplitude and assumed to be equal to the sample amplitude. After quantization, the sample amplitude must thus be one of a restricted repertoire of amplitudes and the number of possible amplitudes is, in effect, limited. The mechanism of quantization, therefore, introduces small errors into the samples, since each quantized sample is really only an approximation to the true sample, and these distortions manifest themselves as noise in the copy of the original signal reproduced at the receiver. This is known as quantization noise and its amplitude is dependent on the number of quantization levels (the "standard" levels mentioned above) and on their spacings.

The quantization levels in the hypothetical system could be equally spaced (linear quantization) but there are advantages, at least in the transmission of speech or music, to be gained from a non-linear quantization process in which the quantization levels are closer together at low amplitudes than at high ones. This is because in speech small amplitudes are far more common than large ones and, in fact, a logarithmic distribution of quantization levels gives the smallest distortion of small signals and, hence, the best overall noise performance. Clearly the number of quantization levels employed greatly affects the performance, since the more levels there are the better will be the approximations made in the quantization process. In practice, telephone quality speech may be transmitted with 128 ($=2^7$) logarithmically spaced levels (64 positive and 64 negative), and 8,192 ($=2^{13}$) levels are adequate for broadcast quality sound.

After quantization, generation of the binary number corresponding to each sample is needed, and this is done by

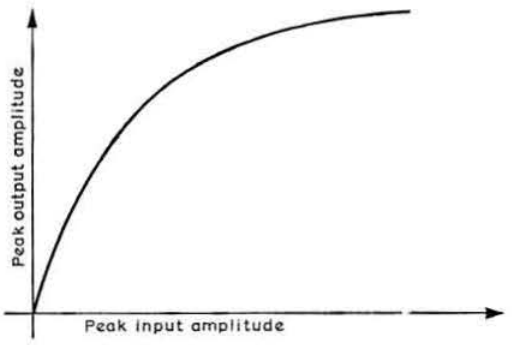

Fig 5. Characteristics of a signal compressor

an analogue digital converter. Successive binary numbers are converted into pulse trains, synchronizing pulses are added and the pulses are transmitted. Two points must be made. First, although the quantization and coding processes have been presented separately above, the two are usually performed by the same circuit, the analogue-digital converter. Second, the analogue-digital converter usually results in linear quantization and so effectively non-linear quantization is achieved by passing the samples through a logarithmic compressor which has the property of amplifying large signals less than small ones, as shown in Fig 5, and therefore of "compressing" the range of sample amplitudes.

A practical system and tdm

That, then, is the outline of a generalized pcm system, as illustrated in Fig 6. Now let us consider a practical system; that employed by the British Post Office for trunk telephone links in some urban areas. The sampling rate is 8kHz and a logarithmic quantization system with 128 levels (corresponding to seven digit binary numbers) is employed, which yields a signal to quantization-noise level of at least 25dB. Each sample is represented by seven binary digits (bits) but an eighth bit is added for the purpose of synchronizing the receiver decoding equipment at the other end of the trunk cable.

One of the advantages of pcm over other systems is that more than one speech signal may be transmitted in coded form over a single pair of wires. This is done by transmitting the pulse train corresponding to each sample in less time than the sampling period and transmitting pulse trains corresponding to samples from other signals during the

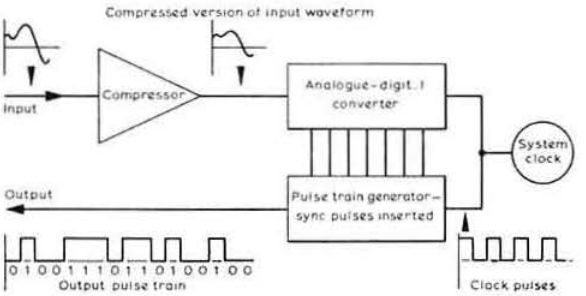

Fig 6. Block diagram of a general pcm system

spare time thus made available. This is called time division multiplexing (tdm) and is employed in the British Post Office pcm system to transmit 24 speech channels over a single pair of wires.

Returning to actual details of the Post Office system; a group of 24 coded samples (one from each channel) is called a frame and is transmitted in 125μs (one sampling period). Thus each sample must be transmitted in about 5·2μs, this interval is known as the channel time slot. Each sample is transmitted as a sequence of eight pulses (or rather as a sequence of eight intervals during each of which a pulse may or may not be present) including the synchronization digit. Each pulse must therefore be transmitted in 0·65μs or less. In practice, only 0·325μs of this time is allocated to pulse transmission, the remaining half being an unoccupied guard period to allow regenerators and receiving equipment to recover from the last pulse before receiving the next one. Binary zeros are represented by negative voltage levels and binary ones by positive levels, and the pulse train is then passed through a process known as output bipolarization which has the effect of reversing the polarity of every alternate pulse, see Fig 7. Bipolarization removes the dc component from the signal (pulse train) and halves the effective bandwidth needed for transmission.

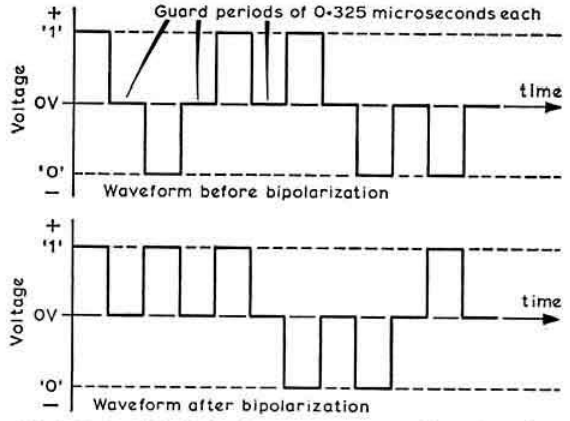

Fig 7. Output bipolarization reverses every alternate pulse

Receiving and decoding

The advantages of pulse-coded transmission from the viewpoint of immunity to random noise have already been outlined. Practical immunity from low-amplitude noise can be obtained at the receiving end simply by passing the received signal through trigger circuits as shown in Fig 8.

In practical systems rather more sophisticated methods are often employed. The actual mechanism of decoding is, at least in principle, fairly simple; the synchronizing information is extracted from the signal and used to "gate" groups of seven bits each into a register consisting of bistable circuits which functions as a digital-analogue converter and recovers the original sample amplitudes one at a time. The samples are then expanded (expansion is the reverse process of compression) to recover their original amplitude distribution and de-multiplexed into their respective channels by what amounts to a fast switching process synchronized to the multiplexing circuits in the coding equipment. In each channel the stream of samples is passed through a low-pass filter which removes any components

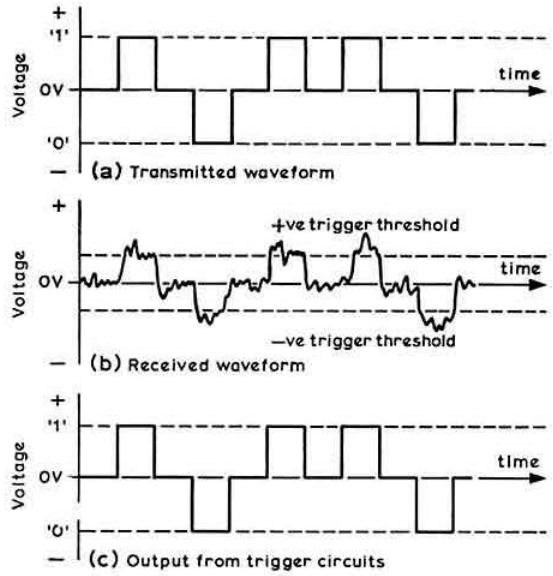

Fig 8. (a) transmitted waveform, (b) received waveform, (c) output from trigger circuits

above half the sampling frequency and the original signal has been recovered with negligible distortion.

Conclusion

Applications of pcm are not restricted to noise-free communications; it can be applied to tape recording to obtain a signal-to-noise ratio far superior to that obtainable with analogue recording methods, and it may be applied to military and other secret communications since it is impossible for anyone to decipher an intercepted pcm signal unless such details as sampling rate, coding system etc are known. Finally, it should be mentioned that pcm is an example of knowledge being ahead of the technology to apply it, for the principles of pcm have been known since it was devised in 1936 by A. H. Reeves, but only recently with the availability of low-cost digital microcircuits has it been a feasible economic proposition.

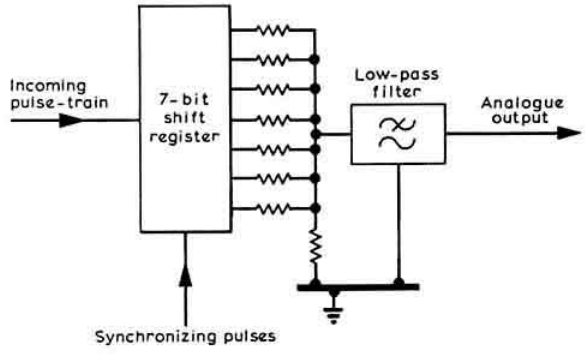

Fig 9. Block diagram of an analogue-to-digital converter. In the matrix of "weighting" resistors, the smallest resistors correspond to the most significant pulses, each pulse being half as significant as the last

An integrated circuit two-tone generator

by R. G. J. WILSON, G3TBS*

Table 1.

RX	Output voltage Vout
56kΩ	100mV
33kΩ	75mV
24kΩ	60mV
18kΩ	45mV
11kΩ	30mV

Component List

S1	Sp on-off
D1	22V Type B122
ZD1, ZD2	6·2V zener diode 400mV
R1	560Ω 5%
R2, 3, 4, 5	100kΩ 2% All
R6, 7, 10, 11	120kΩ 2% type
R8, 9, 14, 15	91kΩ 2% TR5
R12, 13, 16	12kΩ 2%
RX	See Table 1
C1, 5, 7, 8	1,000pF 5% silver mica
C2	1,300pF 5% silver mica
C3, 4, 6	680pF 5% silver mica
C9	10,000pF 10% silver mica
IC1	LM3900 quad op-amp
IC2	741 single op-amp

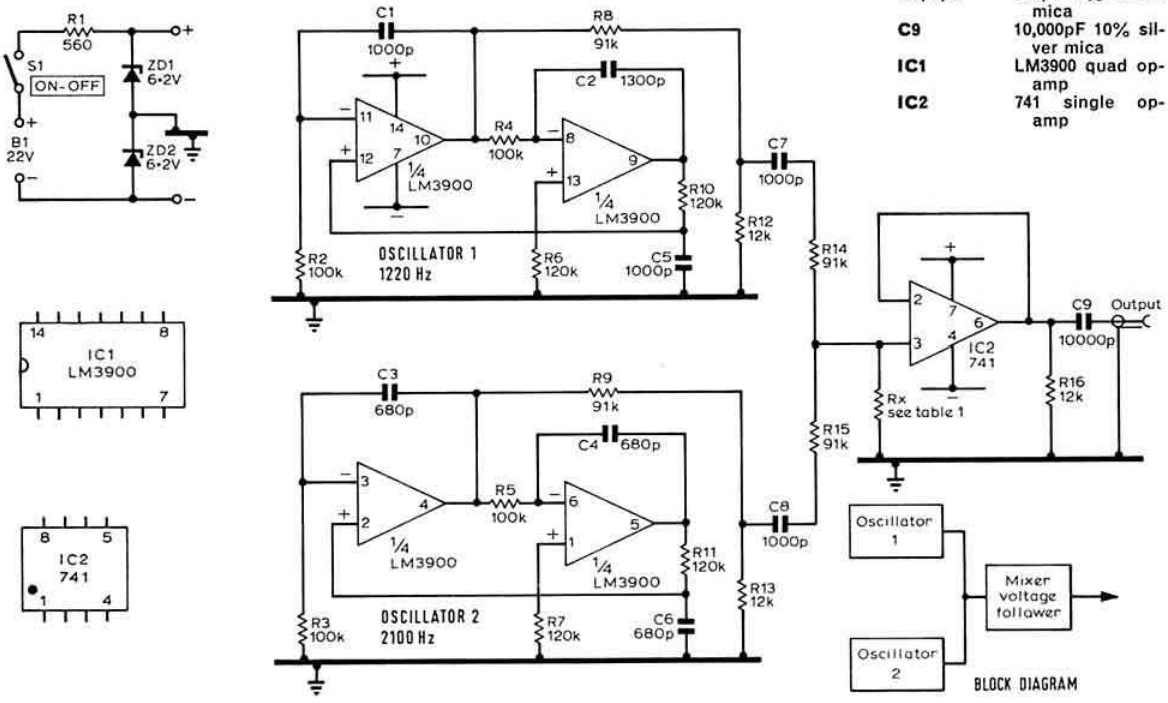

Fig 1. Circuit diagram, pin connections of LM3900 and 741, and block diagram

THE author needed a separate two-tone oscillator with its own separate power supply, and the following is a description of the final unit. No originality is claimed but use has been made of common circuits.

The output requirement of a two-tone oscillator calls for two non-harmonically related audio frequencies, and the frequencies chosen were 1,200Hz and 2,000Hz. As the oscillator of each frequency consists of two operational amplifiers, four op-amps are required, and fortunately there is a very cheap quad op-amp, the LM3900, IC1, available. The output is resistively mixed and fed into a voltage follower, this being a 741 single op-amp (8-pin) IC2. The whole unit, including battery, on-off switch and socket is built into a die-cast box approximately 4½in by 2½in by 1in.

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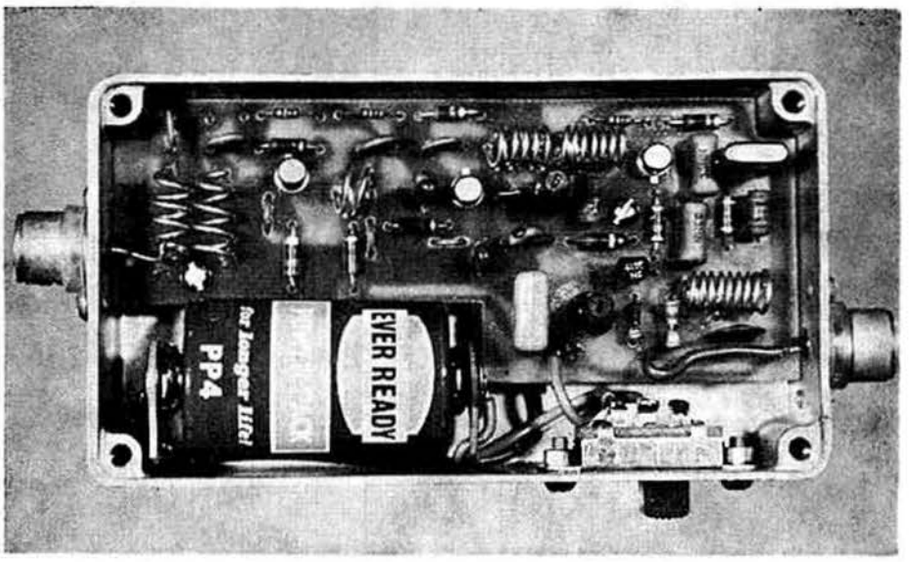
As the voltage output of each oscillator is large, it is lowered by means of a resistive potential divider R8-R12 and R9-R13, and a further divider network at the input to IC2, RX in Fig 1, gives single resistor control of the output voltage and avoids the need to fit a potentiometer. See Table 1 for the approximate output voltages. The author's version has an output of 30mV rms, the following input frequencies of the oscillators being 2,100Hz and 1,220Hz.

It will be noticed that C2 in oscillator 1 is different from C1 and C5, this was increased to change the frequency slightly. The output frequency of each oscillator was checked with the aid of a frequency meter.

The frequency $f = \frac{1}{2\,RC}$ where R3 = R4, C1 = C2 and C5 = C1. R6 R10 is 10kΩ higher than R2 R4 to give a gain of 1 plus.

A converter for the 432MHz band



by J. HAZELL, G8ACE*

IN general, converters for the 70cm band use high tunable frequencies, 28 to 30MHz not being uncommon. For the station equipped with only a modest single-conversion receiver having an i.f. of 470kHz, two problems can arise when tuning 28 to 30MHz. First, the image rejection may be virtually non-existent, causing strong signals to appear twice in the tuning range, and second, tuning scales at 28 to 30MHz are often cramped to a point where reading a signal to the nearest 100kHz can be very difficult. If a low tunable frequency of, say, 4 to 6MHz is employed, then even the poorest receivers attain a useful degree of image rejection and the calibration becomes much less cramped. This lower frequency is also common to many 2m converters. In order to satisfy the requirements of good image rejection and low tunable frequency, the following double conversion converter evolved.

Circuit description

Fig 1 shows a conventional design approach to rf stage, first mixer and second mixer. The oscillator collector circuit is tuned to the fifth harmonic of the crystal and so injection for both mixers is obtained from a single stage.

The BF271 is a 38MHz i.f. transistor with a very low feedback capacitance. Its use was adopted because it was found to perform well at 70cm and is reasonably priced. The ubiquitous 2N3819 fet was chosen as the second mixer for better signal handling.

The aerial is coupled to the rf stage, operating in common emitter by a double tuned circuit, to attenuate strong out-of-band signals. The base of the first mixer is coupled from both the rf stage and the oscillator by means of a capacitive tap across the tuned circuits. A single tuned circuit is used from the rf stage, while a bandpass circuit from the oscillator reduces the coupling of unwanted multiplier harmonics. The output from the first mixer is centred at 76·33MHz, to which the first i.f. coil is tuned.

The second mixer converts this to 4-6MHz. A capacitive tap is used across the second i.f. coil because this has been found to give extended coverage and higher output at the hf end of the band.

A fifth overtone crystal is used in the oscillator to reduce the multiplication to five times for the first mixer. The crystal frequency is extracted from the emitter circuit tuned to 71·33MHz for injection into the second mixer, and the collector is tuned to 356·65MHz for feeding the first mixer. The capacitance between base and emitter was found to be necessary for stability when using the BF271 transistor in this circuit.

The power arrangement can be such that with the switch in one position the converter is powered from the internal battery. In the other position it can be powered from the transmitter power supply via a resistor and zener diode if the supply is more than 9V.

At 70cm it is possible for tuned circuits to miss the band through the effects of small hidden inductances in both the wiring and associated components. To reduce difficulties a printed circuit board is used to control the amount of inductance in the wiring. Fixed capacitors are used throughout to eliminate the unknowns in the various trimmers that might otherwise have emerged from constructors' junk boxes. The i.f. coils are wound on formers and tuned with cores; the other coils are self-supporting and are tuned to resonance by squeezing the turns. Decoupling of the rf and first mixer stages is achieved by using leadless disc ceramic capacitors, which are carefully soldered in slots in the board, thus significantly reducing series inductance.

Construction

The printed board is housed in a die-cast box supported on ¼in pillars. Sufficient room is left to hold a PP4 battery and on/off switch. The input and output coaxial sockets, with their inner connections cut down to ⅛in, are mounted on the outside of the box using short screws tapped into the side walls. A slot cut into the board at the input end allows the board to be angled past the sockets on assembly. When the connections are soldered a plug inserted into the socket will prevent the inner conductor drooping with the heat.

By transferring the component hole centres from Fig 2 to tracing paper, they can be copied on to the copper side of a single-sided glass-fibre board. Because the mounting holes for the transistors are so close, three leads are bent over on to the adjacent copper pads for soldering, while the fourth has

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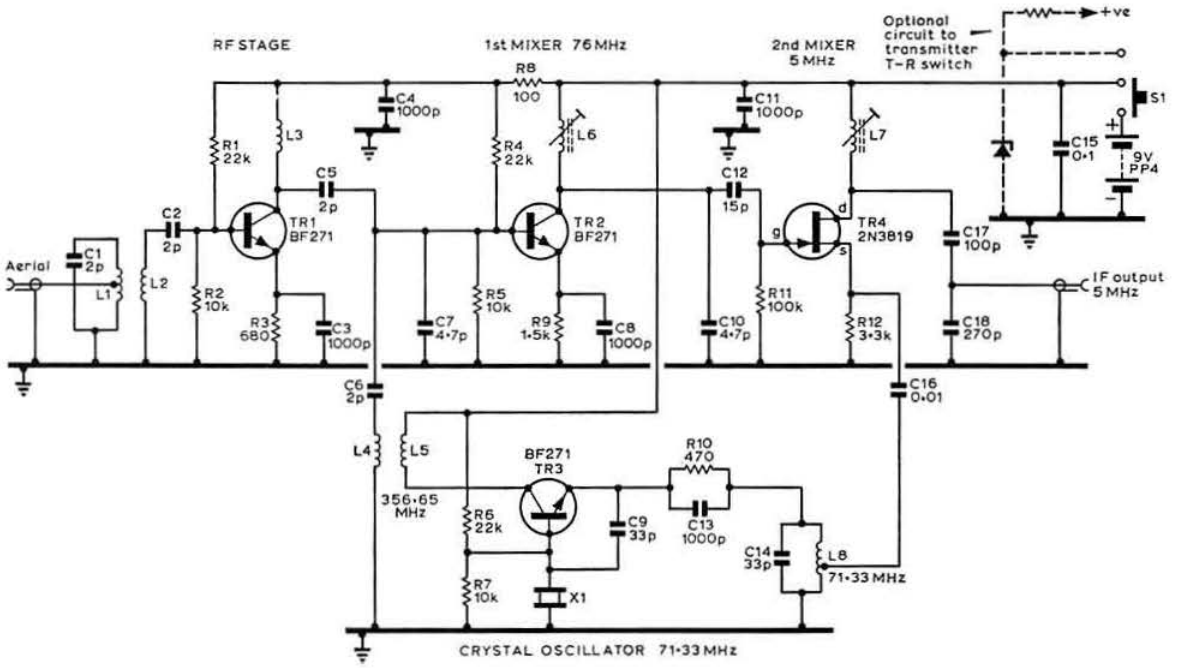


Fig 1. Circuit diagram of the converter for 70cm in which a double conversion process is used to reach an i.f. of 5MHz with injection to both mixers from a single crystal oscillator at 71·33MHz

copper around the hole. After drawing and etching, the two mounting holes can be enlarged to $\frac{1}{8}$in. If the board is then placed into the bottom of the box the mounting hole positions can be marked through. The slots for the leadless disc capacitors are made with a fretsaw, joining up holes made at either end. The two coil former holes are enlarged to suit the base of the $\frac{3}{16}$in diameter formers used. In the prototypes these were salvaged from tv i.f.s and required a $\frac{7}{32}$in mounting hole with two locating slots filed opposite each other. They were also reduced in length to avoid fouling the box cover. This is achieved by running a file around $\frac{1}{8}$in from the base and snapping off the excess.

The BF271 transistors are pushed down so they are no more than 1mm from the board; the coils should have their turns resting on the board. All the other components are soldered as close as possible.

Each coil is wound and then stretched on the former so that the ends match the mounting holes. A slightly larger internal diameter is necessary for L3 to achieve resonance. All coils are wound in a clockwise direction when viewed from the end.

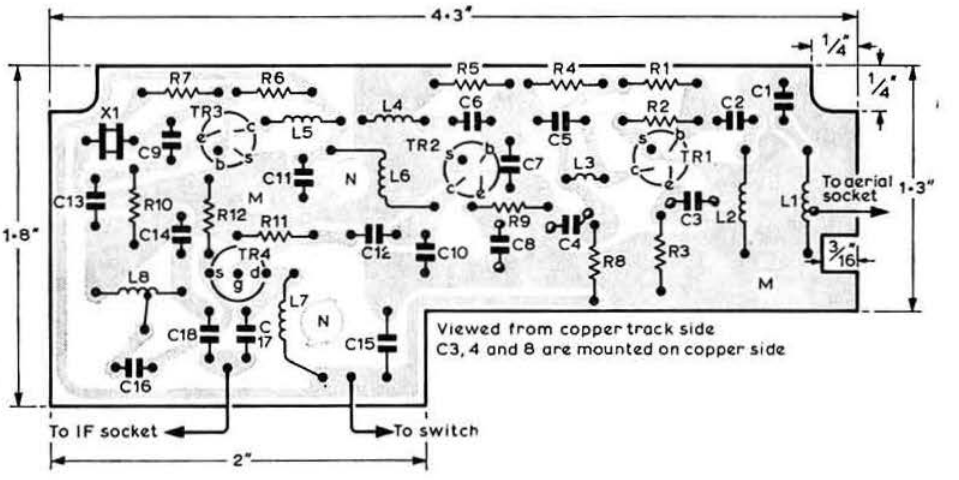


Fig 2. The 70cm converter printed circuit board layout viewed from the copper side. 2 M holes No 30 or $\frac{1}{8}$in, 6BA clearance. 2 N holes $\frac{3}{16}$in to fit Neosid coil formers, remaining holes to be drill No 60. Resistor centres are 0·4in apart. Capacitor centres 0·2in apart, except those with conductors underneath: these are 0·25in

Components List

L1 4t 20swg tinned copper, tap ½t from cold end, ⅛in int. dia.
L2 4t 20swg tinned copper, ⅛in int. dia.
L3 2t 20swg tinned copper, ¼in int. dia.
L4 5t 20swg tinned copper ⅛in int. dia.
L5 7t 20swg tinned copper, ⅛in int. dia.
L6 7½t 30swg enamel, close-wound on ⅛in former, 6mm vhf core
L7 35t 36swg enamel, close-wound on ⅛in former, 10mm F14 core
L8 9t 20swg tinned copper, tap 3½t from cold end, ⅛in int. dia.
Slight variation in gauge of wire is permissible for L6 and L7.

R1	22kΩ	**R5**	10kΩ	**R9**	1·5kΩ
R2	10kΩ	**R6**	22kΩ	**R10**	470Ω
R3	680Ω	**R7**	10kΩ	**R11**	100kΩ
R4	22kΩ	**R8**	100Ω	**R12**	3·3kΩ

All ¼ or ⅛W.

C1	2pF	**C7**	4·7pF	**C13**	1,000pF
C2	2pF	**C8**	1,000pF leadless disc	**C14**	33pF
C3	1,000pF leadless disc	**C9**	33pF	**C15**	0·1μF
C4	1,000pF leadless disc	**C10**	4·7pF	**C16**	0·01μF
C5	2pF	**C11**	1,000pF	**C17**	100pF
C6	2pF	**C12**	15pF	**C18**	270pF

Capacitors between 2pF and 1,000pF should be Erie type 831, 861, A or AD, X or XD, Y or YD, or similar. Leadless discs, Erie type LD19, or similar.

TR1	BF271	**Diecast box,** RS Components Ltd, No 993
TR2	BF271	**Slide switch**
TR3	BF271	**Two battery connectors**
TR4	2N3819	**Two coaxial sockets**
X1	71·33MHz HC18/U fifth overtone	

Alignment

After the component positions have been checked, the supply can be connected. The BF271 emitters should be at +2V and the 2N3819 at +4V with respect to earth.

A wavemeter is normally essential for any work carried out at 70cm, but the tuning range of the self-supporting coils in this design is so small that if they have been accurately wound they should be almost on tune. If either a wavemeter or signal generator is available they can be used to confirm the following procedure. An insulated tool with a small metal blade ⅛in wide by ¼in long is necessary to knife the coils.

Connect the converter to the receiver by a 3ft length of coaxial cable and tune to 5MHz. Turn up the receiver gain until noise is heard and then adjust the second i.f. core L7 for maximum noise output. Moving to the oscillator coil L8, short two turns together with the insulated metal blade; a reduction in noise will show that the oscillator is functioning. If no change is detected squeeze the turns together until the test shows it is functioning. Leave it functioning and move to the first i.f. coil L6, which can now be peaked, screwing the core down from the top of the former. Stop at the first peak in noise; the second is incorrect. Readjust the receiver gain if necessary so that further noise changes can be detected easily.

Moving on to L4, the first mixer oscillator coil, short two turns at the earthy end adjacent to L5. Squeeze or expand the turns a little at a time until a change in noise is heard on shorting the same two turns. The noise should increase when the short is removed, showing coupling of oscillator power. A change of 0·05V should be seen in the first mixer emitter voltage when the short is applied The primary coil L5 is best left at this stage unless insufficient power is available. The rf stage collector coil L3 can be adjusted, using the same procedure. A change in noise should now occur when the base coil L2 is shorted. It must be emphasized that the noise changes at each stage are quite small but should not go unnoticed by the keen ear.

If the aerial is now connected, 70cm signals should be heard, allowing a final touch to be made to each coil to obtain maximum S-meter reading. Finally, re-peak the second i.f. coil L7 to 4·5MHz; this should give the most even distribution of gain across the band. Little change in performance should be noticed when the lid is screwed down.

Performance

Four prototypes have been constructed and the overall performance in each case has been similar to a converter using a single AF186 rf stage. If the ultimate performance is required for dx working, a separate rf stage can be constructed using a low-noise transistor. This has the advantage that it may be kept up to date without affecting the rest of the converter. It can also be situated next to the transmitter pa stage to take advantage of diode aerial switching techniques, or at the mast-head to overcome feeder loss.

Only one design fault has come to notice since the first converter was constructed. L3, between the rf stage and mixer, is tuned almost to the same frequency as the sixth harmonic of the crystal. This lowers the immunity to some very strong Band 4 tv signals, particularly Channel 24 vision, which can be changed down to i.f. by the same double conversion process. This is not a serious problem as attenuation is provided by the input circuit. An external filter, which ought in any event to be used with a transmitter, will eliminate the problem.

The BFY90 transistor can be used as a substitute for the BF271 if this is to hand, but the reversed base emitter connections should be observed. Performance is about the same with the substitution.

Satisfactory operation should be obtained down to 6V, the oscillator stops at approximately 5·5V.

The RSGB News Bulletin Service

The RSGB News Bulletin, callsign GB2RS, is broadcast every Sunday morning. This bulletin can be received on either vhf or hf, which gives almost complete coverage of the British Isles. It keeps radio amateurs up-to-date about happenings in the world of amateur radio and gives information on coming events, supplementing and bridging the gap between successive issues of *Radio Communication*.

SCHEDULE

Time	Frequency (MHz)	Location and coverage (hf) or beam heading (vhf) of station
0930	3·6	Bromley, Kent (SE England)
1000	3·6	Cheltenham (SW England)
	145·8	Aberdeen (NNW)
	145·095	Croydon, Surrey (NE)
1015	3·6	Belfast (N. Ireland)
	145·8	Bangor, Co Down (N)
1030	3·6	Derby (N. Midlands)
	144·337	Weston-super-Mare (NW)
	145·8	Aberdeen (SW)
	145·3	Brierley Hill (NW)
1045	145·89	Middlesbrough (NW)
	145·095	Croydon, Surrey (SW)
1100	3·6	Bridlington (NE England)
	144·3	Brierley Hill (SW)
1130	3·6	Motherwell (S Central Scotland)
1200	3·6	Aberdeen (NE Scotland)

MICROWAVES

by DAIN EVANS, G3RPE*

News

GM3DXJ recently visited Vancouver and met G3ZGO. Robert has been very busy reorganizing their repeaters but is now turning his mind to higher things: moonbounce on 10GHz. He plans to use up to 10W and a dish 10ft in diammeter. One is envious for another reason: on hot days, you can actually *see* ducts form over the sea.

From Scotland the 10GHz news is that GM8HBU is now operational, and that GM8GEC and GM8HEY have a 151km GM path lined up.

F9OD of Nantes is now equipped for 1,296MHz with a transmit frequency of 1,239·330MHz. Presumably he will still be able to listen on 1,296MHz, although this has not been stated.

The second microwave round table

Last June a very successful round table, at which a wide range of topics of general microwave interest were discussed in a quite informal way, was held in Winchester; about 40 people attending.

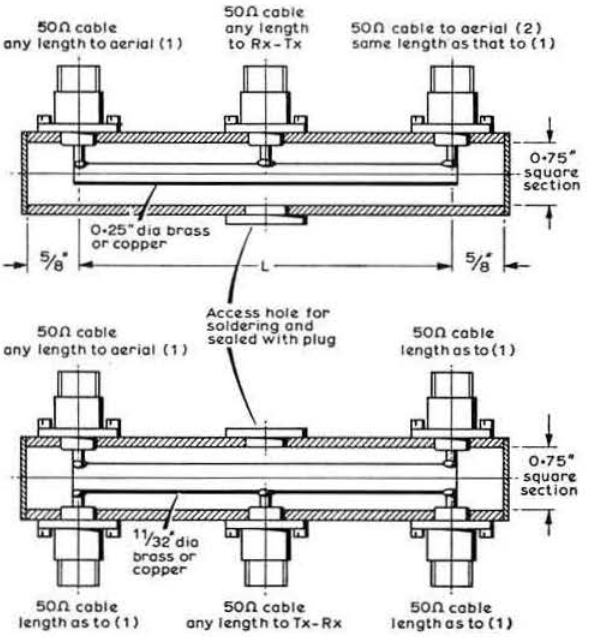
A second meeting commencing at 10am will be held on 7 December in the Ground School Building at Kidlington Airport, which is about five miles north of Oxford on the A423. During the morning session it is proposed to repeat the style of the last meeting, that is a controlled free-for-all. The main feature of the afternoon programme will be a look at current 1,296MHz equipment and practice, and to examine future trends. Everybody is welcome, but a line to G3JHM, "High Peak", Telegraph Lane, Fourmarks, Hants, will be of value in giving the number to be catered for.

A much appreciated feature of the last meeting was the equipment display. We would like to see even more this time. Even if it has been shown before, bring it again for the benefit of newcomers. There are no prizes, so its condition and completeness are immaterial.

That well-known microwave enthusiast GM3OXX seen operating his 3cm portable gear in the county of Kinross. This is the equipment which achieved the British 3cm record distance of 243km earlier in the year. The object fitted with a horn seen in the right background is an even smaller portable 3cm transceiver

Power splitters/combiners

The power splitters shown in Fig 1 enable either two or four aerials of a given impedance to be fed from a single coaxial cable of the same impedance. The unit consists of a length of fabricated coaxial line which performs the appropriate impedance transformations. The inner is made exactly $\lambda/2$



Frequency (MHz)	L (inches)
2305	2·56
1296	4·55
432	13·67

Fig 1. Power splitter/combiner for connecting two or four 50Ω aerials to a common feeder

*4 Upper Sales, Chaulden, Hemel Hempstead, Herts.

Continued on page 860

Building blocks for the novice

by SVEN WEBER, G8ACC*

Diodes, diodes and diodes — and some experiments with them (Part 9)

Diodes and modulation

In part 8 of this series it was shown how diode circuits loaded (or damped) the sources feeding them, and some remarks were passed about rf rectification efficiency. In all the experiments that were described, the source was always a steady alternating voltage at various frequencies. However, a steady voltage or output can transmit no information or intelligence about the source except to say that it is on: information can only be passed from source to receiver if the source output varies in some way, ie if it is modulated. The main methods of modulating are by varying the amplitude of the carrier wave (a.m.), phase or frequency (fm), or duration or position of pulses in a pulse train, pcm (pulse code modulation), a.m. and fm being the two most commonly used forms. Unfortunately, there are not many practicable experiments that can be described except the obvious ones of trying the circuits.

Amplitude modulation

The source voltage or carrier is varied by the modulating voltage in two ways. The first is that the depth that the carrier wave is impressed is directly proportional to the amplitude of the modulating voltage (at least, under normal circumstances it is) on both positive and negative half-cycles, up to a certain point at which the carrier is interrupted (100 per cent modulation). Anything more than this is called over-modulation and for various reasons (which can be deduced from what follows or can be looked up in text books on the subject) adversely affects the surrounding rf spectrum and is generally speaking not liked (Fig 61).

The second way is that whatever the modulating frequency or frequencies, in a properly-designed modulator these will impress themselves on the carrier at the same frequency (Fig 62). This might seem obvious, but in consequence one can draw a number of conclusions. First, and most important, is that any frequency *modulated* on to another frequency causes two more frequencies to appear: the sum and difference respectively of those two frequencies.

$$f_c \bmod f_m \rightarrow f_m + f_c + f_{(c+m)} + f_{(c-m)}.$$

The last three frequencies are the ones normally emitted and form an a.m. transmission. The two combined frequencies are called sidebands and they are, as was implied above, just as much above the carrier as below it in frequency as was the original modulating frequency. A point to notice is that the sidebands carry the information, not the carrier, and one sideband just as much as the other. So there is quite a bit of redundancy in a normal a.m. transmission. However, the carrier is normally necessary to recover the original signal by providing something for the sidebands to beat against.

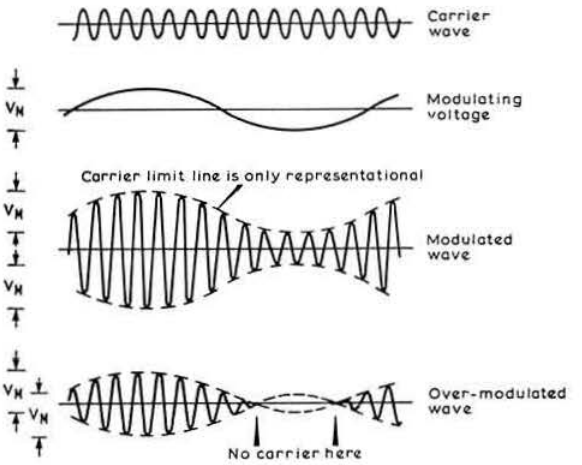


Fig 61. Representation of a.m. waves (not to scale). Note the last one where the modulation cuts off the carrier

There is a certain amplitude ratio for these three emitted frequencies for 100 per cent modulation: the amplitude of each sideband is 50 per cent of the carrier or a quarter of the power (Fig 63). All this makes it obvious that the required bandwidth to receive a full a.m. signal would be twice the highest modulating frequency. One sideband can be reduced or suppressed to take up less rf space and the carrier can also be filtered out to make an ssb signal (single sideband, which implies that the carrier is suppressed as well). The carrier can be reinserted in the receiver. Generating a modulated signal can be carried out quite simply by passing both the carrier and

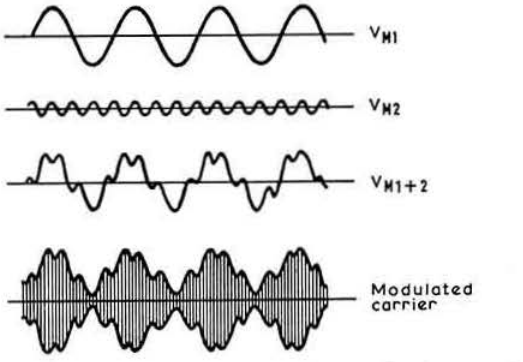


Fig 62. Two independent modulating frequencies impressed on carrier

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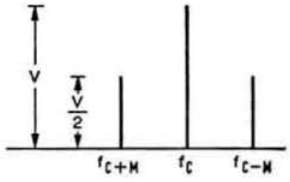

Fig 63. Amplitudes of components in an a.m. wave with one modulating frequency and modulated to 100 per cent

modulating voltage through a non-linear impedance (which does all the work) and a linear impedance (to tap off the output). In passing it should be said that a linear impedance (C, L or R and combinations of these) cannot by definition alter the shape of a signal going through it, but a non-linear one can. As far as the present series of articles is concerned, a non-linear impedance (resistance, here) means a diode of one sort or another, although very often in certain circumstances a diode is not the most efficient way of doing things. Putting the two frequencies through a diode and including some linear impedance to cream off the output voltage makes a modulator (or mixer: the two terms are synonymous), by varying the biasing point on the diode E/I curve with the carrier or modulation frequency (Figs 64, 65). In such a simple form, the modulator is rarely used except as a mixer in a receiver.

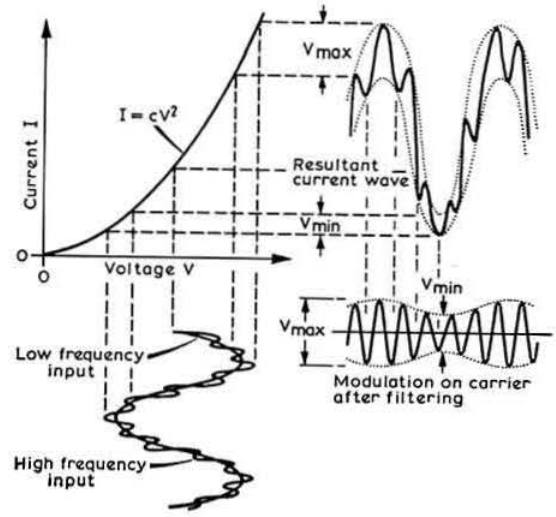

Fig 64. Modulation process with a non-linear (square-law) modulator

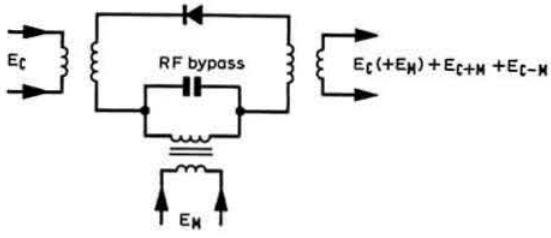

Fig 65. Simple diode modulator: non linear, approaches square law with small amplitudes

Analysing the position mathematically with the kind of E/I relationship mentioned in part 1 of this series for a small silicon diode ($E = m\log_{10}I + c$), if the two voltages are applied to a diode the resultant comes out to be an infinite series of harmonic and sideband terms. But with reasonable coefficients, c reduced to zero through forward biasing, and one voltage much bigger than the other, it reduces practically to a dc voltage, the original frequencies, the two main sidebands and various harmonics and sidebands of harmonics. If the relation were purely square law, the larger part of this harmonic spectrum would disappear and only the second harmonic of the two applied voltages would be surplus to requirements. However, with one voltage much smaller than the other, it is surprising how close to this state it is possible to get with a simple diode. Of course this means that any depth of distortionless modulation is difficult to achieve.

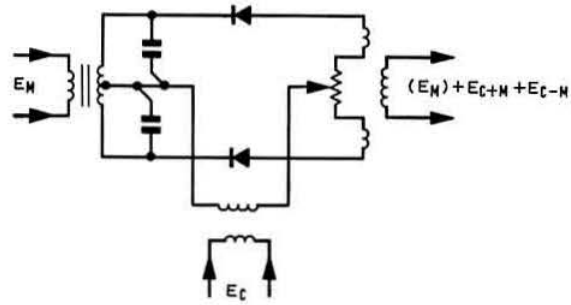

Fig 66. Balanced modulator

Using two diodes as in Fig 66 leads to both a theoretical and practical suppression of one of the original components, *if* the circuit is properly balanced (which means among other things that the diodes are identical). This is called a balanced modulator. Assume that the amplitude of the carrier (E_c) is large compared with the modulating voltage (E_m), only the biasing of the diodes with E_c need be considered. If the instantaneous state of E_c across the diodes is to give them a large forward bias then E_m will have a low resistance path from input to output. If E_c is the other way round, the diodes will be in a high resistance state preventing any passage of E_m. Now as far as the output is concerned, E_c is balanced out due to its being in phase opposition in the output transformer, but any value of E_m would add on to or subtract from E_c (depending on which diode and what part of the cycle of E_m) thus unbalancing the output.

Therefore the output would be the original modulating voltage, if the output transformer could cope with that, and the sidebands produced by E_c and E_m and the sidebands of 3, 5, 7 . . . times the original E_c frequency. These would appear because the circuit literally switches the carrier on and off and makes a square-wave output, and a wave of this type is a succession of diminishing odd harmonics. The unwanted frequencies can be filtered off quite successfully. This kind of output is called "double sideband suppressed carrier" (dsbsc). To go even further, one of the two sidebands can be suppressed by filtering to make the output into ssb. Notice the essential difference between the balanced modulator and the simple diode version: one switches and the other operates on the smooth part of its characteristic.

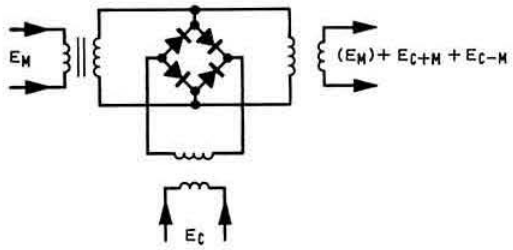

Fig 67. Cowan balanced modulator

A bridge form of this modulator is sometimes used (Cowan modulator). This is a shunt rather than a series modulator (Fig 67). If the carrier input sign across the diodes back biases them, the path from the top of the circuit to the bottom (A-B) will have a high resistance. The other way round, A-B will have a low resistance and would short-circuit E2. So the output would be the same as the simpler balanced modulator or mixer in Fig 66. Taking Fig 66 again, lay a couple of diodes (identical to the first pair) across the diagonals between the two horizontal arms as in Fig 68. Here the carrier E1 switches E2 either straight along the horizontal or across the diagonals and the output, at balance, only contains sideband and harmonic sideband frequencies; the original frequencies are balanced out, and the carrier changes phase by 180° with each half of the modulation cycle. This circuit can be redrawn as in Fig 69 and is called a double balanced bridge ring modulator, or ring modulator—because of the way that the diodes are connected to each other. Incidentally, the sidebands would have twice the amplitude compared with the simpler balanced modulator.

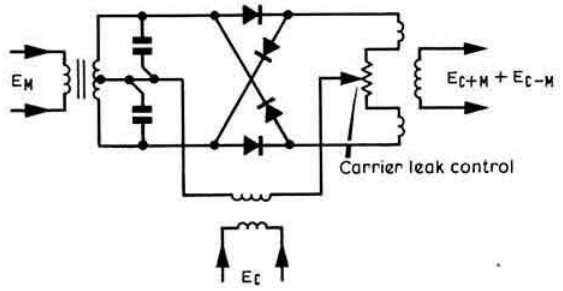

Fig 68. Double balanced modulator (lattice arrangement): carrier and original modulation frequencies are balanced out leaving only sidebands

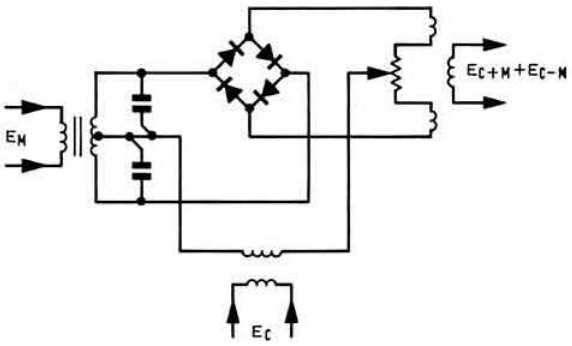

Fig 69. Double balanced modulator (ring modulator): Fig 68 redrawn. Note which way diodes are connected to each other

Part 10 will deal with demodulation, mixing and multiplication.

Microwaves

(Continued from page 857)

	50Ω system		75Ω system	
	2-way Z_O=72Ω	4-way Z_O=50Ω	2-way Z_O=100Ω	4-way Z_O=72Ω
d D	2·82	1·96	4·50	2·82
d D	3·32	2·31	5·30	3·32
d D	1·54	—	2·46	1·54
d D	1·66	—	2·65	1·66

Fig 2. Alternative coaxial configurations

long between the centres of the outer connectors, and the outer is made approximately 1¼in longer. In the original design (by W0EYE), the outer was made from square section aluminium tubing, the ends of which and the access hole for soldering the centre connector being sealed with aluminium plates bonded with an adhesive. Alternatively copper or brass tubing may be used and the plates soldered. Any other size of inner or outer within reason may be used provided that the ratio of the inside dimension of the outer to the diameter of the inner conductor is unchanged.

Other forms of coaxial line should work just as well. Fig 2 gives the design details for a number of configurations.

The cables connecting each of the aerials to the splitter must be of the correct impedance cable, and can be of any length provided they are the same in all cases, and preferably taken from the same batch. Note that the aerials need not be of the same type: a broad-beamwidth aerial of moderate gain may be combined with a high-gain aerial of narrow-beamwidth provided that both are of the correct impedance.

The 24GHz record

Since the report of the 72km contact by G3BNL and G3EEZ on this band in the October column, nothing has been heard of any other contacts. Their contact would therefore seem to be the first world record on the band.

TECHNICAL TOPICS

by PAT HAWKER, G3VA

OVER the years, in putting together these *Topics* and then subsequently selecting from them part of the material for *Amateur Radio Techniques* (the fifth edition of which is now available at what surely represents good value for money by current publishing standards at £2 for 304 large pages and over 700 diagrams) I have had plenty of time to reflect on how some new ideas rapidly attract attention and come into general use while very many others, equally promising, never seem to be taken up, at least the first time around. A recent report of the National Research Development Corporation suggests that only a tiny proportion of the new inventions submitted to them by individuals are ever converted into marketable products.

Why is it that people spend a lot of time and effort developing novel ideas, prove to their own satisfaction that they really work and seem capable of providing either a new facility or a more elegant or more economic solution to a real problem, only to find that very few people appear interested? There seems to be an inherent distrust of novelty unless it offers a great improvement, partly due to the intrusive opposition to innovation that we have mentioned before.

Sometimes, perhaps often, the innovator is at fault; his absorbing interest in his own system making it difficult for him to see that there is really no need for a change; or that his system, while worthwhile, would involve major changes by other users (the old question of non-compatibility); or that it brings its own difficulties that outweigh the advantages. But certainly almost any innovator must expect to meet opposition and (worse) indifference and rejection, even for those ideas that later prove to be winners. But surely one of the most potentially rewarding aspects of amateur radio is that it should provide a test bed for experimentation and innovation.

With the publication of *ART5* and as we approach the end of yet another year, I would like to take this opportunity of thanking all those who have contributed ideas and suggestions to recent *Technical Topics*.

Experiments in modulation

One keen and experienced experimenter (who is also a professional electrical engineer), J. A. Adcock, VK3ACA, of Preston, Victoria, Australia, recently published a series of articles in *Amateur Radio* reporting work on no less than five potentially significant developments (see later). He writes: "In general the articles have been received with stony silence. Among people I have asked, some say they found the ideas interesting, others say they just do not understand them. It is quite another matter whether a person who finds the ideas interesting will make use of them . . . unfortunately to present the ideas in detail would require a great deal of space . . . one of the systems took several years to develop and I wonder if I could seriously expect any other amateurs to build such a system . . . my approaches to commercial interests have met with indifference although I feel quite sure that the ideas are worth further development."

Basically the systems developed (at least to the extent that shows they do work although in some cases further development is needed to make them work well) cover:

(1) a new method of generating dsbsc;
(2) a new method of demodulating dsbsc without the use of a local oscillator;
(3) a method of electronically dividing the audio frequency spectrum by two, then transmitting it with half normal bandwidth and finally multiplying it by two at the receiver. This has been done with a.m. and more recently with ssb transmissions;
(4) a new method of generating ssb;
(5) a method of simulating the effect of rf clipping on system (4).

In so far as I can judge from the series in *Amateur Radio*, from correspondence with the author and in brief discussions with others, the claims for novelty made by J. A. Adcock are justified and all the systems are fundamentally sound, although some offer considerable difficulties in implementation with low-cost analogue integrated circuits currently available. In effect systems (3), (4) and (5) consist of performing mathematical analogue-computer-type operations on the signal with, for example, ic quadrant multipliers programmed as multipliers, squarers, square rooters and dividers.

Clearly *TT* is not the place to attempt to describe this work in the detail it deserves. Nor am I altogether convinced that the bandwidth compression system (system 3) would, due to the compatibility problem and the susceptibility of music to certain types of distortion, ever prove suitable for mf broadcasting, which is one of the possibilities put forward by VK3ACA, although it could well be valuable for speech (and indeed is an electronic realization of a system, based on a

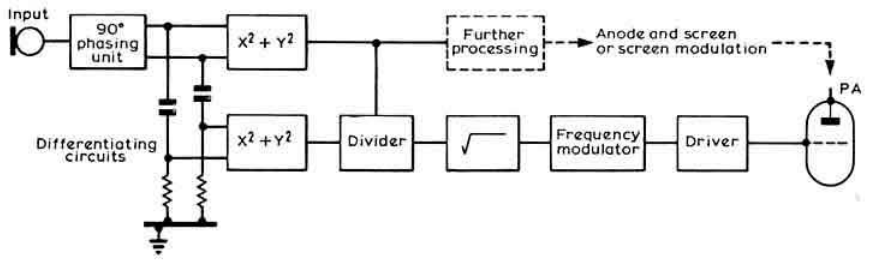

Fig 1. A method of generating ssb developed by J. A. Adcock, VK3ACA, suitable for use at uhf and allowing the pa stage to operate in Class C

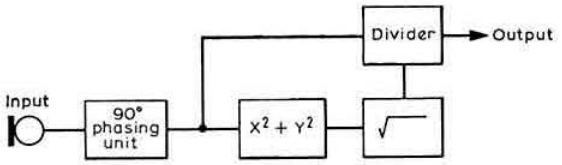

Fig 2. The most recent system developed by VK3ACA to provide compression in conjunction with the ssb generator shown in Fig 1

mechanical divider, put forward many years ago by a well-known figure in electronics, Dr. Denis Gabor).

The VK3ACA ssb generation system (Fig 1) may give some idea of the sort of approach he has adopted in these systems. Effectively it is a system of synthesizing ssb in which the transmitter-oscillator is frequency-modulated with the frequency deviation curve of the original audio spectrum at the same time as the power amplifier is amplitude modulated with the amplitude curve of the audio signal. This system then forms part of (5) which provides a fully compressed signal. System (4) should be capable of providing good quality ssb up to uhf. Fig 2 shows a method of implementing system (5) recently developed.

To develop fully several of these projects is clearly a bit too much for one person, and VK3ACA believes that nothing like as much work has yet been put into developing applications of analogue computing elements as into digital techniques. He finds that even people closely connected with electronics have only a very hazy idea of the nature and use of these ic analogue elements.

In these notes I can perhaps only hope to have whetted the appetite of a few of the more experimentally minded readers but it may be possible to return to some at least of these intriguing systems on other occasions. I must freely confess that whether VK3ACA has come up with practical solutions to real problems would need other brains than mine to decide. But I feel certain that these "experiments in modulation and audio" as the articles in *Amateur Radio* (March, April and May 1974) were called—and the subsequent developments that VK3ACA has reported in correspondence—are worthy of study and encouragement.

ZL2AMJ Kwik-Sorta transistor tester

Several years ago, Fred Johnson, ZL2AMJ, described in *Ham Radio* (November 1970) a simple test set for bipolar transistors and diodes. This provided a quick "go/no-go" status of the device and also sorted unknown devices into pnp/npn types, identified lead connections, etc. It used a small ac test potential derived from a mains transformer with pilot lamps as indicators in conjunction with diodes.

Now in *Break-in* (October 1974), ZL2AMJ comes up with a Mark 2 version. It performs the same tasks as the original but has the advantage that the 60mA pilot lamps are replaced by two light-emitting-diodes (LEDs) which act also as their own diodes and allow the unit to function with appreciable lower test voltages and currents and so to reduce still further any possibility of causing damage to devices under test: Fig 3.

Of this simple, seven-components-in-a-box unit ZL2AMJ writes: "The value of this unit as a checker and time saver cannot be over-emphasized. It is my observation that people who scoff at its simplicity do not understand its purpose, or appreciate the wide application and useful results that can be obtained from it. I firmly believe that every home constructor would find it invaluable."

Clearly it is not meant to be a laboratory instrument but as a straightforward "go" or "no go" indicator for finally testing a device before it is popped into circuit, always advisable whether using new or reclaimed devices. ZL2AMJ makes it a rule that all bipolar transistors and diodes are checked in this way before being mounted in any new circuit. Even new components, he notes, can be found to be improperly marked, or packed in wrong boxes, or have newly changed pin connections. Devices rejected should not immediately be thrown away since they may be FETs or UJTs, and faulty bipolar transistors may still form useful diodes if one good junction can be located on the Kwik-Sorta.

Power transistors and power diodes can be checked using wander-leads and croc-clips or by wiring single-strand leads to the device pins and then plugging these into leads in the test socket; alternatively separate *e*, *b* and *c* test sockets can be fitted in addition to the usual test socket.

Basically, since the power supply is ac, any diode under test will conduct only when the polarity is appropriate and when this agrees with the polarity of one or other of the two LEDs. If a test diode is removed from the socket and the connections reversed the other LED glows; if the diode is open-circuit neither LED glows; if short circuited both LEDs glow.

Transistors behave similarly except that to make them conduct a base current is needed, and this is supplied through R2 which is normally kept in the high-resistance position and then advanced until one or other LED begins to glow. An indication of transistor "gain" is provided by comparing the point on R2 travel where the LED first starts to glow. Since it is possible to treat a transistor as two separate diodes, devices with unknown connections can be sorted out to find base, emitter and collector connections.

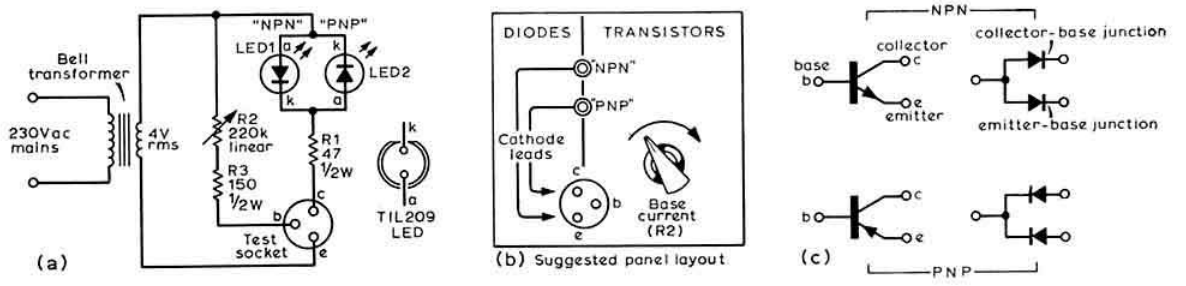

Fig 3. The ZL2AMJ Kwik-Sorta Mk 2 transistor and diode tester

TABLE 1—Kwik-Sorta test procedures

Device under test	R2 position	"pnp" led	"npn" led	Conclusion
Diode between "e" and "c" pins		On	Off	Good unit. Anode connected to "e" pin.
		Off	On	Good unit. Anode connected to "c" pin.
		Off	Off	Faulty unit. Open-circuit or faulty connection.
		On	On	Faulty unit. Short-circuited.
Transistor (known pin connections) to "e", "b" and "c" pins	Max value	On	On	Faulty. Probable s-c to emitter.
		Off	Off	Normal. Proceed to rotate R2.
	Decreasing	Increases in brilliance	Off	A good pnp device.
		Off	Increases in brilliance	A good npn device.

Note: with practice other indications, such as correct pin connections of an unknown transistor will be obtained, and "gains" can be compared by noting position and effect of R2 on light glow.

The accompanying table gives an idea of how to use the tester but in practice after a bit of experience further operations are likely to become second-nature to a user.

Optical coupling isolators

Refinements to improve the stability of variable frequency oscillators continue to appear. For example, A. K. Langford, G4ARY, in *Wireless World* (November 1974) shows that an oscillator can be effectively isolated from load fluctuations by using optical coupling in the form of one of the packaged LED/photo-transistor combinations (eg Hewlett-Packard 5082-4350) as an alternative to a series of Class A isolating stages: Fig 4. The article also shows how an agc system can be incorporated to provide a fixed voltage output over a very wide frequency range.

This general technique of optical coupling has been mentioned several times before in *TT*, although it is only quite recently that the LED has been used in this application to reduce the amount of drive current that is required. G4ARY's arrangement provides about 6mA bias for the LED by simply putting it in the collector circuit of the oscillator, and such devices can provide coupling at frequencies up to and beyond 10MHz. For example, another recent application of this technique investigated by Mullard Research Laboratories is to provide a means of coupling video or Oracle/Ceefax data signals into a television receiver having a "live" mains-connected chassis (*Royal Television Society Journal* Vol 15 No 4 page 98-9).

Oscillator stability in the EC958/7

An article on the design of the Eddystone EC958/7 communications receiver by G. J. Mellor and R. T. Sutton (unfortunately in the withdrawn January 1974 issue of *Point-to-Point Communication*) also suggested a number of ideas on improving the stability of free-running oscillators. In this receiver, which uses partial frequency synthesis, a 5·5 to 6·5MHz vfo is used with a decade divider to provide a 550 to 650kHz interpolation oscillator range having a resolution of the order of 1Hz. The receiver is designed to meet the Defence Specification DF133 vibration requirement of frequency shifts of less than 4Hz peak to peak amplitude for a variety of vibration frequencies and amplitudes.

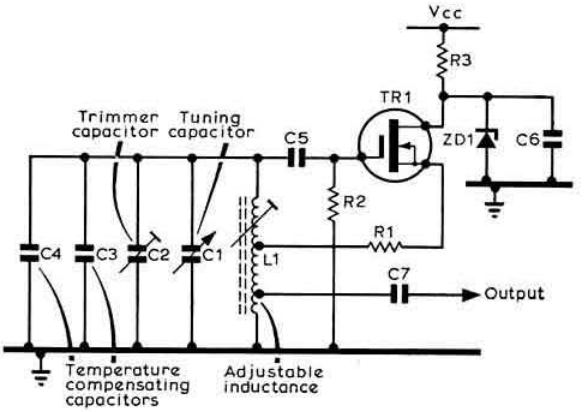

Fig 5. Basic circuit diagram of the 5·5 to 6·5MHz interpolation oscillator used in the Eddystone EC958/7 receiver

The idea of running an oscillator at 10 times the output frequency may seem at first sight to fly in the face of traditional practice, but the range was chosen so that the physical size of the variable capacitor, inductance etc is kept small to allow the whole oscillator to be enclosed in an insulated heavy copper box with its temperature closely controlled by a heater coupled to a sensitive temperature dependent semiconductor inside the box. The use of this frequency range, it is stated, also enables a rigid single layer inductance, L1, to be used rather than a bulky wave-wound coil that would be needed for 550 to 650kHz.

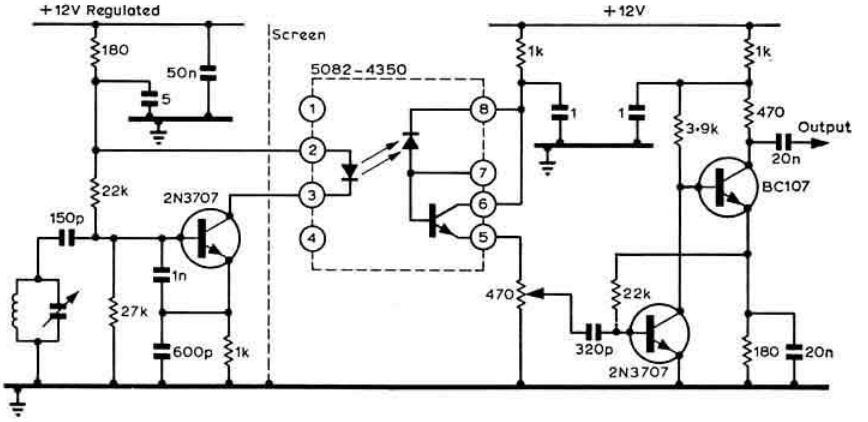

Fig 4. Simplified circuit of the optically-isolated vfo described by G4ARY in *Wireless World*

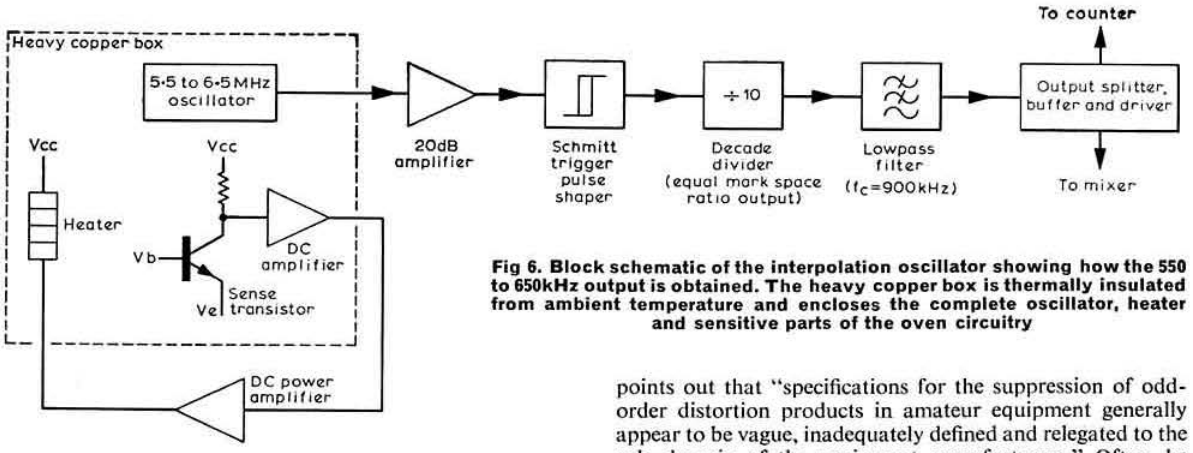

Fig 6. Block schematic of the interpolation oscillator showing how the 550 to 650kHz output is obtained. The heavy copper box is thermally insulated from ambient temperature and encloses the complete oscillator, heater and sensitive parts of the oven circuitry

The basic oscillator (Fig 5) uses a single-gate mosfet of good parameter stability which is enhanced by the use of degenerative source feedback applied by R1 at ac and dc. Positive feedback is applied via a tap on L1 with the output taken from a second tapping point at very low impedance to minimize the effect of load fluctuations. The oscillators are individually temperature compensated by using the appropriate ratio of negative temperature coefficient ceramic and positive temperature coefficient silver mica capacitors across the tank circuit.

All the components used in this oscillator are stated to be of high quality: metal film resistors, silver mica and scintillation-free ceramic capacitors. Any components which might move under vibration are semi-encapsulated in Araldite and after test the box in which the oscillator board is mounted is soldered together to prevent any tendency to open. A well-buffered low-impedance, low-level output is taken from this oscillator to an amplifier and ttl Schmitt trigger which provides drive for a ttl decade divider and then through a six-pole low-pass filter (centre frequency 900kHz) to restore the output to the required sine wave: Fig 6.

At about 600kHz the typical output stability is shown to approach 4 or 5Hz/10h after the unit has been switched on for a couple of days; and to change frequency by less than 1Hz/°C.

On the general question of temperature compensation of a vfo we see that in *Break-in* (October 1974) Jamie Pye, ZL2NN, describes the technique used to provide compensation of the semiconductor vfo of the FT200. This turns out to be a technique which was developed originally for valve oscillators: the use of a variable differential capacitor to provide a continuously variable ratio of positive and negative coefficient compensation capacitors: as in all editions of *ART* (*ART5* page 133). Unfortunately differential capacitors are not easy to come by these days, although with ingenuity they can be built or formed by coupling together two trimmers with a 90° phase difference.

Intermodulation distortion of ssb transmitters

In *Ham Radio* (September 1974) Marv Gonsior, W6VFR, puts forward a strong argument that there should be agreed industry standards for ssb amateur transmitters, particularly in the field of intermodulation distortion (imd) figures. He points out that "specifications for the suppression of odd-order distortion products in amateur equipment generally appear to be vague, inadequately defined and relegated to the sole domain of the equipment manufacturers." Often, he suggests, imd figures are given simply as −30dB without indicating that there are at least two recognized ways of defining imd (one of which is 6dB different from the other for the same degree of imd). But in practice even this ill-defined figure must be regarded with caution since valve manufacturers data, for example of the 6146 family, may suggest that it is virtually impossible to achieve the claimed figure at the input that the user would expect unless rf negative feedback is incorporated (and of common factory-built units only Collins transmitters make use of this). Sweep tubes operated near full power usually have third-order imd products in the −20 to −24dB region; this compares poorly with the −30 to −35dB specified for commercial and military equipment, or the −40 to −50dB for some state-of-the-art military units. Further, as G3GGK and G3EDD have pointed out, the word specification is now seldom used, for fear of contravening the Trades Descriptions Act, and all the prospective buyer can obtain is "technical data" that has little legal significance. It is, as W6VFR puts it, truly a matter of *caveat emptor* or "let the buyer beware". Yet very few amateurs have, or have access to, a spectrum analyser that is really capable of checking imd performance.

For example, in a review of a respected Japanese transceiver last year, G3FRB noted that the manufacturer's published figure for imd (−25dB) gave no indication whether this was based on the more conservative method of measuring one tone of a two-tone signal, or was reference to p.e.p., a form of definition which yields a 6dB *apparent* improvement, and on one band his own measurement yielded a figure of only −12dB (unless this was a misprint) although considerably better on the other bands.

It thus does seem that manufacturers imd figures are virtually meaningless, if not suspect, and at times verge on the impossibility with the type of pa valves fitted. And it also raises the question of whether amateur equipment should be so much more relaxed in this respect than that required for professional applications. It is pointless to complain that our bands are narrow unless we can back this up by showing that amateur transmissions generally do not occupy excessive bandwidth due to flat-topping and poor imd performance. Many years ago (*CQ*, October 1963), K4TUA reported an analysis of the average bandwidth of 1,000 ssb stations: the great majority were between 4 and 6kHz wide, only 2·4 per cent 3kHz wide and the average about 5kHz. It would be

interesting to know the situation today, particularly to, say, limits of −30dB.

Single-conversion and vhf

The vast majority of vhf receivers used by amateurs for fixed or mobile applications involve at least two frequency conversions; often to 10·7MHz and then 455kHz in the factory-built vhf units or with a crystal-controlled converter in front of an hf receiver (which may itself involve double or even triple conversion).

Nevertheless it has been widely recognized for some time that single conversion would offer useful advantages and provide a new standard of excellence if carefully implemented. It is interesting to find this view being argued strongly in the field of commercial mobile radio in an article: "Single conversion vhf/uhf receiver design and the impact of monolithic technology" by O. S. Giles of General Electric in *IEEE Trans on Vehicular Technology* (Vol VT-23, No 1, February 1974, pp 9–15).

Advantages of single conversion are listed as follows:

(1) a single conversion receiver is free of second mixer spurious responses;
(2) "tweet" frequencies are eliminated (tweets are the result of the mixing of harmonics of the two oscillators to generate a birdie at i.f.);
(3) no second mixer to worry about densitizing with strong close-in interfering signals (ie possibility of improving dynamic range).

An fm design is discussed using three monolithic crystal filters and with a crystal discriminator. It is noted that the i.f. should be less than or equal to one-fifth of the signal frequency, and that crystal discriminators (*ART5*) are to be preferred in spite of their lower audio output than possible with some other types of discriminators.

LED voltage monitor

Yet another use of LEDs turns up in an item by Marvin J. Moss in *Electronic Design* (13 September 1974): this is to form voltage monitor for 12V supplies, indicating both over or under tolerance voltages: Fig 7. Using three LEDs the user can see at a glance whether power is on, over-voltage or under-voltage. This is achieved by means of a balanced bridge that uses zener diodes ZD1 and ZD2 in the bridge's opposite arms and back-to-back LEDs between the mid-points of the bridge arms. If the input voltage does not exceed the two zener breakdown voltages (ie 2 by 6·8 or 13·6V), LED1 lights. But above 13·6V LED1 becomes reverse biased and remains "off". When input voltage increases to the extent that voltage drops across R1, R2, CR1 and CR2, then LED2 is turned "on" and this will be, in this arrangement, at 15·2V, with R3 limiting the current through the LED. By mixing of silicon and germanium diodes etc, it might well be possible to decrease the voltage tolerance. The total drain of the circuit as shown is of the order of 50mA, which is not excessive for car batteries or mains units although would have to be considered for dry battery operation.

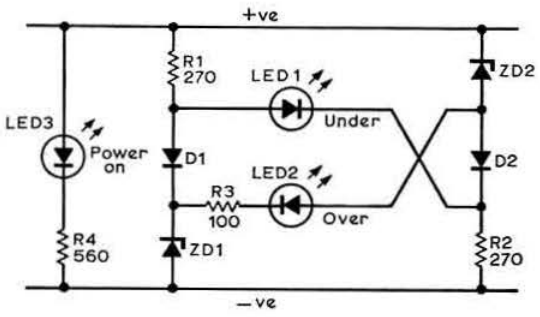

Fig 7. The led voltage monitor which provides indication of over or under-tolerance voltages. CR1, CR2 silicon diode (eg 1N4001), ZD1, ZD2 zener diodes, 6·8V ± 5 per cent. LED1, 2 and 3 light emitting diodes (eg Motorola MLED 500 or equivalent 1·6V nom units, red for over-voltage, yellow under-voltage, green for pilot)

Microphones and acoustics

In the November *TT*, I mentioned some books which give information on room acoustics and microphone techniques. It was only a few days later that a copy reached me of a new book—*The use of microphones* by Alec Nisbett (Focal Press, £1.75 paper covers)—which gives a well-illustrated and down-to-earth review of many aspects of these subjects. Although written from the viewpoint of monophonic broadcasting and sound recording, parts are not without relevance to amateur operation. For instance, it includes some useful notes on the various types of microphones and their directional characteristics, on acoustic treatment of studios and the colouration of sound by the selective emphasis of certain frequencies by the successive absorption of other frequencies at each reflection. Such colouration is particularly noticeable in smaller rooms such as those often used for amateur operation. The author points out that a hand-clap can be used to obtain a rough guide to reverberation time of a room and its suitability for speech transmission. Ideally the sound of a clap should die away quickly but not so fast as to make the room sound muffled or dead, and there should be no "ring" fluttering along behind it. Reverberation time is defined as the time it takes for a sound to die away to a millionth part of its original intensity (−60dB).

One of the points made about obtrusive background noise is that doors, chairs, footsteps are easily identified, but noises due to personal habits or idiosyncrasies may be more difficult to spot: a persistent and erratic click may turn out to be a retractable ball-point pen or a loose dental plate; in radio transmission such sounds may be more noticeable than in real life.

Motor reversing by diodes

C. Draper, G3TSK, two years ago built an aerial rotator using a 24V Meccano motor and some gears—and devised an interesting means of reversing the direction of the motor. Rather than put a relay in the motor box where it would be subject to inclement weather conditions, he used the system shown in Fig 8, based on diodes, These are arranged so that they effectively change over the field or armature windings depending on the polarity of the supply.

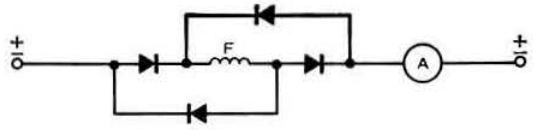

Fig 8. G3TSK's system for reversing a beam-rotating motor by means of diode-switching

FOUR-TWO-SEVENTY

by MARTIN DANN, G3NHE*

THE stable high pressure systems, so common in autumn, which bring the seasonal fogs and, hopefully, tropospherical openings ("Season of *lifts* and mellow fruitfulness", as Keats almost put it) have not, at the time of writing, made an appearance. Even the excitement of a new amateur satellite had to be forgone when a technical hitch delayed the expected October launch.

However, despite the prolonged normality of conditions, it is heartening to note a level of activity that would have been most unusual only three or four years ago. The 2m band, of course, carries by far the greatest amount of traffic, and one would have to be either an insomniac or in an appallingly bad vhf location to find a time of day or night when no amateur signals could be found, particularly around the sideband calling frequency.

Auroral encore

In his report of the September auroral opening, G3MWQ concluded by saying that he looked forward to a repeat in 28 days' time. How right he was! Auroral signals duly appeared from the northeast around 1400gmt, and lasted until after 1800gmt. Although the event seemed to be centred too far south for any exceptional dx to be worked, signals were strong and fairly widespread. Activity was helped by the fact that the opening occurred, once again, on a Sunday afternoon, and the lively state of 4m reflected the possibility that many 70MHz receivers had been left switched on after the first of the cumulatives, held that morning.

G3NHE was very interested to hear G3LQR peaking 56A on 70cm cw at 1600gmt. No contact resulted, and it would seem that a good deal more power is required on 432MHz in order to achieve appreciable reflection from the auroral curtain. While this is not the first time that Simon Freeman has been heard aurorally on this band (DK1KO reported hearing G3LQR's signals some years ago) he has not yet managed a contact. It is a different story on 2m, and the September aurora gave Simon three UR2 contacts. On 4m GM3EOJ, in Aberdeen, gave G3DAH his 60th county on the band, and a prompt QSL resulted in the "Senior" mentioned elsewhere. Both GM3EOJ and GM3ZBE (also in Aberdeen) were extremely strong tone A signals in the south, and sideband was again noticeably more readable on 4m than on 2m.

Best dx on 2m for G3NHE was SQ1JX in QRA I035g, and although Scandinavians were heard working OK, UA1 and UQ2, nothing was heard of the more distant stations. Beam headings were between NNE and ENE throughout, and long after the Continentals had faded out, the GMs were still filtering back from the curtain.

As if to confirm that Sunday is aurora-day, a further opening, much reduced in intensity, occurred one week later, on the 20th. This appears to have been a patchy affair, with some stations hearing neighbouring amateurs working GM and GI, and being unable themselves to detect any auroral signals.

Contest dilemma

Around this time each year the VHF Contests Committee has the impossible task of drawing up a contests calendar which will satisfy the vhf/uhf fraternity. Those who feel that there cannot be too many contests have little cause for complaint in 1974; a quick count reveals that approximately one day in six will, by the end of the year, have been occupied by one vhf contest or another. There comes a point of saturation when support starts to dwindle away, and that is what appears to be happening now. For example, the first of the 432MHz autumn cumulatives was held under above average conditions, yet activity was extremely poor. It is understandable, therefore, that there is a desire by the committee to reduce the number of contests held in 1975 and restore support to those remaining.

So, something will have to go—but what? Several contests are held in conjunction with IARU events and will obviously have to stay, while others are sufficiently popular to be assured of good support. The most vulnerable are the cumulatives, which have accounted for 32 days of contests this year. While these events are valuable in promoting activity on the less-used 4m and 70cm bands, there *are* other ways of doing this, so it is most likely that the committee will seriously consider cutting cumulatives in order to reduce the contest programme to more reasonable proportions.

The suggestion has been made that some kind of achievement competition could be carried on through the columns of *Four-Two-Seventy*, in the form of a monthly table culminating in an annual award of certificates. Your scribe would be happy to conduct such a table if he felt that the support would justify the use of precious space from the limited amount allocated to this feature.

Whether the idea is proceeded with will depend on the response received; so, to provide a basis for discussion, let us suggest that the table will show the total of the best five claimed QSOs on 70MHz and/or 432MHz each month. Contacts to be made during specified activity periods, with scoring based on the RSGB 50km ring system. The monthly total to be cumulative and a certificate awarded annually to the leading station in each zone.

The sooner we know whether the idea is acceptable, the sooner it can be implemented. Remember, the whole purpose is to promote activity on less-used bands, and to provide a competition that does not need the complication of logs and cover sheets normally required in contests. We look forward to receiving your comments.

Contest news

Good conditions and activity combined to make the first of the 70MHz cumulatives an interesting session, but the following week found conditions back to normal, which

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meant that the more remote stations had the worst of things.

The October 432MHz ssb contest was held under normal conditions, and although there was a promising amount of ssb on the band only a few non-sidebanders turned up to give cross-mode contacts. Perhaps the A3j activity on 70cm has now reached the level where the cross-mode concession could be dropped, making the event a true ssb-only competition. The efficiency of the mode allowed several 200km plus contacts to be made despite the conditions, and it is believed that the well-sited GW3UCB/P team worked into PA0.

Mention was made earlier about the poor support for the first of the autumn 432MHz cumulatives despite the above average conditions. Conversely, the November 144MHz cw contest produced the activity but not the hoped for good propagation. A few Continentals were heard from the G3NHE location, F9FT in Rheims being the best dx, but they were having difficulty working much beyond the south of the country.

G3DAO of Selsey was disappointed by the paucity of dx to be heard during the Marconi Memorial CW Contest, being held over the same weekend as the RSGB event. However, despite his visions of working Italians by the score not being realized, Peter Cutler did manage to raise ON, DK, PA0 and a string of Frenchmen. During the period of the RSGB contest, Peter found activity good in the south, but heard little from the north.

News from Cameroon

News from TJ1EZ in Yaoundé seems at first glance to have little to do with the British vhf scene, but add *ex PA0EZ* and Arie Dogterom's many friends in this country will realize why his signals have been so conspicuous by their absence lately. Arie regrets that he is currently restricted to the hf bands with, as he puts it, the big, impolite pile-ups. Happily, he hopes to be back in Holland in 1976, and in the meantime will try to arrange some activity through Oscar 7.

Awards

Just too late for last month's issue came two more claims for Four Metres and Down Supreme awards. G3DAH of Herne Bay earned Supreme No 7 when he added 1,296MHz certificate No 5 to Seniors already held for 144 and 432MHz. Mike Dormer then indulged in overkill when he also submitted a claim for the 70MHz Senior, and in gaining certificate No 20 becomes the first winner of all three Seniors, plus the 23cm award; a fine achievement, and a just reward for Mike's years of dedication to the vhf/uhf bands.

Supreme No 8 goes to John Reed, G3ZMD, of Luton. His 432MHz Senior claim resulted in certificate No 23 being added to his Seniors for 70 and 144MHz.

Winners of the Supreme award are rare enough, but to announce three in the last two months is heady stuff. Congratulations to G3ZMD and G3DAH, and to the following award winners:

144MHz Transmitting: G8EQT of Hatfield gains certificate No 405, and to G3ZJY of Co Durham goes No 406.

144MHz Senior Transmitting: To G8GNE of March goes award No 65. Vernon Cracknell thus becomes the first G8 – – – to win the 144MHz Senior, and this from a site only 11ft asl. Another "first" is G4BPY of Walsall, who is the first G4B – – to achieve this award, receiving certificate No 66.

Some of the barest pages in the VHF Awards Manager's record books are those allocated to listener awards. While it is by no means easy for the listener to persuade the transmitting amateur to part with a card, the level of activity on 2m should enable the determined listener, by providing useful and informative reports (and not forgetting to enclose an sae), to collect the necessary cards for his award within a reasonable period of time. From there, the more dedicated vhf listener might go on to tackle 4m and 70cm, and, who knows, on to a listener "Supreme"; all things are possible.

When DM2BUL confirmed his sporadic-E QSO with GW3ZTH, he sent this photograph of his station. Both DM2BUL and his xyl are keen vhf operators, and the gear is all home constructed: very neat too

Meteor scatter

I1GEI would like to hear from anyone wanting meteor scatter skeds with him on 144MHz. He is also prepared to try similar tests on 28, 21 or 14MHz if required. Anyone interested should write to Guiseppe Gerbore, Casella Potale 415, 18100 Imperia, Italy.

G8CUI of Goole joins the ranks of meteor scatter enthusiasts when he runs skeds with DC7IT (Berlin) during the Taurids and Leonids in November.

Technical tips

GM3HAT is interested in low power fm on 2m and believes in keeping expense to a minimum. He passes on his method of generating rf for both transmitter and receive converter using only one crystal. A fifth overtone crystal on 72·5MHz is doubled to give a transmitter output frequency of 145·0MHz. The same crystal operated in the third overtone mode (43·5MHz) and tripled will give 130·5MHz which, when used as local oscillator injection for the converter, provides an i.f. of 13·5-15·5MHz. To avoid i.f. breakthrough from the strong broadcast stations on these frequencies, GM3HAT suggests using good quality coaxial cable from the aerial, and earthing the outer to the 14MHz receiver before taking the feeder to the converter.

Further to G3HDQ's query last month about persuading the Liner 2 onto cw, G3USE achieves this by using the spare "make" contacts on the test button to operate the t/r relay when pressed. The key is then used to break the carrier insertion function of the same switch. Steve Down points out that the power output (5W in his case) will vary from rig to

rig, depending on the position of the carrier with respect to the filter passband, and he adds that for exact co-channel operation, the irt control needs to be offset slightly 1f.

G3s OZO and PRD intend to modify their Liners by plugging audio oscillators into the microphone sockets, and taking the ptt facility to a separate switch.

To buy, or not to buy

Now that another manufacturer of vhf/uhf amateur equipment has developed a transverter for 70cm, those with no time for building, and with deep pockets, who fancy a little peace and quiet away from the hustle and bustle of 2m have ample opportunity to sample the 432MHz band. The purists among us who frown upon plug-in-appliances are to be admired for their do-it-yourself approach, but they should allow that not everyone has the time or inclination to make their own gear. There is little doubt that a great deal of satisfaction can be gained from operating a home-constructed station, but if commercially available equipment helps to swell activity on the 4-2-70 bands can it be a bad thing? The sad thing is when such equipment is used merely as a cheap telephone system, instead of for the furtherance of the art of amateur radio.

"Blow, blow thou winter wind"

The more seriously involved with vhf/uhf one becomes, the more metal twigs seem to sprout from the aluminium tree in one's garden! For example, the writer has a 4-el beam for 4m, a 10-el long Yagi for 2m, a 46-el multibeam for 70cm and a 34-el Yagi for 23cm—all between 35 and 44ft in the air. With this amount of wind resistance, and winter already here, the question has to be asked, is it really safe? When G3NHE's system blew down last year little damage was done, but it could have been a lot worse. Lessons were learned, and (hopefully!) a considerable safety factor has now been built in; but however safe things may appear, a force 10 gale can wreak havoc with structures much more solid than aerial installations, and a freak gust has been known to remove the gable wall of a house—which is where the G3NHE mast is situated! So, the sensible thing to do is to make sure that the house insurance covers any aerial systems, and if not, take out separate cover. Let us hope that the winter wind is not *too* unkind this year.

A matter of manners

The GW3UCB Bangor University team, whose Scottish trip was reported on last month, were mildly critical of the 2m stations who replied to "CQ 2m, for 70cm skeds only" calls, and who, it turned out, had no 432MHz facility. This is a practice akin to the misplaced response to directional CQ calls referred to by G4JJ (*FMD* October 1974) and is a simple case of enthusiasm overcoming good manners.

A worse malpractice, all too common when there is dx about, is the calling of stations "blind"; that is, hearing someone else calling the dx, and breaking in despite the fact that the station being called has not been heard. Offenders of this kind are often given to long calls, usually coinciding with the dx station's transmission and serving no other purpose than to make it difficult for everyone else. While this sort of behaviour is frequently heard on the hf bands, it is disappointing to find it occurring increasingly on vhf and uhf, especially when it is perpetrated by the holders of callsigns who have been licensed long enough to know better.

FM channel

The UK FM Group (London) was formed in 1972 for the furtherance of vhf/uhf fm in the UK. GB3LO, the London area 2m repeater, was designed, built and commissioned by the group, which was also instrumental in bringing about the adoption of the IARU simplex channels in this country. The group's PRO, Kris Partridge, would welcome any enquiries for further details to either himself at Apartment 10, 74 Woodside, Wimbledon, London SW19 7QL, or to the membership secretary, G8CUX, QTHR.

Kris suggests that prospective fm groups, or individuals, stick to the appropriate IARU channels when buying new crystals. Channel 20 (145·500MHz), he reminds, is the international fm calling channel, and should not be used after contact has been established. The choice of which simplex channel to use when moving from the calling channel seems to vary from area to area. S21 (145·525MHz) is used by the UK FM Group (Southern); S22 (145·550MHz) appears to be the most popular, being used in London, South Wales and Cambridge; S23 (145·575MHz) is used in Torbay, and S24 (145·600MHz) widely used in Scotland.

The counties question

With only a few weeks to go before the new English and Welsh counties list is implemented by the RSGB, there seems to be a good deal of confusion as to what exactly will happen with regard to FMD awards. Full details, together with the new counties list, will appear next month, but in the meantime we can reassure those who are just a few cards short of an award that they will *not* have to start again from scratch on 1 January 1975.

The official date for the change from Scottish counties to the new regions is 1 April 1975 but, as with the English counties (which officially changed in April this year), it has been agreed, for FMD award purposes, to wait until the end of the year before implementing the change.

Crystal exchange

Ray Jarvis, G2BPC, QTHR, has a number of HC25/U crystals which he is prepared to swap, on a two for one basis, for third overtone HC6/U crystals on 51·7266, 51·9000, 52·0666, 52·0833 or 52·1500MHz. He has 12 36·275MHz (× 4 = 145·100 = channel R4) and 24 48·375MHz crystals (× 3 = 145·125 = channel R5). G2BPC would also consider any offer from a club for all 36 crystals.

Miscellany

If the Wrotham beacon has seemed stronger since mid-October, it is not due to a sustained improvement in conditions, but to the addition of the G3COJ solid-state pa, now delivering 40W of rf to the aerial.

GM8HXQ and GM8BBA hope to be active during the December 144MHz contest from the Isle of Benbecula. They will be running 300W of ssb to a fixed 14-el beam—fixed on account of the frequent 50knot winds.

It is nice to hear Bill Hawthorne, G3MCS, of Aylesbury, back on 70cm with low power ssb. Bill will be remembered by many as the first winner (and, for a long time, the only winner) of the FMD Supreme Award.

Finally, the deadline for reports for the January issue is immediate, so material to G3NHE as soon as possible please.

THE MONTH ON THE AIR

by JOHN ALLAWAY, G3FKM*

ARGUMENTS urging fuller use of the 28MHz band during times of reduced sunspot activity were amply supported by events taking place during the Society's 21/28MHz dx contest. On the first morning of the competition signals were arriving in quantity from Australasia and the Far East and events were reminiscent of better times. Although such propagation is infrequent it happened to coincide with a period of increased interest on the band and it is quite possible that other good openings have been happening but have been missed through lack of activity. It is probably worth remembering that published propagation predictions refer to probabilities and not certainties and that a pessimistic forecast *may* be correct but could just possibly be wrong.

Your scribe would like to wish all readers very sincere season's greetings and to thank all who have helped through the past year in the writing of this column.

Top Band news

VK3CZ has kindly supplied details of his 160m activities between 16 May and 10 October. He managed to contact WA8IJI (several times), W7QID, W1HGT (twice), K1PBW, possibly W4EX, and ZL1MQ. PY1RO was logged, as were KV4CI, W7ZC, W1BB/1, KV4FZ, WA4SGF and W2BP. Although DHJ was audible on many occasions at signal strengths up to RST 579, the only European heard during the period was OK1DOK (at 2116 on 6 August). The latest *W1BB 160 Meter DX Bulletin* notes that the past summer has not been a good one for top band dx, with higher than usual noise levels. Transequatorial test results were fair, possibly partly due to the unavoidable absence of PY1RO and EI9J, but VP8NP, 4S7GV and ZE7JX were active.

The matter of the 160m long distance record is also mentioned by W1BB. W1BB/1's contact with VK6HD covered 11,609 miles, that between PY1RO and JA1MCU 11,532 miles, and W5RTQ/VK6HD/VK6NK 11,577 miles. KV4FZ/VK6HD was 11,463 miles but KV4FZ thinks that a G-ZL contact may exceed any of these. W1HGT and KV4FZ both have WAC/ssb on the band now. Stew remarks on the declining number of G stations taking part in 160m dx activities—in 1965-66 90 were noted, 1966-67 27, 1967-68 69, 1968-69 57, 1969-70 50, 1970-71 55, 1971-72 52, 1972-73 93, but only 56 in 1973-74.

A reminder that the second First Timer's Test takes place on 22 December (see November *MOTA* for details). Results to G3FKM please.

John, ZS6ZE (G3LZQ), reports that Mollie, ZS1MH, ZE7JV, ZS6DW, and he are all active on 160m. ZS1MH worked PY1RO on 27 July for the first PY-ZS contact. This was at sunset in Brazil; attempts at South African sunset time were unsuccessful. ZE7JX has worked PY1RO and many Ws. Discussion is currently taking place with the South African authorities for permission to be given for 1,800-1,850kHz to be released for use for dx working.

* 10 Knightlow Road, Birmingham B17 8QB

Dxpeditions

The most recent information on VS5MC's movements is that he has given up the idea of visiting Barque Canada Reef but may instead go to Amboyna Cay late in December or early in January. It is believed that this island would count as Spratly Is for DXCC purposes.

The *West Coast DX Bulletin* has mentioned a rumour that a VK6 operator may accompany the ship which visits Heard Is every two years when it next makes the trip.

The intended expedition to Bajo Nuevo which should have been on the air at the end of November seems to have been cancelled.

The YL operators who visited Chatham Is during the CQ WW DX Contest in late October are considering a trip to the Kermadec Is early in 1975.

The KP6KR expedition made 5,535 contacts in 29h 43min, and 1,193 of these were on cw. Only three Europeans were contacted on the latter mode—G3AAM, DJ2BW and DL2DK. On ssb 260 Europeans were worked, of which 21 were duplicate contacts. KP6KR was worked by 37 British stations. From VR3AG 1,534, KP6PA 6,235, and W6WX/KJ6 571 QSOs were effected—a grand total of 13,875 for the expedition.

DX news

VS6BL advises that the 1974 Hong Kong VS6 activity day will be held from 0900 7 December until 0900 8 December. HARTS hopes to get as many VS6 stations on the air as possible during that period.

G3LSQ/MM left the UK for Gibraltar early in November on board the 44ft auxiliary sailing cutter *Lucina*, and will leave ZB2 for the West Indies on 20 December. Equipment consists of a Yaesu FR75 feeding 20W p.e.p. into a 75ft end-fed aerial, and one crystal frequency mentioned is 14,200kHz.

Since 1 October stations in Algeria have used prefixes which indicate the region in which they are located—7X2 La Saoura, 7X3 Oasis, 7X4 Alger, 7X5 Oran, and 7X6 Constantine.

The VX1 prefix is being used by Newfoundland stations until 31 December. This celebrates the 25th anniversary of the incorporation of their country into the Canadian federation. The 9J10 prefix marked the 10th anniversary of Zambian independence and was used between 24 and 31 October. Gambia joined the ITU on 25 May 1974 and has recently been issued with the prefix sequence C5A-C5Z.

F9MS is on Reunion Is and is often to be heard around 14,020kHz using fast cw. He is said to be best heard in Europe between 1530 and 1730, and to use ssb mostly on Sundays. QSLs go to his home address and the other station using the callsign FR0BCS and asking for QSLs via F2MO is a pirate. FR7ZL was expected to commence a two-month stay on Juan de Nova in mid-October and to be active as FR7ZL/J.

UK1PAA is thought to be UW3HY operating from Franz Josef Land. He is said to favour 14,030, 14,040 and 14,180kHz around 0400, 0700, 1000, 1300, 1600 and 1800.

QTH Corner

A35AF	JA1SWL, PO Box 12, Denenchofu, Tokyo 145, Japan.
CR8AC	PO Box 59, Dili, Portuguese Timor.
HI8XKP	via W0GX, L. W. Knaust, RFD 1, Cassville, Mo, 65625, USA.
KG6SX	via K4KQB, J. Simon, PO Box 62, Sterling, Va, 22170, USA.
PJ9RT	via WA3IAQ, 11827 New Hampshire Av, Silver Spring, Md, 20904, USA.
S21A, S21KP, S21KK	via JA2KLT, 204 Gonaka, Shinozuka, Kozakai, Hoigun, Aichi 441-01, Japan.
VK2BKE	via W9RKP, 6285 S Baas Drive, New Berlin, Wis, 53151, USA.
VK0DM	via WA4NRE, R. C. Crawley, Box 4336, Columbia, SC, 29204, USA.
VP2EY	via W3HNK, Box 14, Norwood, Pa, 19074, USA.
VP2E	via W4GSM, Box 1383, Newport News, Va, 23601, USA.
VP2MSU	via WB5IZN, Box 13442, Austin, Texas, 78711, USA.
VP5CW	via W4ORT, 1045 Le Brun Drive, Jacksonville, Fla, 32205, USA.
VP5WW	via WB4EYX, 62 Coquina Av, St. Augustine, Fla, 32084, USA.
VR4AZ	VE3GUS, 72 Woodward Av, Thornhill, Ont, L3T 3R7, Canada.
VS9FBS	via G3GKD, Dormer Cottage, York Rd, West Hagbourne, Didcot, Berks.
ZD3T	OH2BFJ, T. Jannson, Bergstrask, SF-02400 Kirkkonummi, Finland.
ZD3X	OH2NB, Lansipellontie 12, SF-00390 Helsinki 39, Finland.
ZF1ST	via W1CER, 115 Starr Av, Newington, Ct, 06111, USA.
ZF1WM	via W8JUY, 221 Boardman Av, Traverse City, Mi, 49684, USA.
ZL1AA/C	PO Box 23-508, Papatoetoe East, Auckland, New Zealand.
3A0FY	via F9UW, C. Bazzilou, Les Orangers, 208 Av L-Pasteur, 06190 Roquebrune, Cap-Martin, France.
3A0GZ	via DJ8RR, B. Kleinstr 9, 5340 Bad Honnef 1, W. Germany.
4X4UR	via VE3MR, 161 Old Forest Rd, Toronto, Ont, M6C 2G7, Canada.
5T5AC	via W1YRC, 30 Rocky Crest Rd, Cumberland, RI, 02864, USA.
5Z4PP	via W3HNK (see VP2EY).
9J2KO	F. Sawyer, PO Box 952, Mufulira, Zambia.
9M8NK	via JH1FWB, 3-169 Aloi, Kiryu City, Gunma 376, Japan.

RSGB QSL Bureau, G2MI, Bromley, Kent, BR2 7NH

He may be found on 7,003kHz at 2000. QSLs should be sent via UW4AT.

OE2EM/YK, OE2NWL/YK and OE2HZL/YK have been reported on the hf bands using ssb. They have asked for QSLs to be sent to OE5CA or OE5WYL.

WB4KSE (who was previously KX6LA) is on Wake Is. It seems that FAA activities on the island have now ceased and that fewer KW6 signals may be heard in the future. Doug expects to use the callsign WB4KSE/KW6 until his proper call is issued, and he hopes to be on all bands 3·5 to 28MHz. A beam aerial has been ordered. W2BT will act as QSL manager.

W1JFL reports that all A51PN QSL requests for QSOs and reports up to 26 June this year have been dealt with and that he is awaiting logs for the July and August period.

Readers awaiting QSLs from the recent Desroches Is expedition by VQ9BP/D, VQ9D/D and VQ9M/D are asked to be patient as the cards were expected from the printer in mid-November. All contacts will be QSLd.

G4AFJ says that G3VPW now has the callsign F0BJO and is on the air from a location in the Pyrenees. Latest information on the VP8 situation received via his schedules with VP8NO is that there is an operator on South Georgia (VP8NW) who is rather inactive due to his work load. G4BNQ is due to arrive on South Georgia from the RS *Bransfield* and hopes to be more active. VP8MS will also be on the island for a short spell while servicing the ionosond equipment.

Contests

The Spanish Contest

2000 14 December to 2000 15 December.

CW only, 3·5 to 28MHz. One point per QSO with Spanish stations. Exchange RST plus serial QSO number (from 001). Multiplier is number of EA districts contacted on each band added together. The same station may be worked on each band for credit. Final score is total QSO points multiplied by total multipliers. Send log and summary sheet (with address in block letters) to URE Concurso International, PO Box 220, Madrid, Spain, no later than 15 January.

The ARRL 160 CW Contest

2200 6 December to 1600 8 December.

Only contacts with USA. Five points per QSO, multiplier is ARRL "sections" worked. Certificates to high scorers in each country. Send logs to ARRL Communication Dept, 160 Contest, 225 Main St, Newington, Conn, 06111, USA, to arrive before 8 January.

The ARRL 10 Metre Contest

1200 14 December to 2359 15 December.

Single or multi-operator sections. CW and phone; stations may be worked once on each mode but cw contacts may only be made below 28,500kHz, and mixed mode contacts are not allowed. Contacts via Oscar 6 and Oscar 7 count (in this case the cw frequency restriction does not apply). Exchange RS/T and serial QSO number from 001. Contacts count two points, or four if with a W/K novice. The multiplier consists of the number of USA states, Canadian provinces, and DXCC countries worked (a state or province cannot be counted again as a country). Send logs before 20 January to ARRL, 225 Main St, Newington, Conn, 06111, USA. Top scorer in each country will receive a certificate. Note that for each unmarked duplicate three points will be deducted and if a score is reduced for any reason by two per cent or more the entry may be disqualified. UK scores in the 1973 event were G3MXJ (2,432 points), G3IAS (1,274) G3IOR (1,064), G3DME (784), and G2BVN (594).

Major changes are being made in the format of the **1975 ARRL DX Contest.** Single operator entrants will be able to operate on all bands, or in a low band (1·8, 3·5 and 7MHz) or high band section (14, 21 and 28MHz). It is also proposed to give certificates to all who make more than 1,000 contacts. Full rules will appear later.

Apologies to GW6GW whose score in the 1973 CQ WW DX Contest (phone) was not included in the information sent to your scribe and therefore omitted from the list given in October *MOTA*. The club's score exceeded 1,600,000 points and placed it top GW and fourth in the UK.

"DX News Sheet"

Readers may be well advised to take out a subscription to this weekly news sheet which is produced and sent out by Geoff Watts, 62 Belmore Rd, Norwich NR7 0PU, from whom subscription rates may be obtained. Being a weekly production it contains much information of a current nature which arrives too late to be included in monthly magazines.

Odds and ends

G4CEO complains that he is receiving QSL cards in response to supposed operation on 1·8, 7 and 14MHz cw and ssb. He has no top band equipment, only operates on 3·5MHz cw, and has been off the air since September.

Band reports

As mentioned elsewhere, 28MHz has opened for dx working on a number of days during the month under review. The experimental "set listening period" organized by BRS25429 seems to have produced more interest from transmitting amateurs than listeners and G3AWR, G2BJY, G4BTI, G4AGZ, HB9UD, F8RU, DJ0LC, I1ZL, PY2CDN,

K0CMF/4, W1EXZ and W7RFH are all thanked for their participation. Reports were received from 10 countries in four continents, and 67 countries were heard in the British Isles during the six-hour period; mostly northern Europe, the Middle East, South Africa and South America. YB0AAG was heard in Cornwall. The Ws had propagation to South America, Africa and the South Pacific (FO8).

Many thanks to the following for information used in compiling the list below: Gs 2HKU, 3GVV, 3NKQ, 3ORP, 3UOL, 4RZ, 5JL, 6GH, 8MY, 4AFJ, GW4BLE, Gs 4CLN, 4DJY. BRSs 17567, 17991, 25429, 31301, and As 7056, 8312, 8420, 8713 and 8752. Stations named in italics were using cw, the rest ssb.

1·8MHz. 0000 *VE3DN*, *VK1KE*, 4U1ITU, 9H1BX. **0300** DL, OH, PA0. 4X4UR. **0500** PY1RO, W1HGT, W2DEO etc, WB8APH, ZD3X. **2200** *ZB2CJ*. **2300** HB0LL, KV4FZ, *W1HGT*.

3·5MHz. 0000 CT2BN. **0100** UK9AAN. **0200** VP2GMB, VP7BC. **0300** OJ0MA, PJ9JR, 9Y4VU. **0400** VP2E, VP2MSU, 9L1JT. **0500** TF3KM, VP2DA, 8R1G. **0600** CV4C, FP8AA, YS1MV, ZD3X, ZLs. **0700** HI8XAW, VP2GMB. **2000** *JA6ACZ*. **2100** VP9AF, 5B4DW, 5T5AJ. **2200** 9G1DY, 9M2DQ.

7MHz. 0000 VP2GMB. **0300** CR7JO, PJ9JR, ZD3X. **0400** FY0BHI, VP2MSU. **0500** LUs, *VA7WJ*, *W7NCO*. **0600** HIs. **0700** *FO8EG*, *JX2HK*. **1800** 5T5DY. **1900** VU2DK. **2000** VU2CBE, 4S7DA. **2100** *EL8A*, FP8DH, FY0BHI, TR8DG. *7P8AY*. **2200** *A9XU*, *CR7IZ*, XU1DX, *3B8CV*, 5Z4LW.

14MHz. 0600 4S7AS. **0800** FK8s AT, BG, KB6CU, KL7s, P29KE, WA6WBO, 3D2AN, 4J0BAM. **0900** VKs, ZLs, 5R8YA. **1100** VP2EEA, YJ8BL, ZK2AN. **1200** TI1K, W7HOI. **1400** DJ6QT/CT3, VP2EY. **1500** DU1XKE, FB8WB, SU1MA, VK9XJ. **1600** A7XA, FR7ZL/J, ST2AY, VS5MC, W6/W7s, XU1DX, XV5s AA, AB, OE2NWM/YK. **1700** FR0BCS, *KH6s*, KL7HCN, VU2GDG (Andaman Is, QSL to VU2IJ), 3B8DN. **1800** OX3DL, VQ9M, WA1OGA/VQ9 (Chagos), *VR1AA*. **1900** KL7s, VP1WB, VP2MOT, *VP5CW*, 4K1D. **2100** VP8s CX, NO.

21MHz. 0800 *DJ3DH*/*ET3* (QSL to DL6ME). **0900** JAs, P29RJ, *UA0YT*, XU1DX, YJ8BL, ZLs, 9K2M. **1100** P29RJ, 5N2ESH. **1200** *FR7AL*, *SU1MI*, VS5MC, *VU2LO*, *F2JD*/*5U7*. **1300** A6XT, A9XL, ST2AY, VP2E, *VS6HI*, ZF1JA, 3B8DS. **1400** VP2EEA (QSL to W4GSM), VP2GTE (QSL to W5TMN), *3D6AX*. **1500** *C31IS*, W6s. **1600** FY0BHI, W6/W7s, *ZD7PS*. **1700** KC4AAC, PJ3A, VP2KJ, VP8s LP, ML, NO, NY, VQ9HCS, 4W1ED. **1800** HC0HM, *VP2MQ*, 5T5GS. **1900** HH2WF, VP9HS, W6s. **2000** VE6, W6s. **2100** W6/W7s.

28MHz. 0700 3B8CV. **0800** VK6FI, 5X5NK. **0900** UI8IF, UV9BB, VK6s KW, NG, VS6DO. **1000** HZ1KE, TR8DG, VK6s AO, KZ, PM, WB2VUO/VQ9 (Chagos), VU2ABC, 5B4ES, 9M2DQ. **1100** UA9s, VU2DK, VK6PM, VQ9BP, ZSs. **1200** A2CJP, FY0BHI, HT10AA, *JY9GR*, ZD7HH, TA1SK/4X, *5Z4PP*. **1300** CE3RC, FR7AL, VP2s GMB, MSU, *VQ9D*, 4M6AW, 9G1AR, 9L1JT. **1400** CR6/CR7s, EA9ET, ET3FF, KP4EAJ, KV4AD, PYs, 3B8DG. **1500** CP1DN, TR8SS, ZS1DC/ZS3, 3B8CV, 5N2ESH. **1600** CX, EL, PY, TU2CH, VE1, W1, ZSs, 7Q7BC. **1700** CE, CX, FY7AN, KC4AAC, KP4, LU, TI. **1800** CR4BS, HK3LT, KV4AD, VP8HZ, ZD7HH, ZP9AH. **1900** CE6EZ, LU, PY. **2000** ZD3X.

Many thanks to all other correspondents, and also to the authors of the following for information extracted from their publications: the **Ex-G Radio Club Bulletin** (*W3HQO*), **DX News Sheet** (*Geoff Watts*), the **29 DX Club Newsletter** (*George Allen*), **World Radio News**, the **DX'ers Magazine** (*W4BPD*), **Long Skip** (*Nick Sawchuk*), the **West Coast DX Bulletin** (*WA6AUD*), and **DX'press** (*PA0INA*/*PA0TO*).

Please send all items for the **January** issue **to reach G3FKM no later than 4 December** and for **February** by **8 January.**

Propagation Predictions

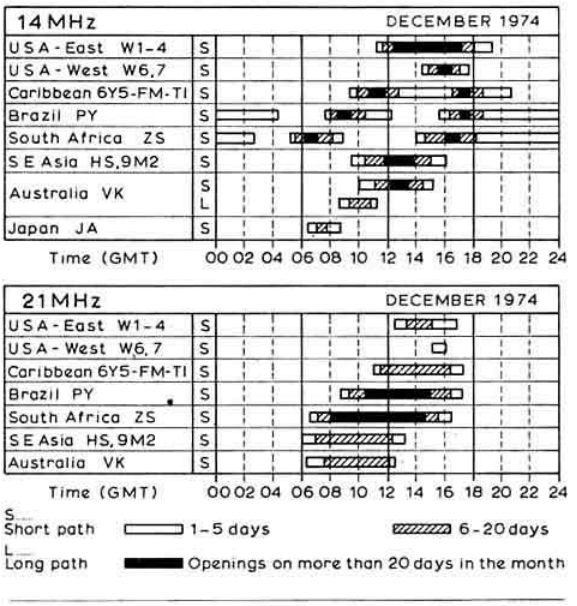
Conditions on the hf bands will worsen during December compared to the two previous months. Short days mean shorter hours of communications on these bands and the f2 MUFs are lower than in October and November.

28MHz will be open relatively seldom and all times will be shorter for dx on hf bands. South and Central America will be heard between 1030 and 1445gmt, and Africa between 0800 and 1500gmt. Contacts on **21MHz** are only certain with South America and Africa. Traffic from the south of Europe will be more certain than from countries further north. The early sunset will cause dx traffic on 21MHz to cease about 1700gmt.

In contrast to 21MHz all continents will be open to traffic on **14MHz** but dx will cease about 1900gmt. There is a good chance of WAC on 14MHz between 0700 and 1300gmt. Seasonal conditions favour dx via the indirect path, and communication with South America and East Asia should be possible before noon. During early evening South American and South African stations should be heard. QSOs might be difficult because of atmospherics. Between 1630 and 1800gmt traffic with KH6 should be possible on 14MHz via the indirect path.

QRM permitting, eastern North America will be heard on **7MHz** from 1930gmt, South America from 2100gmt and Japan from 1330gmt. Traffic on this band will be interrupted during the latter half of the night because of low frequencies. Relatively good dx conditions can be expected on **3·5MHz.** Local traffic on 7MHz will often be interrupted by the dead zone, and traffic on 3·5MHz will be interrupted late at night and in the second half of the night.

The provisional sunspot number for October from the Swiss Federal Observatory was 46·5 with the first half of the month showing considerable solar activity. Geomagnetic disturbances were noted on 12 and 18 October and the general levels of MUFs were near to seasonal normals. The predicted smoothed monthly sunspot numbers for February, March and April 1975 are 28, 26 and 25 respectively.



COUNCIL PROCEEDINGS

A brief report of the Council meeting held on 16 September 1974

Present: Mr. G. R. Jessop (*President in the Chair*), Dr E. J. Allaway, Messrs R. J. Baker, J. O. Brown, D. Byrne, R. W. Fisher, W. J. Green, C. H. Parsons, J. R. Petty, W. A. Scarr, F. C. Ward, (*members of Council*), D. A. Findlay, (*general manager*), A. W. Hutchinson, (*Editor*).

Apologies for absence had been received from Dr J. A. Saxton, and Messrs W. F. McGonigle, L. E. Newnham, R. F. Stevens and G. M. C. Stone.

Region 1 ORM

Mr Baker reported that together with Messrs Newnham and Stone he had attended the Region 1 ORM held in Lancaster on 14 September. Arrangements for the meeting were not entirely satisfactory as there had been a second meeting in progress at the same time and this had resulted in a very small number of members being present at the ORM.

35 Doughty Street

The Honorary Treasurer pointed out that very frequently there was discussion as to the advisability of moving headquarters from 35 Doughty St; he was not sure of the wishes of Council and he together with the other members of the "ad hoc" committee that had been set up required Council guidance.

Considerable discussion took place and the following terms of reference were agreed: To consider the feasibility of moving headquarters out of London, with special reference to:

(1) geographical areas;
(2) availability of staff;
(3) gradual transfer of the various sections of the headquarters organization;
(4) the question of cost of purchase in relation to the selling price of Doughty Street; and
(5) the direct and indirect cost implications.

Accounts to 30 June 1974

The Honorary Treasurer reported that the Society had had a satisfactory financial year and despite the very great increase in expenses the accounts (subject to audit) showed a surplus of nearly £4,000.

Mr Brown explained various items appearing in the accounts that had been circulated to Council members and after a discussion the accounts were adopted.

Membership and affiliation

It was resolved:

(i) to approve the applications for membership, transfers, reinstatements and accordingly elect 141 new members;
(ii) to accept reduced subscriptions from three members;
(iii) to waive the subscriptions of five members on the grounds of blindness or other disability;
(iv) to grant affiliation to the Patcham Fawcett Amateur Radio Club;
(v) to approve applications for life membership from Mr J. S. Stratfull, 3B8CV, and Mr C. Linnell, G3VLT.

Trophies and awards

It was agreed that the Calcutta Key should be awarded to Mr R. H. Cherrill, W3HQO/G3XNV. Council accepted the following recommendations of the Technical and Publications Committee:

(a) The Norman Keith Adams Prize to L. V. Mayhead, G3AQC,
(b) The Bevan Swift Memorial Prize to L. A. Moxon, G6XN,
(c) The Wortley Talbot Trophy to A. M. Pomfret, G3LZZ,
(d) The Ostermeyer Trophy to the Rev P. W. Sollom, G3BGL.

1973 President's Committee

Although the question of a reduced subscription for students was not strictly relevant to the proposals put forward by the 1973 President's Committee, an amendment to the Articles of Association would be required and Mr Brown, secretary of the committee, asked that Council should deal with the amendments for both matters at this point.

Council confirmed that: (a) it was in favour of a reduced rate of subscription in certain circumstances for students over the age of 18 years who were still in full-time education, and (b) it accepted in principle the "Six Year Rule" whereby a Council member, with the exception of the President and the Immediate Past President, would only serve for a maximum of six consecutive years, before allowing a break of at least one year before seeking re-election.

(*a*) *Amendments relating to Council service.* Mr Brown explained that originally four proposals were made, but one of these had now been dropped. Two other proposals were not being dealt with at present and this left one proposal to be dealt with at the forthcoming Annual General Meeting.

This dealt with the "Six Year Rule" and the necessary amendment to the Articles of Association would be the subject of a special resolution to be presented at the AGM.

(*b*) *Student subscriptions.* A special resolution would also be required to amend the Articles in connection with the reduced subscription rates payable by students engaged on full-time education.

It was explained that at present a student under 18 years of age was classed as an associate and was required to transfer to corporate status on attaining the age of 18 years or on being granted an amateur transmitting licence. It had been suggested that the transfer to corporate status on attaining a transmitting licence *under* the age of 18 years should be made optional. Transfer to corporate status on attaining the age of 18 years should be made compulsory, although Council already had the power to grant a reduced subscription in certain circumstances. Students over the age of 18 years would be corporate members but could apply to pay a reduced subscription.

It was therefore agreed that two special resolutions would be submitted to the membership at the Annual General Meeting. One resolution would deal with Article 27 in connection with the length of service on Council, and the other resolution would deal with the amendment to the Article dealing with associate status.

Committee minutes

Council received the minutes of the following committee meetings: Technical and Publications Committee (11/6/74 and 13/8/74), Scientific Studies Committee (2/6/74), Mobile and Exhibition Committee (9/7/74), Telecommunications Liaison Committee (25/7/74), VHF Contests Committee (27/6/74 and 25/7/74), VHF Committee (31/7/74), Finance and Staff Committee (25/6/74 and 1/8/74), Membership and Representation Committee (15/8/74), IARU Working Group (22/8/74), MPT Liaison Committee (30/5/74), Interference Committee (28/6/74).

Council meeting, January 1975

It had been agreed that the Presidential Inauguration should take place in Cardiff on 17 January 1975. To facilitate travel arrangements and to allow Council members to attend the inauguration a suggestion was accepted that a Council meeting should take place in Cardiff during the afternoon of 17 January.

OBITUARIES

The Society records with regret the deaths of the following radio amateurs:

Mr N. H. R. Munday, G5MA

Bob Munday died on 19 October at the age of 76. He was well known in the 'fifties and 'sixties for his regular portable expeditions which gave new counties to many 2m operators.

Mr H. E. W. Nicholls, G8AQZ

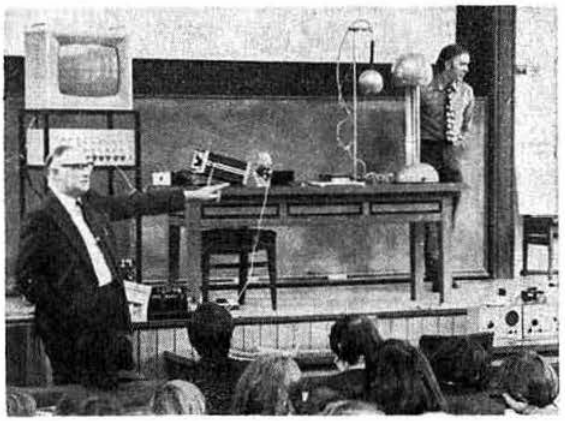
Mr Nicholls died on 12 October. He had been a keen 70cm operator for a number of years.

Education Committee in action

Nottingham University lecture

One of the functions of the Society's Education Committee is to encourage an interest in amateur radio among the younger generation still at school or college. With this in mind a session full of action and excitement was given last month in the School of Education lecture theatre at Nottingham University. It was attended by parties of young people and their teachers from Nottingham, Derby, Newark and the surrounding areas.

Before talking about amateur radio the basic principles of radio communication were discussed and related to the classic theory and experiments taught in the physics laboratory. Sparks from a van der Graaf generator and an induction coil proved to the audience that the coherer receiver of Leon Newnham, G6NZ, really did work. Following Leon's demonstration of early methods of communication he explained to the audience the reasons why they should pursue the hobby of amateur radio.



Leon Newnham, left, points the way to the young people wishing to embark upon a journey into amateur radio

Joe Hill, G3JIP, with the aid of numerous demonstrations, went on to explain more sophisticated methods of communication. A range of colour slides of typical amateur stations accompanied Ron Wallwork, G3JNK, as he discussed field days, mobile rallies and the jamboree on-the-air. Included in the session was a demonstration contact on 144MHz given by Fred Ward, G2CVV, and a souvenir QSL card was given to everyone present.

A school headmaster and some young enthusiasts take a closer look at the demonstration station in the lecture theatre operated by Fred Ward, left

It has been proved previously that lectures to school children are extremely beneficial to the amateur radio movement. The future of the hobby is largely dependent upon the recruitment of young people, and it is the intention of the Society to do more work in this field. The Education Committee would be very interested to hear from anyone who would be willing to devote some time to give short talks on amateur radio to schools and colleges.

YOUR OPINION

The Editor
Radio Communication

Sir—In "Month on the Air" in the October issue of *Radio Communication*, G3FKM laments the dearth of national radio societies in the various countries of the African continent, without mentioning the difficulties which exist.

It is now some years since I was last in Africa but I do not suppose that circumstances have altered much since then. In those days amateur radio activity was restricted to expatriate staff employed by the various local governments, commercial firms or agencies of the United Nations, who at one and the same time possessed both the technical knowledge required and the funds available to purchase the necessary equipment, all of which had to be imported and was usually subject to excessive customs duties. There were a number of Africans interested in amateur radio as a hobby, and who had acquired an adequate level of technical knowledge, but the purchase of equipment in areas where no second-hand market exists was quite beyond their means.

With the spread of technical education in Africa, there now exists a large number of individuals capable of becoming radio amateurs, but the ever-increasing cost of equipment, which yearly becomes more and more complex and in consequence more expensive, together with the rising cost of living in developing countries, makes the possibility of their ever becoming active amateurs more and more remote.

Perhaps the introduction of ssb in replacement of a.m. in the amateur service in developed countries, while lessening congestion on the dx bands, has made the creation of a strong amateur radio movement in developing countries a practical impossibility.

J. T. Blackwood, G3TG, ex D2TG, D4AEX, DL4EX, MT2EX, 5A2TG, ZC4EX, 7Q7EX, DL5ZY

The Editor
Radio Communication

Sir—A word of warning to readers with receivers capable of receiving WWV on 15MHz. The Colorado station is not often at great strength on that frequency these days but the Russian standard frequency transmitter RWM is commonly S9 plus.

So too are the adjacent Soviet standard frequency stations RTA (14·996MHz) and RKM (15·004MHz) which radiate similar time signals as part of a joint programme with RWM—all three together at times and singly at other periods during the hour.

It is all too easy to hastily zero-beat to one of the off-set stations so, if in doubt, wait for the station identification!

E. B. Grist, G3GJX

The Editor
Radio Communication

Sir—I have read with interest the article in the October issue on repeater frequency planning. It is my opinion that too much emphasis is being placed on fm repeaters for 2m. Although they do and will fulfil a valuable service to the mobileer, what about non-fm mobiles?

In order to plan ahead, with the increasing use of ssb, I feel we should all be seriously considering linear repeaters, for they are surely more versatile. Any extra technical complexity should not be an adverse factor.

I am sure that my views are shared by many other amateurs. Let us not go too mad on fm it is not the only mode and not the mode many of us favour.

In-band linear repeaters would fulfil a more useful purpose, I think, especially in the early stages.

B. L. Lonnon, G3ZUM

The Editor
Radio Communication

Sir—I would like to register a good natured protest against some of G5UM's logic as expressed in his October *Four Metres and Down* feature.

Mr Hum seeks to prove that more people prefer vhf to hf operation, by virtue of the fact that in a given period more Class B licences are issued than Class A ones.

Surely, however, all his figures show is that many people are failing (or not taking) the morse test. Is not the reason for this just as likely to be an aversion to morse code as a preference for vhf operation?

The Class B licensee *has not got a choice* as to where in the spectrum he will operate, and it would be equally valid to assess the relative popularity of vhf/hf by the time spent on vhf by those *licensed for all bands*, ie the Class A people.

With regard to the claim by some of those unable to use morse that same is outmoded, suffice it to say that a listen on the short waves will suggest that this news has not yet been received in many quarters!

Finally may I suggest that one need make no excuses about one's likes and dislikes, and it is certainly not necessary to justify same by superior-sounding criticism or statistics, phoney or otherwise.

E. G. Allen, G3DRN

Leicestershire Raynet Group stand at the ARRA Exhibition at Leicester. The group's secretary, Mike Barker, G8CAC, was on hand to enrol new members and answer questions

Mobile rallies calendar

18 May—Amateur Radio Mobile Society rally, London
18 May—Northern Mobile Rally, Victoria Hall, Keighley, Yorks.
1 June—RNARS rally, *HMS Mercury*, near Petersfield, Hants.
29 June—City of Bristol RSGB Group rally, Longleat House, near Warminster.
20 July—Cornish RAC rally, Cornwall Technical College, Pool, Camborne. (Provisional.)
24 August—Torbay ARS rally.

Looking ahead

6 December—RSGB AGM, Royal Society of Arts, John Adam Street, Adelphi, London WC2.
17 January 1975—RSGB Presidential Installation, Cardiff Castle.
27 April 1975—NRSA Convention, Belle Vue, Manchester
10-11 May 1975—21st VHF Convention, Winning Post, Whitton, Middlesex.

Terms of reference of RSGB trophies and awards

National Field Day Shield	Winner of HF NFD
Bristol Trophy	Leading single entry station in NFD
Gravesend Trophy	Runner-up in NFD
Frank Hoosen (G3YF) Trophy	Station with highest score on 14MHz band in NFD
Scottish NFD Trophy	Leading Scottish station in NFD
BERU Senior Rose Bowl	Winner of BERU Contest
BERU Junior Rose Bowl	Winner of low power section of BERU Contest
BERU Receiving Rose Bowl	Winner of receiving section of BERU Contest
Col Thomas Rose Bowl	Highest placed UK station in BERU Contest
Victor Desmond Trophy	Winner of Second Top Band Contest
Maitland Trophy	Scottish station with highest aggregate number of points in the two yearly top band contests
L. H. Thomas (G6QB) Trophy	Leading "G" station in 7MHz CW Contest
Metcalfe Trophy	Winner of 21/28MHz Receiving Contest
Somerset Trophy	Winner of 1st Top Band Contest
Edgware Trophy	Winner of Affiliated Societies Contest
Houston-Fergus Trophy	Winner of 80m Low Power Field Day Contest
Whitworth Trophy	Winner of 21/28MHz Contest telephony section
1930 Committee Cup	Winner of Low Power 80m Contest
G2QT Cup Winners' Cup	HF Contest Championship
1950 Council Cup	Winner of DF National Final
Surrey Trophy	Winner of VHF NFD
Tartan Trophy	Leading "GM" station in VHF NFD
Mitchell Milling Trophy	Winner of 2nd 144MHz Open Contest
Arthur Watts Trophy	Activity on 2,300MHz and above
Thorogood Trophy	Outstanding contribution to European VHF
Hanson Trophy	VHF Listeners Championship
VHF Manager's Trophy	70MHz Contest
1951 Council Cup	Highest score in 3rd Open 432MHz Contest
1962 VHF Committee Cup	Best home-constructed equipment
Louis Varney Cup	Space research etc
J. Fraser Shepherd	Research into microwave applications to radio communications
Ostermeyer Trophy	The most meritorious description of a piece of home-constructed radio or electronic equipment published in *Radio Communication*
Courtenay Price Trophy	Outstanding technical development in the field of amateur radio
Norman Keith Adams Prize	The most original article published in *Radio Communication*
Bevan Swift Memorial Prize	The most meritorious article published in *Radio Communication*
Wortley-Talbot Trophy	Outstanding experimental work in the field of amateur radio.
G5RV Trophy	Most meritorious article on radio interference
Founders Trophy	Services to the Society
Milne Trophy	Winner other than "G" in ARRL DX Contest
ROTAB	Outstanding and consistent dx work
Braaten Trophy	Leading "G" in ARRL DX CW Contest
Calcutta Key	Outstanding service to international friendship through amateur radio
Horace Freeman Trophy (In suspense)	Best home-constructed entry at yearly exhibition
John Rouse Memorial Trophy (In suspense)	Best home-constructed equipment by a member under the age of 18 at the annual exhibition
RAEN Trophy	Outstanding service to RAEN

RAYNET

by S. W. LAW, G3PAZ*

As this twenty-first year of our organization draws to its close we may look back with some pride on our progress over the period. This was marked by an informal gathering at the Mount Pleasant Hotel on 25 October which was graced by the presence of the RSGB President and his lady. The minutes of the Raynet Committee will show this as a worthy milestone in its 21 years of operation.

Those members who visited the ARRA Exhibition at Leicester will have noted the excellent stand provided by the Leicester group, with a comprehensive map depicting group coverage of the area and some first-class photographs which deserve special commendation. We were also delighted to note that the Isle of Man Raynet group was represented among the long-distance visitors. Their alliance with the Cumbria group (also represented at this date) should prove a valuable asset should future emergencies arise.

Raynet Committee

The final 1974 meeting of the Raynet Committee was held on 26 October. Regret was expressed that no group controllers had taken up the invitation to attend the proceedings. The chairman would once again like to make it clear that any group controller is welcome to attend a Raynet Committee meeting by arrangement with G3BPT, QTHR, in order to voice group opinions or put forward suggestions for consideration. The committee once again agreed that controllers meetings were a very desirable feature of area administration, but it should be made quite clear that it is the responsibility of the controllers in various areas of the country to arrange the time and venue of these meetings by mutual consent. The Raynet Committee will be only too pleased to receive reports from controllers meetings and to consider any points raised therein.

It was agreed to adopt a suggestion to inaugurate a "controllers' net" on 80m ssb to be held on the first Monday in each month at 8pm on a suggested frequency of 3·610MHz (plus or minus QRM), an experimental start to be made 2 December 1974. Will all controllers please note and try out this net in the coming year?

The group awards for 1974 will be presented at the RSGB AGM, and it is understood that representatives of the groups concerned will be in attendance to receive them.

Some concern was expressed in connection with the unauthorized use of the title "Raynet" in certain quarters, and the question of copyright or registered design was raised and discussed at length. Another point raised was the misunderstanding by certain groups regarding the age limit rule for membership. It must be seen that our rules do not permit young persons of either sex under the age of 16 years to become members. The question of our insurance may well arise here. Contact G3BPT if in any doubt on this point.

Finally the committee wish all Raynet members the traditional greetings for the approaching festive season and new year.

* 130 Alexandra Road, Croydon, Surrey CR0 6EW

CONTEST NEWS

VHF NFD 1974 RESULTS

WINNER: March & District ARS
RUNNER-UP: Southampton RSGB Group

BAND LEADERS

70MHz	G3FDW/P	Westmorland VHF Group
144MHz	GW3OXD/P	Albright & Wilson and
432MHz	GW3SLJ/P	Caesaromagus Group
1,296MHz	G4BEL/P	March & D ARS

GALE force 8, cool, squally showers, wind in the squalls storm force 10. Despite this forecast, 120 groups erected their stations, operated, and sent in entries.

Propagation conditions were poor, as was to be expected with the prevailing weather pattern. Some short-lived lifts on the two lower frequency bands gave most stations reasonable dx; a comparison of the "Best dx" columns of the last few years shows no significant change. The position is accurately reflected by the following table which shows overall and band winner's scores.

Year	Overall	70MHz	144MHz	432MHz	1,296MHz
1972	9,159	2,168	2,498	3,456	2,530
1973	10,794	2,724	2,993	4,068	1,994
1974	5,249	1,476	2,359	1,344	1,262

Comments on the weather conditions included: "Our trestle table blew away"; "One tent torn to shreds"; "We were unable to reach our site due to swollen streams, on the way back we were overtaken by a low-flying shed". Tremendous efforts were made by many groups to combat the gales, those who took angle iron for tent pegs, and a sledge hammer, were rewarded for their foresight.

In spite of the appalling weather and disappointing propagation, a remarkable number of group secretaries stated "We all enjoyed ourselves".

70MHz

There were marginally less entries this year, with scores and number of contacts well down. Stations out on a limb were favoured as usual, and G3FDW was the band leader by an outstanding margin. While the use of ssb has been gradually increasing during the year, there was a lower percentage of stations so equipped than in recent 4m contests, due no doubt to the once-a-year boys. In this context, stations whose 427 forms indicated that they used ssb are asterisked in the Band Results table. This information is also similarly given for 1,296MHz. A careful examination of the logs shows that the majority of the leading stations had ssb, and that there are stations who are well down the table who used the mode. The winner used A3J and A1 only.

By lunchtime on Sunday almost everyone had changed to A1, and with a couple of short lifts during the afternoon many operators found this usually dead period highly productive.

The increasing use of transverters with their normal exclusively co-channel facility makes it imperative to listen on one's own frequency, particularly after calling CQ on A1. A surprising number of operators still do not.

Finally, a mild reproof to the station who called CQ without sending the callsign twice the same, and not once his own, and to the GD station who, replying to a CQ, repeated the two callsigns for so long that he went from S8 down into the noise.

144MHz

On this band the scores compare more favourably with recent years. SSB has annihilated all other modes, and this regretfully includes A1. With a few exceptions signals and operating were good, with many stations showing commendable perseverance with difficult contacts. The use of high power has not caused as many problems as many groups anticipated, and the use of a receiver with adequate dynamic range and an aerial system with a narrow beam width help to make increasingly larger numbers of contacts possible in any contest.

432MHz

When conditions are poor 70cm is frustrating and boring for the participants. For stations favourably sited an average rate of just over two contacts an hour is all that can be expected, for those away from centres of activity as few as a dozen is a fair total.

SSB equipment for this band still needs technical know-how and adequate spare time rather than a well filled stocking. The change is proceeding, and at about the same rate as it is on 70MHz; the results table making its advantages apparent.

Signals and operating, as usual, very good with almost no A1 and possibly too much F3.

1,296MHz

The NFD 23cm signals, and to some extent the operating, compare very unfavourably with those experienced during the June and October microwave contests. Most groups now appreciate the wisdom of using a Class A call, and receivers have been improved considerably with noise figures of 5dB or better almost universal.

Here the improvements end: numerous very poor signals, both fm and a.m.; "Pse QRX while we finish building the tx"; very modest aerial gain; inability to point the beam in the right direction. The inevitable result: far too many one-way contacts.

Adequately tested gear, high aerial gain and vastly increased transmit power could, with the receiver improvements already extant, give this band an entirely new look. Twenty watts of rf is not difficult or expensive and 50W is practicable. Aerial gain of 22dB is readily attainable. How? The next edition of the *VHF/UHF Manual*, to be published next year, will contain a number of designs, including an ssb transmit converter and linear. *G5HD*

The Kingston & D ARS VHF NFD stations. Left to right: Steve Carpenter, G3ZQF, operating the 2m station G4AKA/P; Stephen Etheridge, G8JHX, at the controls of G3KIN/P, the 4m station; and Cliff Robinson, G8FZG, manning the 70cm station G3ZYS/P

OVERALL RESULTS

Posn	Club/Group	Points	70MHz	144MHz	432MHz	1,296MHz
1	March & DARC	5,249	G3VCV	G3PMH	G4BEL	G4BEL
2	Southampton RSGB Gp	5,048	G5HD	G8FAB	G3SOU	G3WDG
3	Albright & Wilson ARS and Caesaromagus VHF Gp	5,006	GW3UEY	GW3OXD	GW3SLJ	GW3SLJ
4	Hereford ContestGp and Bournemouth & Poole VHF Gp	4,257	GW3PFM	GW3WRA	GW3OBD	GW3OBD
5	Plymouth RC	3,746	G3ULN	G3PRC	G8AGU	—
6	RS of Harrow "A"	3,683	G3MLS	G3EFX	G3HBR	G3HBR
7	Leicester RS & VHF Gp	3,356	G5UM	G3ZJG	G3LRS	G3TQF
8	Echelford ARS	3,341	G3TDR	G3UES	G8EDL	G8EDL
9	Southgate RC	3,245	G3TDM	G3SFG	G3TTV	G3TTV
10	Verulam ARC	3,206	G3ZAM	G3JKB	G3VER	G3VER
11	Westmorland VHF Gp and Fylde & Blackpool Gp	3,062	G3FDW	G3NJN	G3JYP	—
12	AERE Harwell ARC	3,043	G3PIA	G4CXJ	G3NNG	G3NNG
13	Stockport RS	2,898	G3PMJ	G6UQ	G8BCG	G8BCG
14	Addiscombe ARC	2,868	G3WRR	G4ALE	G4CDY	G3SJX
15	Assn of Sheffield ARC	2,630	G3RKL	G3PHO	G4BCQ	G8KB
16	Maidenhead DARC	2,582	G3RQI	G3WKX	G8HNI	G3VCT
17	Dunstable Downs RC "B"	2,576	G3WLM	G8CBU	G4ARD	G4ARD
18	Southdown RS	2,530	G4AOL	G8BQX	G3WQK	G3WQK
19	Bexley VHF/UHF Gp	2,442	—	G8BIS	G8CXI	G8CXI
20	South Dorset RS	2,393	G3VPF	G3SDS	G3RZG	G3EGV
21	Horsham ARC	2,353	G3NPF	G3TNO	G3WZT	G3WZT
22	GM4BWT	2,297	GM4AOR	GM4BWT	—	—
23	Sutton & Cheam RS	2,271	G3LCH	G4BOX	G4ADM	—
24	Grimsby ARS	2,268	G3RSD	G3CNX	G3XDY	—
25	Sutton Coldfield RS	2,265	G3LNN	G3RSC	G8AVH	G8AVH
26	Mid-Herts ARS	2,217	G3AAZ	G4BWY	G3WGC	G3WGC
27	Pennine VHF Gp	2,126	G3VVT	G3JIJ	G4BVE	—
28	Crystal Palace & DARC	2,112	G3XFT	G3VCP	G3FZL	G3FZL
29	Reading ARC	2,110	G4BLT	G4CCC	G3ULT	G3ULT
30	Worthing ARC	2,034	G3YHM	G4ACG	G3WOR	G3WOR
31	West Kent ARC	2,027	G3WKS	G4BKG	G4BOO	G4BOO
32	Swansea ARS	2,016	—	GW5ZL	GW5ZL	—
33	Reigate ATS	2,007	G3XIG	G3REI	G3YQW	—
34	Cray Valley RS	1,993	G3TAA	G3YGR	G3RCV	G3RCV
35	Grafton RS	1,911	G3ZKE	G3AFT	G4CYR	G4CYR
36	Clifton ARS	1,846	G3UAD	G3GHN	G3UAD	G3UAD
37	Ipswich ARC	1,819	G3UUS	G4BPO	G8CFI	G8AXU
38	Gizmo CG	1,682	—	GW4CTF	—	—
39	Mid-Cheshire ARS	1,602	G4CAX	G3ZTT	G8ARQ	—
40	Kingston & DARC	1,585	G3KIN	G4AKA	G3ZYS	—
41	NE London VHF Gp	1,578	G4DDP	G4APJ	—	—
42	Mid-Sussex ARC	1,573	G3RXJ	G3ZMS	—	—
43	M.R. Kavanagh	1,548	—	GM8CNK	—	—
44	Luton VHF Gp	1,508	G3WOS	G8CDL	G8ATD	—
45	Guildford & DRS	1,488	G3PJX	G6GS	G3TLM	G3TLM
46	Bracknell ARC	1,424	G4DDL	G4DDK	G4DDN	—
47	Bristol CG	1,411	G3SXY	G6YB	G8CKK	G8CKK
48	Norfolk VHF CG	1,402	G3ZIG	G8AUN	G4BEW	—
	Brinkley & DCG	1,402	—	G3SZY	—	—
50	Mafia CG	1,391	GI3FFF	GI6YM	GI8AYZ	—
51	Hull & DARC	1,385	G3PQY	G3AMW	G8GBY	—
52	RS of Harrow "B"	1,347	G3KRT	G8HOW	G8BJO	—
53	Chippenham & DARC	1,288	G3UFW	G3VRE	—	—
54	Cheltenham ARC	1,249	G3MOE	G5BK	G4BRX	—
55	West Dorset ARG	1,244	—	G8IWD	G8EOJ	—
56	491 ATC	1,227	G3PUV	G8ELO	G3PUV	—
57	ARC of Nottingham	1,191	G3YUT	G3EKW	G8IUT	—
58	Cardiff RSGB Gp & Newport	1,140	—	GW5BI	—	—
59	Scunthorpe ARC	1,095	—	G4CDC	—	—
	Purley & DARC	1,095	G3XMW	G4APL	G8JAZ	—
61	Kidderminster & D VHF/UHF Gp	1,089	—	G3EPR	G4CKK	—
62	Jersey ARS	1,084	GC3XQM	GC3DVC	GC8EZA	—
63	Doncaster Coll of Tech	989	G3KPU	G3UER	G3WHL	G3WHL
64	Corby Tech Coll ARG	985	—	G3MQV	G3MQV	—
65	South Birmingham RS	982	G3OMG	G3OHM	G8GDZ	—
66	Chichester & DARC	966	G3ISO	G3IZP	G2DSP	—
67	P.W. Brown	943	—	G4AJE	G4AJE	—
68	Banbury ARS	920	—	G4COA	G4COA	—
69	Salop ARS	842	GW4AZS	—	—	—
70	RAF Sealand ARC	829	GW3ITZ	GW3UOO	GW8ITZ	—
71	G3JFO Gp	825	G3JFO	G3JFO	—	—
72	Woodmansterne Gp	822	G3KTA	G8CCK	G3KTA	—
73	Cannock Chase ARS	806	—	G3VCC	G3VCC	—
74	Royal Signals ARS	805	G4RS	G3VYZ	—	—
75	Shefford & DARC	791	G3XTQ	G3FJE	G8AKT	—
76	Dial House RS	752	—	G3WDH	—	—
77	Wakefield & DARS	744	G3WWF	G3WRS	—	—
78	Windswept Wanderers	710	—	G3ZJZ	G8ELM	—
79	Channel CG	694	—	G4DAA	—	—
80	Coventry ARS	668	—	G2ASF	—	—
81	Farnborough & DARC	656	G3XCH	G8DIZ	G4DKN	G4DKN
82	Chad RC	655	—	G4CAR	—	—
83	Silverthorn RC	642	G3LJB	G3SRA	G8CSA	—
84	Medway VHF CG	640	G2FJA	G8APB	—	—
85	G3XTT/G8GHZ	633	G3XTT	G8GHZ	—	—
86	Taunton & DARC	570	G4BHZ	G3XZW	G4BHZ	—
87	Exeter RC	559	G4ARE	G8GON	G8GON	—
88	Liverpool & DARC	545	G3WCS	G3AHD	—	—
89	Fulford Gp	544	—	G3OZE	—	—
90	G3CDG	542	G3CDG	—	—	—
91	V.G. Whitehead	538	—	G8GZJ	—	—
92	Dunstable Downs RC "A"	507	GM3USE	GM4DDC	—	—
93	Denby Dale RC	501	—	G4CDD	—	—
94	G4CDN	487	—	G4CDN	—	—
95	Spalding & DARC	473	G3XBS	G4DFQ	—	—
96	Glenrothes & DARC	472	—	GM3YOR	—	—
97	Northumbria RC	454	—	G4AAX	—	—
98	GM8EUG CG	402	—	GM8FVC	—	—
99	J. D. Goodman	394	—	G3WOA	—	—
100	P. T. Gaskin	392	—	—	G8AYY	G8AYY
101	Torbay ARC	368	G3NJA	G8IUI	—	—
102	Border ARS	360	GM3JNW	GM8BDX	—	—
103	Edgware & DARC	347	—	G8ERS	—	—
104	Preston ARS	342	—	G3KUE	—	—
105	R. A. Wybrow	336	—	G3JVJ	—	—
106	Havering & DARC	321	G3KFW	G3TPJ	—	—
107	Nailsworth & DARC	301	—	G8AWK	G8BEL	—
108	Mid-Warwicks ARS	245	—	G3UDN	—	—
109	Cheltenham Top Bandits Gp.	238	G4BGG	—	—	—
110	Harrogate & Knaresborough ARS	206	—	G3HRS	—	—
111	GM8BOW	187	—	GM8BOW	—	—
112	Essex Nomads	128	G3PGN	—	—	—
113	G8HUP	107	—	G8HUP	—	—
114	G8HQL CG.	74	—	G8HQL	—	—
115	HGS OB RG	66	—	G4BMO	—	—

70MHz BAND RESULTS

Posn	Callsign (/P)	Points	QSOs	County	Best dx	Km
1	G3FDW*	1,476	72	DH	G3ULN/P	470
2	G3ULN*	1,002	61	DN	G3FDW/P	470
3	G3VVT*	880	68	YS	G3XCS	430
4	G3VCV	858	81	CE	GM3JNW/P	425
5	G3YHM*	854	87	SX	GD4BEG	460
6	GW3PFM	846	73	BR	G4AOL/P	—
7	GW4AZS*	842	71	SE	GM3JNW/P	350
8	G3LCH*	826	101	SY	GM4AOR/P	470
9	G3RKL*	808	80	YS	G3ULN/P	312
10	GW3UEY	796	68	—	GI3FFF/P	335
11	G3VPF	792	68	DT	G3FDW/P	445
12	G3ZAM	774	80	—	G3FDW/P	337
13	G3TDM	736	85	WE	GD4BEG	355
14	G5HD*	706	77	WE	G3FDW/P	390
15	G3ZKE*	686	78	HF	—	—
16	G3ZIG*	682	39	NK	G3ULN/P	410
17	G5UM	630	68	LR	GD2HDZ	280
18	G4AOL	626	76	SX	G3FDW/P	470
19	G3XIG	624	94	SY	G3FDW/P	411
20	G3TAA	618	81	KT	GM4AOR/P	578
	G3TDR	618	89	HE	G3FDW/P	415
22	G3PJX*	612	74	SY	GM4AOR/P	470
23	G4CAX	566	51	—	G3IKD	—
24	GM4AOR*	550	32	RH	G3TAA/P	491
25	G3CDG	542	55	GR	GM3USE/P	355
26	G3YUZ	536	64	DT	G3ZIG/P	330
	G3MLS	536	74	SX	G3UVR	366
28	G3RSD	528	46	—	G3RXJ/P	260
29	G3RXJ	524	72	—	G3FDW/P	—
30	G3WOS	520	64	BD	—	—
31	G3KIN	490	77	SY	G3FDW/P	406
32	G3WLM	482	65	BD	G3VVT/P	262

Posn	Callsign (/P)	Points	QSOs	County	Best dx	Km
33	G3NPF	470	75	SX	GW4AOS/P	255
34	G3MOE*	434	49	GR	G3FDW/P	355
35	G3WWF	432	34	YS	G3VPF/P	—
36	G3WRR*	350	61	SY	G3FDW/P	410
37	G4RS	346	45	DT	G3DAH	232
38	G4DDL	342	58	OX	G4ARE/P	195
39	G3KRT	324	50	OX	G3VVT/P	281
40	G3LNN	316	36	—	G3XFT/P	271
41	G3PMJ	306	39	SD	G3SXY/P	—
42	G4AAH*	302	35	—	G3RXJ/P	250
43	G3XFT*	300	28	—	G3ULN/P	358
44	G4ARE	294	29	DN	G3DAH	320
45	G3XMW	286	59	SX	G4RS/P	248
46	G3PQY	282	40	YS	GM3ZSX/P	309
47	G3AAZ	276	38	HF	G3FDW/P	325
48	G4BLT*	274	46	HE	GW3UEY/P	166
49	G3VJR	272	30	YS	G3ULN/P	374
	G3SXY	272	33	ST	G3VCV/P	218
51	G3WKS	264	42	KT	GW3PFM/P	253
52	G3UAD	254	47	KT	G3RKL/P	—
53	G3KTA	248	47	SY	GC3XQM/P	290
54	G3PIA	240	37	OX	G4AOL/P	143
55	G4BGG*	238	29	GR	G3ZIG/P	227
56	GI3FFF	234	29	AM	GW3UEY/P	391
57	G3KPU*	228	26	LN	G3YHM/P	290
58	G3RQI	214	56	—	G3ULN/P	242
59	G3UFW	210	29	—	G4AOL/P	145
60	G3PUV	192	34	NH	GW4AZS/P	135
61	G3YUT*	188	32	NM	G3FDW/P	185
62	G3KFW	186	43	EX	G4RS/P	175
63	G3OMG	182	31	WR	G3XIG/P	175
64	GM3USE	180	14	WG	G5UM/P	325
65	G3XTT	172	28	NR	GW3UEY/P	145
66	G3XTQ	156	26	BD	G3MLS/P	143
67	G3XCH	152	34	HE	G3ULN/P	225
68	GM3JNW*	134	10	BW	G3ZIG/P	—
	G3UUS	134	16	—	G3NPF/P	187
70	G3PGN	128	18	DT	G3VCV/P	240
71	G3LJB	116	18	NR	GW3PFM/P	140
72	GW3GLY	114	13	GN	G5HD/P	145
	G3XBS	114	19	LN	G3WWF/P	190
74	G3WCS	102	11	—	G3RJR	199
75	G3NJA	76	10	DN	G3TDM/P	175
76	GW3ITZ	66	11	—	G3VVT/P	—
77	G4BHZ	56	10	ST	GW3UEY/P	120
78	G4DDP	28	10	EX	GSRXJ/P	80
79	G3JFO	20	4	YS	G3XBS/P	120
80	G2FJA	14	3	KT	G3ZKE/P	80

Disqualified: G3ISO/P, GC3XQM/P } Cover sheet not signed.

Listeners: BRS15622 120; A8016 76; BRS34348 22

144MHz BAND RESULTS

Posn	Callsign (/P)	Points	QSOs	Best dx	Km
1	GW3OXD	2,359	353	PA0GJA	635
2	G8FAB	2,246	326	GM5MAT/P	610
3	G3PMH	1,839	281	F6BYV/P	525
4	GW3WRA	1,766	535	PA0BWL/A	307
5	GM4BWT	1,747	175	G3PRK/P	554
6	GW5ZL	1,740	222	DJ9DLN/P	785
7	GW4CTF	1,682	300	F9FT/A	681
8	G4APJ	1,550	246	DK7KB/P	246
9	GM8CNK	1,548	157	G3EFX/P	530
10	G3NJN	1,484	197	G3VCP/P	455
11	G3CNX	1,470	222	G3YZX	507
12	G3PRC	1,442	160	ON4PB/P	580
13	G3SZY	1,402	222	F9FT/A	511
14	G4BFO	1,337	160	DK0BN/P	524
15	G3RSC	1,316	250	F9FT/A	550
16	G3EFX	1,168	250	GM3YOR/P	623
17	GW5BI	1,140	192	PA0BWL/P	520
18	G4BKG	1,127	232	DL0II/P	450
19	G4CDC	1,095	184	PA0MS/P	470
20	G3JIJ	1,090	209	F5JY	530
21	GC3DVC	1,084	94	GM8CMK/P	725
22	G4CXJ	1,079	227	GI6YM/P	463
	G3TNO	1,079	211	F9FT/A	455
24	G3VRE	1,078	194	GM8BDX/P	520
25	G8BQX	1,075	215	DC8RLA	509
26	G3SDS	1,071	157	PA0ZAL	557
27	G6UQ	1,061	242	ON6DH	500+
28	GI6YM	1,055	101	G3YGR/P	572
29	G3ZMS	1,049	190	GM3YOR/P	610
30	G3ZJG	987	215	ON4PB/P	415
31	G8IWD	956	147	DJ9DLA	663
32	G4COA	920	137	G3NSN/P	324
33	G3GHN	914	176	GI6YM/P	560
34	G3SFG	904	188	PA0BWL/A	430
35	G3UES	890	188	DJ9DLA	510
36	G3NIL	851	133	DJ9DLA	640
37	G3VCP	842	113	DK8EQ/P	490
38	G3AMW	833	153	G3YJX	515
39	G4ALE	832	209	G3NJN/P	410
40	G3AFT	827	215	PA0JCW/P	415
41	G3EKW	811	175	G4CRC/P	425
42	G3JFO	805	141	G3SOS/P	365
43	G3ZTT	760	180	ON4PB/P	—
	G8BIS	760	168	GM8FIS/P	520
45	G4BOX	755	235	GM3ZSS/P	630
46	G3WDH	752	168	GM5MAQ/P	454
47	G3VAG	741	150	—	—
48	G3JZJ	710	149	DK8EQ	535
49	G4CCC	704	163	GM8CMK/P	433
	G3VCC	704	190	GI6YM/P	350
51	G3REI	699	219	GM4BWT/P	—
52	G4DAA	694	150	GM8CNK/P	515
53	G3MQV	685	139	GI6YM/P	423
54	G8EPR	681	180	—	—
55	G8AUN	672	83	GI6YM/P	500
56	G6YB	671	140	GM4BWT/P	459
57	G2ASF	668	144	—	—
58	G5BK	665	153	GM4BWT/P	415
59	G3YGR	664	206	GI6YM/P	560
60	G8CBU	656	162	GM4BWT/P	407
61	G4CAR	655	139	ON4PB/P	466
62	G4ACG	631	145	GM8F1S/P	525
63	G8ELO	627	161	G4AXX/P	325
64	G8APB	626	136	G3NJN/P	403
65	G3PHO	599	140	PA0MS	510
66	G8CDL	592	170	ON4PB/P	355
67	G4AKA	573	185	G3SHK/P	—
68	G3GQC	554	138	PA0BWL/A	425
69	G4AJE	553	114	GI6YM/P	420
70	G3OZE	544	117	G3TNO/P	355
71	G4APL	539	138	GM8CNK/P	485
72	G8GZJ	538	150	ON4PB/P	538
73	G3UER	534	116	G3PRC/P	385
74	G3WKX	532	149	DJ9DL/A	537
75	G3OHM	530	167	GI6YM/P	370
76	GW3UOO	517	107	F1DHS/A	420
77	G4DDK	512	151	GM4BWT/P	415
78	G4BWY	506	116	GI6YM/P	488
79	G4CDD	501	132	—	—
80	G4CDN	487	103	G8BQX/P	303
81	G6GS	484	154	G3AWM/P	279
82	GM3YOR	472	61	G3ZMS/P	617
83	G8HOW	471	117	GM8CNK/P	413
84	G3IZP	468	118	PA0CML	350
85	G8GHZ	461	123	GM4BWT/P	325
86	G3VYZ	459	83	ON4PB/P	445
87	G3FJE	455	116	F9FT/A	483
88	G4AAX	454	101	G6YB/A	319
89	G3AHD	443	39	G3PRC/P	419
90	G3JKB	437	164	GM4BWJ/P	408
91	G3SRA	412	106	GC3DCV/P	350
92	GM8FVC	402	59	G8FUF	506
93	G8CCK	400	139	GM8CNK/P	490
94	G3WOA	394	90	GM4BWT/P	410
95	G4DFQ	359	100	PA0CKV	380
96	G8ERS	347	163	GC3DVC/P	310
97	G3KUE	342	88	GM5MAQ/P	355
98	G3JVJ	336	98	GM8CNK/P	346
99	GM4DDC	327	43	G4CCC/P	430
100	G3WRS	312	62	PA0BWL	475
101	G3XZW	310	83	G8ABP/P	200
102	G8IUI	292	56	G3PMH/P	325
103	G8DIZ	279	110	G3PRC/P	250
104	G3UDN	245	64	GC3DVC//P	300

Members of the Jersey Amateur Radio Society who took part in VHF NFD for the first time.

Posn	Callsign (/P)	Points	QSOs	Best dx	Km
105	GM8BDX	226	34	G3VRF/P	495
106	G3HRS	206	40	G8FAB/P	340
107	GM8BOW	187	41	G3GZX	400
108	G4BP	184	48	G8FAB/P	325
109	G8GDN	157	46	G3PMH/P	290
	G8DVD	157	31	G3SZY/P	368
111	G3TPJ	135	80	G8GON/P	270
112	GM3VTB	120	42	G3WDH/P	270
113	G8AWK	115	35	G3PRC/P	200
114	G8HUP	107	41	GW8FHJ/P	265
115	G3IHX	104	42	G4BFB/P	190
116	G8HQL	74	26	GW4CTF/P	166
117	G4BMO	66	28	G3JVJ/P	130
118	G3IDV	63	31	G8GXP/P	150

Check logs from: G3TVS/P, G3PLI/M, G3SZS, G8GOX, G8IEL, G4BTS/P. Submitted to IARU: GM3YOR/P, G6GS/P, G4BOX/P, G3VCP/P, G3OHH, G6OL/P, G3EFX/P, GW4CTF/P.

432MHz BAND RESULTS

Posn	Callsign (/P)	Points	QSOs	County	Best dx	Km
1	GW3SLJ	1,344	46	RN	G4BEL/P	223
2	G8AGU	1,302	25	DN	G3LQR	430
3	G4BEL	1,290	49	CE	G8AGU/P	345
4	G8BCG	1,152	54	SD	G8AGU/P	330
5	G3SOU	984	48	WE	G8AGU/P	170
6	G3HBR	900	54	SX	G4CFI/P	165
	G3VER	900	55	HF	GW3SLJ/P	175
8	G3LRS	888	48	LR	G8AGU/P	295
9	G3ULT	858	49	HE	GW3SLJ/P	170
10	G3WGC	846	49	HF	GW3SLJ/P	213
11	G3TTV	828	40	WE	G8AGU/P	180
	G8EDL	828	51	HE	G8AGU/P	218
13	G4ARD	762	50	BD	GW3SLJ/P	190
14	GW3OBD	756	31	BR	G3YQW/P	216
15	G3NNG	750	42	OX	GW3SLJ/P	137
16	G4BCQ	702	36	YS	G8AGU/P	312
17	G8CXI	690	57	SY	G3LRS/P	153
	G4ADM	690	59	SY	G4BEL/P	117
19	G3YQW	684	46	SY	GW3OBD/P	216
20	G4CDY	636	49	SY	—	—
21	G8AVH	630	37	WK	GW8FQF	140
22	G8HNI	618	46	BS	G3FZL/P	144
23	G4DDN	570	39	OX	GW3SLJ/P	170
24	G8BJO	552	33	OX	GW3OBD/P	151
25	G3ZYS	522	47	SY	G4BEL/P	123
26	G3WQK	510	33	SX	G3WGC/P	160
27	G2DSP	498	37	SX	G8EOJ/P	128
28	G3WZT	462	33	SX	G4BEL/P	170
29	G4BOO	444	31	KT	G8HNI/P	105
30	G3WOR	438	33	SX	G3SOU/P	117
31	G3FZL	420	16	KT	G8AGU/P	366
32	G3PUV	408	23	NH	GW3SLJ/P	132
	G4CKK	408	19	SE	—	—
34	G8ATD	396	28	BD	G3WQK/P	130
	G3UAD	396	34	KT	—	—
36	G4AJE	390	25	RD	G8GBY/P	122
37	G8CKK	378	23	ST	G8GDZ/P	130
38	G4CFI	330	13	SK	G8AGU/P	391
39	G3MQV	300	17	NH	—	—
40	G8EOJ	288	14	DT	GW3OBD/P	190
41	G8ARQ	276	22	CH	G4BVE/P	—
42	G3XDY	270	13	LN	G8DLZ	150
	G8GDZ	270	17	WR	G8CKK/P	130
	G8GBY	270	20	YS	G4AJE/P	122
	G8JAZ	270	30	SX	G4ARD/P	85
46	G3RZG	259	16	DT	GW3OBD/P	127
47	G4CYR	258	25	HF	G3LRS/P	120
48	G3RCV	252	20	KT	G3WGC/P	82
	G3TLM	252	29	SY	G3WGC/P	88
50	G3FVU	246	13	DT	GW3OGG/P	142
	GW8ITZ	246	15	FT	—	—
52	G4BHZ	204	12	ST	G4CKK/P	160
53	G8IUT	192	16	NM	G4BEL/P	115
54	G8BEL	186	13	GR	—	—
55	G4DKN	180	18	HE	G3HBR/P	70
	G8AYY	180	14	SD	G4BBR	136
	G8AKT	180	15	BD	G3SOU/P	138
58	G3WHL	174	13	LN	G4BEL/P	137
	G3KTA	174	16	SY	G3WGC/P	85
60	GW5ZL	162	7	GN	G3SOU/P	144
61	G4BVE	156	9	YS	GW8ITZ/P	116
62	G4BRX	150	9	GR	G3EHM	120
63	G8CSA	114	9	NH	GW3SLJ/P	145
64	G8GON	108	8	DN	GW3OBD/P	120
65	GI8AYZ	102	5	AM	GD2HDZ	102
	G3JYP	102	5	DH	G3NHE	165
	G3VCC	102	7	SD	G3TTV/P	—
68	G4BEW	48	4	NK	G3LQR	50
69	GC8EZA	0	0	JY	—	—

Check log (no declaration): G4COA/P, claimed score 546.

1,296MHz BAND RESULTS

Posn	Callsign (/P)	Points	QSOs	County	Best dx	Km	Aerial
1	G4BEL*	1,262	15	CE	G3JVL	193	4ft dish
2	G3VCT	1,212	22	BS	G3HBR/P	93	5ft dish
3	G3SJX	1,150	21	SY	G4BEL/P	121	32el Yagi
4	G3WDG*	1,112	18	WE	GW3OBD/P	123	4 × 25LQ
5	G3VER	1,095	16	BD	G3HBR/P	113	24el Yagi
6	G3HBR	1,079	17	SX	G3VER/P	113	27el Yagi
7	G8EDL	1,005	18	HE	G6XM	73	34el Yagi
8	G8CXI	992	21	SY	G3TTV/P	115	34el Yagi
9	G3NNG	974	16	OX	GW3SLJ/P	137	3ft dish
10	GW3OBD	889	9	BR	G3FVU/P	131	2/26el Yagi
11	G3TQF	851	12	LR	G8BCG/P	94	3 & 5ft dish
12	G3TTV	777	11	WE	GW3SLJ/P	132	3ft dish
13	G4ARD	676	12	BD	G3TQF/P	90	4 × 2 Para
14	G3WGC	589	10	HF	G3NNG/P	112	27el Yagi
15	G3FZL	550	7	KT	G4BEL/P	155	loop Yagi
16	G8KB	521	8	YS	G4BEL/P	159	Q loop
17	GW3SLJ	507	4	RN	G3NNG/P	137	4ft dish
18	G3RCV	459	9	KT	G3VCT/P	82	34el Yagi
19	G8BCG	379	8	DY	GW3SLJ/P	126	12el Yagi
20	G3WZT	342	6	SX	G3RCV/P	90	22el Yagi
21	G3WQK	319	6	SX	G3FZL/P	85	4ft dish
22	G3FVU	312	4	DT	GW3OBD/P	130	4ft dish
23	G3UAD	282	6	KT	G3VER/P	80	22 loop Yagi
24	G3ULT	272	7	HE	G3JVL	64	3ft dish
25	G3EGV	271	3	DT	GW3OBD/P	127	3ft dish
26	G8AYY	212	6	SD	G3TQF/P	85	26Q loop
27	G4BOO	192	5	KT	G3FZL/P	46	5ft dish
28	G3TLM	140	4	SY	G3VCT/P	57	27el Yagi
	G4CYR	140	3	HF	G4BEL/P	71	6ft dish
30	G3WOR	111	3	SX	G3SJX/P	55	3ft dish
31	G8CKK	90	2	ST	GW3OBD/P	75	8/8
32	G4DKN	55	2	HE	G3ULT/P	23	2/25el Yagi
33	G3WHL	53	1	LN	G8KB/P	53	18in dish
34	G8AXU	18	1	SF	G3LQR	18	8/8
35	G8AVH	3	1	SD	G8AMD	3	3ft dish

432MHz Summer Cumulative Contest results

Despite the July-September datelines, this contest took place under undistinguished conditions. Few entrants reported any lifts in propagation, though this did not prevent the leading stations from making some good dx contacts. The familiar band of cumulative contest supporters is headed on this occasion by G3KMS, and G3JVL improved his performance from ninth position in the spring event to take second place. *I.F.W.*

Posn	Callsign	Points	QSOs	County	Best dx	Km	Sessions
1	G3KMS	334	68	LE	G3DAH	352	3,4,5
2	G3JVL	291	62	HE	G3KMS	332	1,2,5
3	GW8ACG/P	280	58	FT	G3DAH	353	1,2,7
4	G3NHE	275	57	YS	G3OBD	290	1,2,7
5	G8BGQ	261	71	HF	GD2HDZ	386	1,2,5
6	G4ALN/P	198	54	EX	GW8ACG/P	310	2,4,5
7	G4BRT *	140	44	WK	G3DAH	242	3,5,7
8	G4BFT	139	46	WR	G3DAH	260	3,4,7
9	G8AVX	100	38	WK	G3KMS	135	3,4,5
10	G5UM	92	44	LR	G8BYW/P	92	2,4,6
11	GW8FQF	69	23	DB	G3XDY/P	210	1,4,5
12	G8EPJ	68	44	SX	G3PQR	177	2,3,4
13	G8ABI	66	30	WR	G3NEO	110	2,3,4
14	G5HD	63	23	WE	G3WDG/P	165	2,4,7
15	G8DIC	58	32	HE	F1AVG	150+	1,2,3
16	G8HND	56	34	HE	G3MEW	0.7	2,3,4
17	G8BVF	55	19	LE	G4BFT	105	1,2,4
18	G4CTZ	46	28	DY	G8AVX	61	4,5,7
19	G8ABI/A	37	19	MX	G3NHE	210	1,6,7
20	G4CZB	27	15	LD	G3PQR	103	4,5,7
21	G8FPS	15	11	YS	G3XDY/P	95	1,3,4

DF Final Contest results

The National Final DF Contest for the RSGB trophy was held in Northamptonshire in showery weather on 22 September when 14 teams, qualified in previous eliminating events, assembled in Salcey Forest. The only non-starter was I. Butson who had unfortunately gone down with 'flu.

The three square miles of the forest provided an ideal starting point, and most competitors suspected that the dense undergrowth concealed at least one of the three transmitters they had to find. At 1250bst good signals were heard from all three stations, and at 1300 in heavy rain competitors were released. The transmitters could be located in any order, and it was interesting to find that each was tackled first by almost equal numbers of entrants.

Station A (G3NDM) was situated 13 miles NNW of the start, well hidden beside a footpath bordering on the Daventry Radio Station. Most competitors suffered from some degree of breakthrough from this powerful station, but that did not prevent Mike Hawkins from arriving in a little over an hour and a half. Ten competitors were successful in finding this station which could only be approached on foot.

Station B (G3TFA) was well hidden in Salcey Forest less than a mile east of the start and approached by a number of tracks mostly deep in mud. This proved the undoing of Eric Mollart who, driving with more haste than caution, became so firmly stuck that it took over an hour for the combined efforts of his team and spectators to bodily lift his car on to firm ground with all hope of a win gone.

Station C (G4AKL) was concealed in a wood eight miles west of the start and could only be approached after a lengthy journey on foot. As at 1600 no competitor had found all three stations, the contest was extended by 30 min; the extra time enabled eight teams to complete their task. Two competitors found two stations and three found only one; one entrant did not locate any transmitter.

At the conclusion of a well-organized, difficult and hard fought contest thanks were expressed to the joint organizers, Derrick Newman and George Whenham, and to the many members of the Coventry ARS and the Rugby Club who contributed so much to a very successful contest. Mrs G. T. Peck presented the RSGB trophy and first prize to Mike Hawkins for the second year running, and the second prize to Eric Mollart who did well to finish only 21 min behind the winner despite his earlier catastrophe.

			Time of arrival		
Posn	Name	Club	Station A	Station B	Station C
1	M. Hawkins	Chelmsford	1438	1607	1510½
2	E. L. Mollart	Oxford	1545	1354	1628
3	T. C. Gage	Oxford	1554	1353	1633
4	W. North	Chiltern	1441	1636	1515
5	B. Bristow	Oxford	1453	1637	1510
6	P. Tyler	Oxford	1548	1637½	1437
7	A. W. Butcher	Chelmsford	1548½	1357	1639
8	P. H. Lisle	Cambridge University	1643	1355½	1505
9	D. C. Holland	South Manchester	1529	1633	—
10	W. L. Pechey	Chelmsford	1645	—	1504½
11	J. R. Vickers	Stratford	—	—	1605
12	J. McBurney	South Manchester	—	—	1611
13	C. McEwen	Chelmsford	—	—	1611½

BARTG Spring RTTY Contest rules

When. 0200gmt Saturday 22 March until 0200gmt Monday 24 March 1975. The total contest period is 48 hours but not more than 30 hours of operation is permitted. Times spent in listening count as operating time. The 18-hour non-operating period can be taken at any time during the contest, but off periods may not be less than three hours at a time. Times on and off the air must be summarized on the log and score sheets.

Who. There will be separate categories for multi-operator stations and SWLs.

Bands. 3·5, 7, 14, 21 and 28MHz bands.

Stations. Stations may not be contacted more than once on any one band, but additional contacts may be made with the same station if a different band is used.

Country status. ARRL Countries List and in addition each W/K and VE/VO call area will be counted as a separate country. (But W/K and VE/VO counted once only for QCA).

Messages. Messages exchanged will consist of:

(a) Time gmt. This must consist of a full four-figure group. The use of the expression "Same" or "Same as yours" will not be permitted.

(b) RST and message number. The message number must consist of a three-figure group starting with 001 for the first contact made.

Points.

(a) All two-way rtty contacts with stations within one's own country will earn **TWO** points.

(b) All two-way rtty contacts with stations outside one's own country will earn **TEN** points.

(c) All stations will receive a bonus of **200** points per country worked including their own. **Note:** Any one country may be counted again if worked on another band but continents are counted once only.

Scoring.

(a) Two-way exchange points times total countries worked.

(b) Total country points times bonus points times number of continents worked.

(c) Add (a) and (b) together to obtain your final score.

Logs and score sheets. Use one log for each band and indicate any rest periods. Logs to contain: date, time gmt, message and RST numbers sent and received and exchange points claimed. *All logs must be received by 31 May 1975 to qualify.*

Send your contest logs to: Ted Double, G8CDW, 89 Linden Gardens, Enfield, Middlesex EN1 4DX, England.

Certificates will be awarded to the leading stations in each class and to the top stations in each continent and each W/K VE/VO call area. The final positions in the results table will be valid for entry in the "World Champion of RTTY" Championship.

The judges' decision will be final and no correspondence can be entered into in respect of incorrect or late entries.

Additional notes.

(a) If a contestant manages to contact 25 or more different countries on two-way rtty during this contest a claim may be made for the Quarter Century Award issued by the British Amateur Radio Teleprinter Group and for which a charge of US$2 or 8 IRCs is made. Make your claim at the same time as you send in a contest log. Holders of existing QCA awards will automatically have any additional new countries added to their records.

(b) If any contestant manages to contact stations on two-way rtty with all six continents and the BARTG Contest Manager receives contest logs from the operators in those six continents, a claim may be made for the WAC Award issued by the *RTTY Journal*. The necessary information will be sent on to the *RTTY Journal* who will issue the WAC Award free of charge.

Grafton RS G2CJN VHF Contest 1974 results

Posn	Callsign	Score	Posn	Callsign	Score
1	G8EOP	113	14	G8ECT	25
2	G4ANS	91	15	G8IMX	24
3	G8FQM	88	16	G3LCH	22
4	G8EEM/P	72		G8EEI	22
5	G3ZKE	67	18	G8BXC	20
6	G8FAT/P	62		G8ICY	20
7	G8GOX	61	20	G8IJP	19
8	G8GHZ	48	21	G8GBN	14
9	G8CTT	44	22	G8HBA/P	13
10	G8HSS	42	23	G8IAT	8
11	G8IBO	40		G4CCA	8
12	G8INN/A	38	25	G4CNG	6
13	G8HCP	27			

Certificates go to G8EOP and G4ANS, and to G8INN/A who was licensed within six months of the contest

AFS Contest rules—amendment

Please note that entries should be sent to the following address and not that given in the rules published in the November issue. D. Thom, G3MKS, 20 Bramble Close, Copthorne, Crawley, Sussex RH10 3QB.

Also please note the date of the contest is **11-12 January,** not 12-13 as published.

Jubilee VHF/UHF Contest results—correction

In these results published in the November issue, position 5 in Zone A-North should read G3NHE, not G3NME.

Contests calendar

8 December 1975	—144MHz Fixed (Rules in November issue)
11-12 January	—Affiliated Societies (Rules in November issue) **(Note corrected date)**
8-9 February	—1st 1·8MHz
8-9 March	—BERU (Rules in December issue)
13 April	—80m Low Power
7-8 June	—HF National Field Day
28-29 June	—Summer 1·8MHz
12-13 July	—SSB Field Day
14 September	—80m Field Day
11-12 October	—21-28MHz
18-19 October	—7MHz CW
1-2 November	—7MHz Phone
8-9 November	—2nd 1·8MHz

BERU 1975 rules

Radio amateurs and short-wave listeners throughout the British Commonwealth are invited to take part in the 38th BERU Contest, to be held on 8-9 March 1975.

Reprints of the BERU rules, the General Rules of RSGB HF Contests and supplies of log sheets may be obtained from RSGB, 35 Doughty Street, London WC1N 2AE. UK members should enclose a large sae with their request.

This will be the last BERU contest to be held under the present rules, and 1976 will see the introduction of a new form of contest for the British Commonwealth. Comments and suggestions from past and possible future entrants will be welcomed.

Rules—Transmitting Section

1. The **General Rules** for RSGB HF Contests, as published in the January 1975 issue of *Radio Communication*, will apply.
2. **When.** From 1200gmt on Saturday 8 March 1975 to 1200gmt on Sunday 9 March 1975.
3. **Eligible entrants.** Members of the RSGB resident in the UK and radio amateurs licensed to operate within the British Commonwealth or British Mandated Territories.
4. **Contacts.** CW (A1) only, in the 3·5, 7, 14, 21 and 28MHz bands. Contacts may be made with any station using a British Commonwealth callsign, except those within the entrant's own call area. UK stations may not work each other for points. In accordance with current IARU recommendations, contestants are requested to confine their operations to within the lower 30kHz of each band.
5. **Scoring.** Each completed contact will score five points. In addition, a bonus of 20 points may be claimed for the first, second and third contacts with each Commonwealth call area (as listed in the accompanying table) on each band. All British Isles stations (G, GB, GC, GD, GI, GM and GW) count as one call area.
6. **Logs.** Separate logs are required for each band. Each band log should be separately totalled and should include at the end a check list of call areas worked on the band. Logs should be set out as shown in the General Rules for RSGB HF Contests. Separate band totals should be added together and the total claimed score entered on the cover sheet.
7. **Entries.** Entries may be single or multi-band. Single-band entries should show contacts on only one band; details of contacts made on other bands should be enclosed separately for checking purposes. Multi-band entries will not be eligible for single-band awards.

Each entry will consist of the separate band logs together with a signed declaration. The form of declaration is shown in the General Rules for RSGB HF Contests.

Entries should be addressed to D. J. Andrews, G3MXJ, 18 Downview Crescent, Uckfield, Sussex, England. Adjudication of this contest will commence on Monday 12 May 1975. Any entry received after this date may be excluded from the contest and may be ineligible for any award. Overseas stations are therefore advised to forward their logs by airmail.

8. **Awards.** To the winner, the BERU Senior Rose Bowl. To the runner-up, the BERU Junior Rose Bowl. To the leading UK station, the Col Thomas Rose Bowl.

Certificates will be awarded to the leading UK and overseas single-band entries on each band; and to the leading UK and continental leaders in the multi-band section.

Rules—Receiving Section

1. **When.** Times and dates as for transmitting section.
2. **Eligible entrants.** Members of the RSGB resident in the UK and all short-wave listeners resident in the British Commonwealth or British Mandated Territories. Only the entrant may operate his receiving station for the duration of the contest. Holders of amateur transmitting licences are not eligible to take part.
3. **Scoring.** To count for points a station outside the entrant's own call area must be heard in a contest contact. CQ or test calls will not count for points. A station may be logged only once on each band for the purpose of scoring. Where both stations in a contact are heard, they should be logged separately and points may be claimed for both entries, provided that the stations are outside the entrants own call area.

Each complete log entry will score five points. In addition, a bonus of 20 points may be claimed for the first, second and third stations heard in each Commonwealth call area on each band. All British Isles prefixes count as one call area.

4. **Logs.** A separate log is required for each band. Logs should show the following details: (i) Date/time gmt, (ii) Callsign of station heard, (iii) Report and serial number sent by station heard, (iv) Callsign of station being worked, (v) Points claimed, (vi) Bonus points claimed. Each log must be set out on one side of foolscap or A4 log sheets and must show the band to which the log sheet refers. A check list showing the call areas heard on each band must also be included.
5. **Entries.** (a) Each entry will consist of the log sheets, check list and a signed declaration that the receiving station was operated in accordance with the rules and spirit of the contest and that the entrant does not hold an amateur transmitting licence. (b) Entries should be addressed and sent as in Rule 7, Transmitting section.
6. **Awards.** The BERU Receiving Rose Bowl to the winner. Certificates of merit to the leading entrant in each continent.

Commonwealth Call Areas

The following call areas are recognized for the purposes of scoring in the 1975 BERU Contest:

A2	Botswana
A3	Tonga Is
A5	Bhutan
AC3	Sikkim
C2	Nauru
G/GC/GD/GI/GM/GW	
P2	Papua New Guinea
S2	Bangladesh
VE1	
VE2	
VE3	
VE4	
VE5	
VE6	
VE7	
VE8	
VK1	
VK2	
VK2	Lord Howe Is
VK3	
VK4	
VK4	Willis Is
VK5	
VK6	
VK7	
VK8	
VK9	Christmas Is
VK9	Cocos Is
VK9	Norfolk Is
VK0	Heard Is
VK0	Macquarie Is
VK0	Australian Ant
VP1	
VO	
VP2A	Antigua, Barbuda
VP2D	Dominica
VP2E	Anguilla
VP2G	Grenada & Dep
VP2K	St Kitts, Nevis
VP2L	St Lucia
VP2M	Montserrat
VP2S	St Vincent & Dep
VP2V	British Virgin Is
VP5	Turks & Caicos Is
VP7	
VP8	Falkland Is
VP8	S Georgia
VP8	S Orkney Is
VP8	S Sandwich Is
VP8	S Shetland Is
VP9	
VQ9	Chagos Is
VQ9	Aldabra
VQ9	Seychelles
VQ9/D	Desroches Is
VQ9/F	Farquar Is
VR1	British Phoenix Is
VR1	Gilbert & Ellice & Ocean Is
VR3	Fanning & Christmas Is
VR4	
VR6	
VS5	
VS6	
VS9	Gan
ZL/C	Chatham Is
VU	India
VU	Laccadive Is
VU	Andaman & Nicobar Is
YJ	
ZB2	
ZC4,5B4	
ZD3	
ZD7	
ZD8	
ZD9	
ZE	
ZF	
ZK1	Cook Is
ZK1	Manihiki Is
ZK2	Nuie
ZL1	
ZL2	
ZL3	
ZL4	
ZL5	
ZL	Auckland & Campbell Is
ZL/K	Kermadec Is
ZM7	
3B6,3B7	Agalega & St Brandon
3B8	Mauritius
3B9	Rodriguez Is
3D	Fiji
3D6	Swaziland
4S7	
5H3	
5N2	
5W	Samoa
5X5	
5Z4	
6Y5	
7P8	
7Q7	
8P	
8R	
9G1	
9H	Maltese Is
9J2	
9L1	
9M2	W Malaysia
9M6/9M8	E Malaysia
9V1	
9Y4	

This list has been compiled from the RSGB Countries List and from information supplied by the Foreign and Commonwealth Office.

MEMBERS' ADS

These subsidized flat-rate advertisements are accepted as a service to members of RSGB. They must be submitted on the Members' Ads order form printed in each issue of *Radio Communication*, or on a postcard similarly laid out. Each **must** be accompanied by a **recent** *Radio Communication* wrapper addressed to the advertiser, as proof of membership, and a remittance by postal order or cheque for 40p (stamps not accepted). They will not be acknowledged. Those not clearly worded or punctuated will be returned. No correspondence concerning this service can be entered into.

The closing date for each issue is the 4th of the preceding month, but no guarantee of inclusion in a specific issue can be given. Valid advertisements not published in the issue following receipt will be held over until the next issue.

Trade or business advertisements, even from members, will not be accepted for Members' Ads but should be submitted as classified or display advertisements in the usual way.

The RSGB reserves the right to refuse advertisements, and accepts no responsibility for errors or omissions or for the quality of goods offered for sale. Advertisements may be edited or abbreviated as necessary.

Members are advised to enclose a stamped addressed envelope when replying to advertisements.

Post to: MEMBERS' ADS. "RADIO COMMUNICATION", 35 DOUGHTY STREET, LONDON WC1N 2AE

FOR SALE

Lafayette Starflite a.m./cw tx, vfo, HE-73 pre-con, HA700 rx, Z-match, bug, trap dipole 10/80m, aerial c/o, etc, comp station, vgc, £80 ono. 807 valves, quantity miniature valves, offers. BC221, £8. G3WYZ, QTHR. Tel East Horsley 2622 (evenings).

Tiger 2m converter self-powered new, £12. *Wanted:* Small extractor fan about 10cm dia. Also co-ax relay type 125. Parker, 133 Station Road, Cropston, Leicester LE7 7HH.

Westminster 2m, 6 chan, a.m., mint cond, with fixing cradle, £70. Garex Twomobile 2m, a.m., £60. (Both rigs fitted xtals on 3 chan). Tel Derby 880610.

Valradio dc/ac transverter. 24V dc input, 240V ac. Square wave output, 50Hz, ½kW loading. Suits most amateur gear, electronic equipment, TVs, tools etc. Would now cost £160 new. New cond, sale at £50. G3TPX, QTHR. Tel Darton 2517 (evenings).

Property late GM6IS KW2000B ac psu; Shure 201 mic; phones, swr meter, £220 ono, plus carriage. Offers for Avo signal generator; Halifcrafters panoramic adaptor, BC221. GM3DOD, QTHR. Tel 0475 23742.

Heathkit power supply for HW32A unused original packing. Tyabji. Tel 01-229 4740.

KW2000A plus ac psu, £140. G3VJD, QTHR.

Heath GR78 rx, superb, factory vetted, £82. *Wanted:* Wartime utility domestic radio. G3AOS, QTHR. Tel 061-908 2415.

AR88 with matching spkr and S-meter in good cond, and working order, few spare valves, £40. Would consider swop for smaller rx. T. Prince, 377 Meadow Lane, Oxford. Tel 21810.

Xtals HC18U 2-pin 36·275, 48·375 for repeater chans 4/5 input, £1·60 each, incl. Also 12W AMTX2 deck with HC6U 8,002, 8,035·41, 8,055·56, 8,063·888, 8,070, FT243, 8,006·667, 8,073·33, 8,075, 8,025, 8,106·667 nil psu. Shure mic, £15. *Wanted:* TC7 rx circuit. G2BPC, QTHR.

KW2000A Q-mult ac power supply, good cond, £140. Help with delivery. G3JVJ, QTHR.

Bird 43 Thruline power meter, new, comp with type "N" female sockets, £40. Also Hewlett Packard counter, dc to 220MHz, £40 (large valve model). Buyer collects, Also Pye a.m. boot Cambridge model for 2m less xtals, £20 + p & p. G8BYL, QTHR.

TA33jnr and RCA rotator plus 150ft 5-way cable, £25. Homebrew linear 4x6HF5s inc self-contained power supply 180m-10m, £35. G3BIC, QTHR.

HW17A tx/rx perfect cond. Offers. GMVXR, 48 Crawford St, Motherwell, Lanarks ML1 3AF. Tel 65443.

Pye Cambridge G8GTP handbook of modifications, a.m. or nbfm, tunable rx, tone burst generator S-meter, output meter and others. A few copies still left, 50p post paid. G8HWR, 11 The Square, Boothfold, Waterfoot, Rossendale, Lancashire.

Comp station home built phasing ssb hf tx psu atu 400W linear self-contained 160m a.m./cw tx in 19in enclosed rack with fan CR100 rx, would sell rx separately otherwise no split, £75 ono. Buyer must collect. G3NPF, QTHR.

Exchange Thorens TD150ABII turntable with SME 3009II arm for 2m gear (especially ssb) or 10MHz scope. Why? G8JAI, Beckgatehead, Barbon, via Carnforth. Tel Barbon 276 after 7pm.

KW2000A comp with ac psu, Shure mic and manual. One previous owner and in really exc cond, £145. G4AQZ, QTHR. Tel 025-584 632 after 6pm.

Cossor 1058 single beam oscilloscope, £10. BC221 frequency meter complete charts and external power supply, one owner only vgc and wkg order, £25 both items. Marconi Instruments TF2201 oscilloscope 30MHz double beam calibrated voltage and time measurement comp with probes and instruction manuals, vgc and wkg order, £100. Buyer collects, New Malden, Surrey. G8DFT. Tel 01-942 1230 after 5pm.

Echelcomm 2m converter, i.f. 4-6MHz, £7.50. 8-element 2m beam slightly damaged £1.50. *Wanted:* Morse key, 50Ω dummy load, HSC morse record(s). Calder, 36 Gartshore Crescent, Twechar, Kilsyth, Glasgow G65 9SX. Tel Kilsyth 821967 after 5pm.

G2DAF tx, and rx with PSUs, £50. BC221, £12. Radivet 211, £10. HRO 5T, £20. HROMX, £10. ME11B swr, £6. EK9X key, £7. EK108A key, £25. Class D, £6. Mobile 160m tx/rx ant and psu, £10. G3RCU, QTHR. Tel. 09367 4117.

Lucas 11AC alternator kit comp and ready to install, list price over £40, accept £30. Pye 25W Ranger comp, cables, cradle, manual, £25 ono. G8DXD, QTHR.

NCX-3 tx/rx 20-40-80, 200W p.e.p. input, with psu/spkr and step-down xformer, good cond, £60. G3ZQC, QTHR. Tel Fair Oak 4367.

Panda PR120V tx vgc, £15. Hartley 13A oscilloscope all leads probe and manual, £20, both carr extra or collect. G3PJN, QTHR. Tel Chesterfield 6040 after 6pm.

Mod a.m./fm QQV06/40A cct dia, £5. Digital clock, rack mounted, mains powered, xtal controlled, £4.50. QY4-250 new, £10. Also valves, xtals, thyristors. All bequeathed to club so *all* funds to South Dorset Radio Society. Sae for list, treasurer, G3VPF, QTHR.

Liner 2, 4-months old, fitted with PA3 pre-amp, highest offer secures. G3XVF, QTHR. Tel Norwich 56782.

Katsumi EK9X keyer hardly used, £5. Microwave Modules dual output 2m preamp, £5. Wallis, 30 Parkstone Ave, Newcastle, Staffs.

Transformers ideal ssb generators, 25,000/600Ω ±3dB 300c/s-5kc/s, 50p each, post 15p. Or swap acoustical SL15 spkrs cash adjustment. Manuals for TSW10, TTD20, CR150/6, 75p. G3BIE, QTHR.

Xtals 98·0278, 98·2222, 98·6111, 100·2639, 100·4583, 100·6528, 100·8472, 102·2923, 102·6163, 103·2642, 104·3980, 105·3699MHz HC18U. Bird elements 1W 150-250MHz. 1W 425-850MHz. 5W 50-125MHz. 10W 50-125MHz. £5 each. Also Bird sockets "N" female and "C" male, 50p. G8BYL, QTHR.

EA12, £130. IC20 fitted nine channels, 5/8-wave G-Whip, £95. Speech processor, £5. 12V dc PSUs, sae details. G5RP, QTHR. Tel East Hendred 384.

2m Pye Ranger tx/rx mains psu QQV03/20 pa with tx xtal, rx with xtals for 145·00MHz, £10. Buyer collects. G8ICF, QTHR. Tel Burgh Heath 54656.

For G3TTG who is re-equipping. Gonset tx/rx 80m-6m inc. 120W cw 90W a.m. double superhet rx, spare PAs and h/book, excellent cond, £60 ono. G3JSY, QTHR. Tel St Austell 3827.

Bargain? Hy-gain 10-15-20 beam and CDR rotator, £75. 30ft tower (3 sections), £35; or £100 the lot. Snag? Buyer dismantles and removes (Oswestry). G2YS, QTHR. Tel 76864.

2m xtals 144·03, ·25, ·39, ·45, ·60, ·64, ·65, ·87, ·91, ·95, 145·16, ·22, ·26, ·56, ·67, ·75, 4m xtal 70·02, ·16, ·22, ·35, ·38, ·47, ·50, ·55, ·61, ·66. All 85p each. G8APB, QTHR. Tel 0634 74641 evenings.

Xtals 2m, 4m, FT243 and 10XJ, some repeater frequencies, £1; stamp for list. UHF transistors BF378 FT. 2·3GHz, N.F. 2·5dB at 500MHz, £1.25. G. Elliott, "Oatlands", Southend Road, Howe Green, Chelmsford CM2 7TD. Tel Chelmsford 71604.

HW32 20m tx/rx offers or will exchange for HW12. HW7 QRP rig, built-in xtal marker, £25. T28 rough no case needs two tuning slugs otherwise ok, £5. Why? G3XOV, QTHR. Tel Kingswinford 79104.

Going QRT clearing shack HW30 tx/rx, £18.50. HRO plus coils, power supply, £18.50. Stolle rotator, 2m 4/4 aerial and pole, £23. 2m converter, £5. Valve power supply, £6. Marker generator, £5. Set of VHF Magazines, £3. List from G8ERF, QTHR.

Trio 9R59DS rx, mint cond, with SP5DS spkr, fitted stabilizer, calibrator, 1MHz xtal, cathode follower, reason for selling, FT101B, £42. Creed 7B printer, without silence cover, in wkg order, £8. G4CFA, QTHR. Tel Formby 77920.

Dash mounting Pye Cambridge 2m rx tunable, £24. 70cm 4CX250 linear amplifier and power supply, less blower, £10. G8CQE, QTHR. Tel 01-656 5285.

FT75 FP75 DC75 FV50B eight xtals going vhf. *Wanted:* ATV info and equipment. G3BKL, QTHR.

70MHz converter, 28MHz i.f., £5. 240V voltstat, £5. *SW Mag* 1962-69, £8. HC6U 19·2666 ($\times 6 + 28 = 144$), £1.50. FT243 7,275, 7,300, 7,800, 7,825, 7,840, 7,850, 7,875, 8,003, 8,061, 8,068, 8,107, 60p. 2N3055(10). 15p. Postage extra. G3OHC QTHR. Tel 021-308 2512.

Pye base station rx IAM10F, converted, varicap tuned with 4 push-button channel facility over 2m, professionally finished, new front panel, S-meter, tape, phones sockets. Perfect wkg order, £25. *Wanted:* FRDX400, mint cond. D. S. Marshall, "Shelwyn", Nut Orchard, Twyning, Glos. (Tewkesbury 294082).

Microwave Modules 2m tx with matching rx built into wooden cabinet with ls etc, tx freqs 145, 145·1, 145·25, rx tunable, one year old only, sae. Details or call weekends, £60. G4HU, QTHR.

Storno Viscount operational on 145·5, Antec 5/8 whip, £26. Macklin. Tel Bracknell 3111, ext 219.

AT5 with h/b mains psu, £15. H/b cw tx (Geloso vfo) with most psu components, £8. CR100, £12. 650 radio magazines 1947/74, mainly *Bull, Radcom, SWM*, 1p to 10p each or £12 lot. Buyers collect. G3IQF, QTHR. Tel Marlow 6421.

4½ digit nixie display, drivers, part strobe, £4. 9999·9 mains hour meter, £1.50. 0-9 push button keyboard, £1. Weston standard cell, 1·01860V, new, £2. CRT character generator ic, data, £1. All post free. Mann, 45 Old School Lane, Milton, Cambridge.

VHF a.m. Pye base station, comp, unmodified tx, rx, psu, control box, and mic, suitable 2m conversion, £40. G3OMK, QTHR. Tel Loughboro' 61778.

Mosley Superb Elan 10/15 3-element beam, 2kW traps, exc performance, £20. ZYG1 20m beam (*Radcom* July '73) comp, offers. Martin, "Eastcote", Mill Lane, Cleeve Prior, Evesham, Worcs. Tel Bidford on Avon 2781.

Minimitter Mercury 150W tx A3/F3/cw 80-10m, good cond, plus handbook and hb atu, £25. Buyer collect. G2RL, QTHR. Tel High Wycombe 23176.

2m Storno fixed station CQF13c-14 with control box aligned on 144·48MHz, £25. 4m Storno Viscount mobile CQM19-25 with control box aligned on 70·48MHz, £15. Both vgc. G3PQC, QTHR. Tel F'boro 44268.

FT101 Mk 1 mint, £220. PW tri-colour disco lighting stereo units, 300W-900W per channel, zero voltage switching (T.I. design), £50. Pair 813s used but ok, £10. Heath SW717G sw rx built, new, offers. L. E. Howes. Tel 01-634 4292 or Ware 870010.

Must lose DX100 or wife. Will sell DX100, partly revalved, or swop for AT5 plus control unit, etc. Could deliver ? Ray. Tel 01-337 9210.

CR70A and spkr and ex-service phones, 12 months old, mint cond, used only when home-brew packs up, offers around £22 including post and packing. A. D. Cann, 14 Falmouth Road, Truro, Cornwall.

FL50B/FR50B, £100. 18AVT/WB HyGain vertical aerial, £35. R107 rx, £5. PTC 114 tx/rx for 4m (less crystals), £10. G4CBE, QTHR. Tel St Albans 55542.

American Heath Pawnee HW-20 2m tx/rx tunable 144-148MHz, built-in vfo or xtal, ac/dc psu, £58. Heath RF-1U sig gen, £15. *Want:* OS-2 scope, 38·666 xtal. G4AFY 37 Cairndhu Nr. Kidderminster, Worcs. Tel 63358.

Telford TC9 2m tx mixer vfo 144-146MHz. Comp. with 144·9 xtal, mic etc, will transmit a.m./fm/cw, £55. Poulter, 279 Aragon Road, Morden ,Surrey. Tel 01-337 0117.

Pye CAT gen cov rx, 60kHz-31MHz in 8 ranges, exc cond, with psu and spkr, handbook, leads etc, £80. *Wanted:* KW Supermatch and KW Monitorscope in mint cond (would consider exchange for above). Phipps, 47 Dean Road, Hinckley. Tel 36811.

FT200 mint cond, few hours use, home made power supply available, £120 or near offer. Tel Windsor 60695 after 6pm.

G2DAF tx power supply, professionally built, £40. 2m tx, rx, converters. 70cm tx, converters, cavity linear, varactor tripler, valve tripler amp. 2m and 70cm aerials. TV camera, control unit, monitor, modulators. SAE list. G3KHU, QTHR. Tel Plymouth 43426.

Equipment of the late GM3FXM. KW Victor, Eddystone 750, rx, spkr, S-meter. HRO rx coils and pwr supply. BC221. Radiovision preselector. Eddystone bug key. GM3PFQ, QTHR.

Heath ATU with lpf, handles 75/100W, useful longwire hf aerial NFD portable etc, weight 2lb, handbook, exc cond, £4. Several Pye Westminster 10·7MHz a.m./i.f. boards 12·5kHz, £6 each. Also other filters 50dB, 90dB, sae details. G2BPC, QTHR.

Three communications rxs. Eddystone S504 580kHz—30·5MHz 10 valve, £15. Marconi CR300 15kHz-25MHz, £10. Collins TCS 1·5MHz-12MHz, £6. Or offers. Mains 3kV 1kW conservative rating, £6. Philpotts G2DAF cabinet black enamel blank chassis, £5. GM8CJW, QTHR. Tel (0324) 26367.

Aluminium 46in parabola, 23cm feed, 3cm test kit 30, includes waveguide, bends, attenuators, klystron generator type 154 includes wavemeter etc. Offers? 23cm microstrip converter, £15. Mains isolation transformer, £5. 200 miniature valves, £4, carriage extra. G8ACE, QTHR Tel 0763-41164.

Pair new unused 6KD6s, £3. EK9X electronic keyer, £5. *Wanted:* Geloso vfo type G4/L05 with all xtals, also good hand key Junkers or ex-RAF type "D" ref L0D/7373 in new cond and with cover. G3JFC, QTHR. Tel Crayford 22489.

SOKA 747 similar FTDX560, no mods, mint, in orig box, perfect, all gen inc Sentinel converter for 2m, £195. Lumenition infra red ign suit Ford. A11 info. G3ZLH. Tel 0691-5730 evngs and wkends.

Tannoy amplifier 130W plus audio (measured), rack, other units. TW12L tx (unused). W2040 hailer. Mullard master bridge. American 2,000V transformer O/F capacitors. 60W resistors. Transmitting and receiving valves. H/R headphones. Other items, mostly small. G5RM, QTHR.

Manuals, £1 each: TM11-669 transients and waveforms, AM10B, PTC2207, PTC6/2207V, Collins 30K, 75A2, National NC-127, Tacan Sturn-3, magslips tx AP6550 rx AP6549, £2.50 each. Set FT241A xtals channels 0-79, offers. Collins 70E2 and 70E3 PTO, £2.50 each. G6ZH, QTHR. Tel Banwell 2119.

Trio 9R59DS with spkr, Pye base station 20W a.m. on 2m, Sentinel 2m to 2-4MHz converter, 4-el 2m Jaybeam, offers. A. Fyfe, 11 Buxton Road, Weymouth, Dorset DT4 9PF.

HW100 and psu, Z-match filter, also other equipment. G3XYD, QTHR. Tel Watford 43516.

Redifon GR286 marine a.m./f.m vhf tx/rx, private deck, good cond, delivery inclusive 200 miles, £25. 1·4MHz ssb xtal filters usb and lsb available, £8. Valves comp with bases 6HF5, £1.75. 5B254/M, £1.50. G3JMJ, QTHR. Tel 073-271 3467.

Q-mult QPM-16, £5. Electroniques QP166, 898 dial, 100kHz cal, Brookes xtal, £16. I.F./AF unit, £3. Coaxial aerial relay, £1.50. FL-8-A, 75p. Xtals: 5500, FT243, with base, 60p; 16000, 19500, FT243, fundamental, Cathodeon, £1.25 each. RF-24, £1.25. G2HLU, QTHR. Reading 61622.

Sinclair stereo fm tuner chassis, in case, £4. Inverter psu 12V in 300V 100mA out, £5. VHF coaxial relay with mains psu, £2.50. Strong metal grey cabinet 13in × 7in × 5in containing psu, relay, etc, £1.50. G3PZF, QTHR. Tel St Albans 57665.

Hi-band clearance. Storno CQM 19-25 with control unit, cables and handbook, £15. Pye AM10BV less control unit, £8.50. Carriage extra, Many smaller items. SAE list. GW3EJR, QTHR.

GR78 rx overhauled Heathkit 1973 good cond 240/12V 190kHz 30MHz six bands bandspread calibrator ceramic i.f.s a.m./cw/ssb, avc S-meter muting n/l, receive/standby switch whip and external aerial, £50 ono. Reasonable delivery. Bruce, 437 Helmshore Road, Rossendale, Lancs. Tel 4620.

Pye Vanguard PTB25AM xtals 145·00 and 145·50, all cables, mic, spkr, handbook, and ¼ whip, £30. Hallicrafter SX110 rx, gen cov 0·538-34MHz, bandspread on 80, 40, 20 and 10m, xtal filter, S-meter, a.m./cw, £30. Top band tx 10W with modulator, £7.50. G8AMN, QTHR. Tel Oadby 71-4786.

TV camera, Ness, Japan, ⅔in Nidicon, 625-line, two lenses on four lens turret, comp with 9in video monitor, all solid state, £90 ono. Will exchange for Propo four-channel rc system. Tel Hatfield 65356 after 6pm.

1·4MHz ssb xtal filter plus carrier xtal (HC 6U) with data, £9. New guaranteed valves; 6/40A (10), £4; 3/20A (11), £3; 4CX250B (14), £4; 829B (3), £3; 6146 (2), £1.50, each. Ex-equip guaranteed: 6/40A, £2; 3/20A, £1.50; 4CX250B, £2; several of each. G8CYN/G4BEW, QTHR.

Potted mains transformer with conservative rated secondaries 330-0-330V 80mA 6·3V 3·2A 6·3V 1·4A 5V 2A, £2.50. Potted If choke 10H 120mA, £1.50. Carriage included in prices. SAE with enquiries. Hayward, "Sunnyfields", Lighthouse Road, St Margarets Bay, near Dover, Kent.

KW E-Zee match. £10. Burns FMD-1, unused, £5. Heathkit HM-102, as new, £10. Lowe pulser, unused, £2. All carriage extra at cost. G2BVN, QTHR.

Heathkit 10-18U oscilloscope exc cond, £28. Hart, 52 Glenthorne Avenue, Croydon CRO 7EY. Tel 01-656 5564 evenings.

"Radio Communication" and "RSGB Bulletin" 8 Vols Jan '66 to Dec '73. *Short Wave Magazine* 8 Vols Mar '66 to Feb '74. *Practical Wireless* 8 Vols May '66 to April '74. *Radio Construction* Vols 22, 23, 25, 26. Buyer collects. Offers. Tel 01-571 1443.

Trio 9R-59DS, mint cond, in original packing, only used twice, built-in voltage regulator, full manuals included, only £42. Gibson, 3 Suffolk Road, Middlesborough. Tel 822556.

Microwave Modules 144MHz converter, just returned from makers check, 28-30MHz i.f., £10. GW8NP, QTHR. Tel Cardiff 0222 68768.

Drake R4B rx, exc cond, £155. G3FKM, QTHR. Tel 021 4293200.

Creed 54 teleprinter, fitted punch, comp with metal desk and power supply, all wkg, £30 or offer. Buyer collects. TTL terminal unit, £5. (Emigrating). G3NBU, QTHR. Tel 073529 Burghfield Common 2257.

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Bright emitters, one dozen, £3 each offered, preferably "R" type. Also a Chakkaphone, Cosmos, Levis or BSA rx, excellent price. Require bound *WW* for years 1918-9 1920-1 and 22. Neale, 11 Pine Drive, Wokingham, Berks. Tel Eversley 732626.

AR88D in original cond, preferably comp with manual and trimming tools. Details and price. G3GUU, QTHR.

E-Zee Z match or other atu, also HC6U 8·075 xtal. Thornton, 26 Stagbury Avenue, Coulsdon, Surrey CR3 3PD. Tel Downland (073 75) 54130.

Heathkit ssb adaptor SB-10U any cond with or without manual, or manual only. For sale or exchange. WHY ? KW160 top band tx as new unmodified with circuit and instruction leaflet. Homewood, 73 Hughenden Rd, Hastings TN34 3TF.

Inexpensive 2m station required by schoolboy of limited means. An hf tx is available for use with a converter if required. Peel, Bankwood, Hathersage, Sheffield S30 1BJ Tel Hathersage 394.

G2DAF tx and rx. G4CTU, 12 Parkland Avenue, Kidderminster, Worcs. Tel 3966.

Semi-auto bug key vibroplex etc. Must be in good cond. Please state price. G3FYR, QTHR.

QST pre-1940. G5RI, QTHR. Tel 0434 3100.

70cm valve converter. 2m transistor converter. Mains transformer 400-500V. Audio op/t 100W. G3OWB, QTHR. Tel Cambridge 59127.

KW Atlanta with psu, £125. Duette dual control unit 240V input 12/16 dc output, 2A output, good cond. D. Plant, 13 Highfield, Elton, Chester. Tel Thorton-le-Moors 433.

Manual or handbook for Cossor oscilloscope model CT52. Will buy or can photocopy and return immediately. Unable to achieve results through normal channels, would greatly appreciate help. Will pay postage. G3VTD, QTHR. Tel 0977 73674 (evenings).

KVG XF-9A and sideband xtals 11·00MHz fundamental 25·00, 32·00, 32·50, 33·00MHz 3rd overtone, 6146 + base 12BY7, transistors etc for G3LUB Cumbrian (*Wireless World* Jun-Sept 1972). G3UYC, 11 Fosseway Close, Colerne, Chippenham, Wilts. Tel 022-121 2781.

Pye low band base station, solid state rx, working 4m, £30. Pair Heathkit SSU-1 spkr units and 10 + 10W stereo amp/pre-amp, £25 ono. Beattie, "Mayerin", Churchway, Stone, Aylesbury, Bucks. Tel Stone (0296-74) 354.

Minimitter TOP-2-7 3-band, must be good cond and fair price. G3XRH, QTHR.

Wanted to swop, my 2-4MHz 2m converter by Solid State Modules for similar with i.f. 28-30MHz. J. Deasington, 17A Westbury Park, Bristol BS6 7JA. Tel Bristol (0272) 32065 (evenings).

HRO S-meter, not carrier level indicator, in new cond. G. Rhodes, 23 Whitby Ave, Brentwood, Essex.

RAFARS offers up to £20 for multi-band vertical 18AVT or equal in good cond without feeder cable. Offers to HQ RAFARS, RAF Locking, Weston-super-Mare, Avon, BS24 7AA. Tel Banwell 2131, ext 206 during working hours.

Mullard 20W amplifier built strictly to Mullard specification published in "*Circuits for audio amplifiers*" 1959. G3THY, QTHR. Tel 01-551 1467.

SSB tx £40-£50. Prefer part exchange for following: Wasp enlarger twin condensers. 35mm to 2¼in², 2in and 3in lens, Smith timer, two tanks, 12 + 10 dryer/glazer, value £20. G3TLI, QTHR. Tel Hornsea 2588.

Urgently! Comp tv station or individual items (cameras etc) (*not* sstv), please write or phone stating prices. G4BKM, QTHR. Tel 01-892 7641.

KW600 or 1000 linear amplifier, please state price and approx age or year of manufacture for the KW1000 linear amplifier. G3SUU, QTHR.

Eddystone EC10 rx. Valves QY4 250, QY4 400, QY3 125 etc. Mechanical filters 455kHz and 9MHz with carrier crystals. 50Ω and 300Ω non-inductive high wattage resistors. G3ZTK, QTHR.

AKG D900 "Gun" Mic or similar, Sennheiser etc. Dolby "B" noise reduction unit, also handbook for EMI RE301/TR52 series tape recorders. Please give any details and price required. G8HMF, QTHR.

Dual trace plug-in amp type CX1252 for Solartron oscilloscope CD1212. G3YPS, QTHR.

SSB tx, would prefer G2DAF type. *Ham Radio Magazines* also. G8FPT, QTHR. Tel 01-504 4942.

Transistors AFY10 or AFY11. Also 4m Cambridge. G3XBP, QTHR. Tel Marlow 3186.

HW22 40m single bander with or without ac psu. Kind, 20 Kent Road, Harrogate, Yorks HG1 2LF. Tel 0423 61597.

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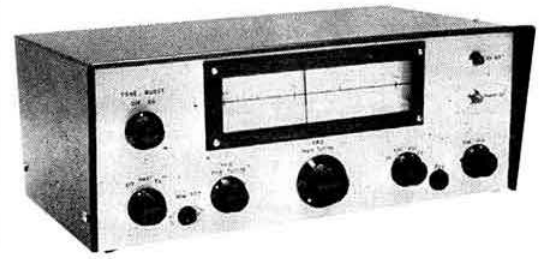

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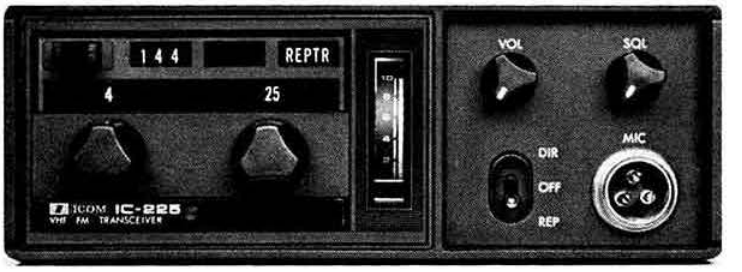

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SWAN ELECTRONICS (USA)

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The SWAN 700CX is the latest from a long line of successful SSB transceivers to roll off the production line in California. Capable of more than 700 watts p.e.p. on 80 to 10 metres, here in one package is all the dynamic performance needed to punch through the QRM without the additional expense of a linear amplifier. Cross-modulation and front end overload are a thing of the past and with the famous Swan 8 pole 2.7kHz crystal filter installed you have that crisp clear voice quality for so long the hallmark of Swan engineering. Among the many standard features included in the 700CX are ★ Automatic level control ★ Fast attack AGC with controlled decay ★ CW sidetone ★ Selectable sideband ★ Velvet smooth dual ratio planetary tuning ★ S-metre ★ Extra wide range "Pi" antenna coupler ★ 25/100kHz calibrator ★ carrier suppression in excess of 60dB ★ unwanted sideband suppression in excess of 50dB.

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DEAR OM

Early in December we shall be moving into new and larger premises. As well as our own large car park, we will have more staff to assist you whether it be amateur equipment or hi-fi. Our address is as below.

Thank you for your custom during 1974 and we should like to take this opportunity to wish all readers a very happy Christmas.

Kind regards,
Peter Waters G3OJV,
Jeff Stanton

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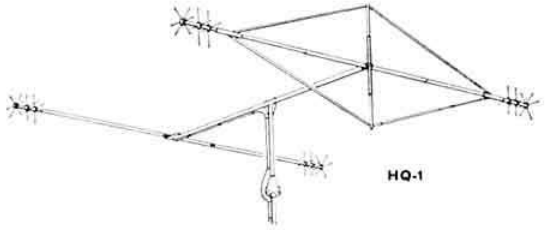
700 WATTS PEP 80-10 METRES SSB CW AM FIXED-MOBILE-PORTABLE

SWAN'S CRISP CLEAR VOICE QUALITY FOR THAT DISTINCTIVE SIGNAL

FABULOUS MINI-BEAM BRINGS DX OPPORTUNITIES TO EVEN THE SMALLEST GARDEN



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NO ATU NEEDED HUNDREDS IN USE

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SPA ROAD, HOCKLEY, ESSEX Tel. 03704 6835

NEW! Universal R.F. Speech Clipper

INCREASES 'TALK POWER' — ELIMINATES 'FLAT TOPPING'

Easy to install — long battery life

- ★ **Simply connect in series with your microphone lead. Needs no internal connections to your transmitter. Push-to-talk facilities are retained.**
- ★ **Can give increased "punch" or "talk power" comparable to a times-ten power increase, plus improved speech characteristics**
- ★ **Ideal for SSB, AM, or FM.**
- ★ **Advanced circuit uses optimised combination of digital and analogue techniques for long-term reliability and stability.**
- ★ **Seven integrated circuits, one transistor, three diodes.**

£45 + VAT

See August Rad. Comm. for a review of this equipment

DESCRIPTION: The Datong R.F. Clipper brings the unique benefits of rf clipping to any conventional transmitter. It should not be confused with agc-type speech compressors or af clippers. The Datong R F. Clipper is a complete closed-circuit ssb transmitter and receiver. Amplitude clipping of the internally generated ssb signal (at 60kHz) greatly increases the average-to-peak amplitude ratio of the speech input signal. This is achieved without harmonic distortion.

Price, including delivery by parcel post, only £45 plus VAT. Add 43p for delivery by registered first class mail.

Write or phone for full information, including a copy of the installation and operating instructions.

SOLD OUT AT LEICESTER!

We wish to apologise to those of you who arrived at the Leicester Exhibition on the Saturday afternoon to find that we had already sold all of the considerable stocks which we had brought with us. However, our normal stock situation will have been regained by the time this advertisement appears.

We also extend our thanks to the many customers who called in at the stand to tell us how pleased they are with the performance of their Datong Clippers.

DATONG ELECTRONICS LTD.

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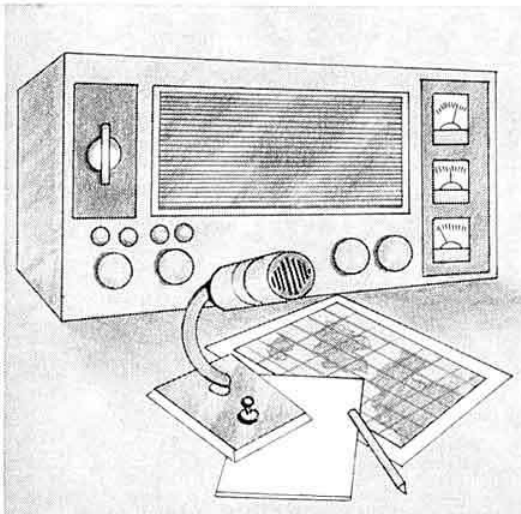

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10 PILGRIM ROAD, DROITWICH, WORCS

We Proudly Announce the QM70 High Power 28/144 Transverter

JUST LOOK AT THE FOLLOWING FEATURES

★ Chassis construction rendering strength and mechanical stability
★ Very attractively finished in cabinet measuring 9½" × 5" × 5" (approx.)
★ Cabinet is of perforated metal all round thus allowing an uninterrupted circulation of cooling air
★ Hybrid solid state/valve circuitry
★ Receive converter uses TWO RF stages (FETs) and a MOSFET mixer. In this way we achieve excellent gain and noise figures. Gain = 30dB. Noise = 3dB
TWO IF outputs from the receive converter for transceive and/or split frequency working
★ Internal solid state master oscillator is zener regulated using a control transistor network for increased stability
★ Antenna change over relay built-in
★ QQV06-40A final linear amplifier running at up to 200 watts input (50% output efficiency)
Accepts drive (28-30MHz up to ½W p.e.p.) in the following modes: A1, A3, A3J and F3.
Front panel contains: Indicator light, PA current meter, mixer tune control, driver tune control, PA tune and load controls.
Rear panel contains: Antenna socket, bias adjust control, 2 × IF output sockets, 28-30MHz input socket.
All drive, switching and power drawn from your ssb transceiver.
Supplied with all necessary plugs for your transceiver.
Unit operates with transceivers having heater voltages of either 12.6v AC or 6·3v AC, but please state transceiver to be used when ordering.
For our other units please see page 721, October *Radio Communication*
Please send large sae for full details of this and all our other products.

PRICE £85.00

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36·2500 in HC6/u (145·0)	**£2.30**	36·3750 in HC6/u (145·5)	**£2.30**
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We are pleased to advise our commercial customers that we are able to supply crystals to most Pye specifications with a fast service available for that Urgent Order: Please write for details or telephone between 5-7pm, ask for Mr Norcliffe.

TERMS: CASH WITH ORDER—SAE WITH ALL ENQUIRIES
MAIL ORDER ONLY
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Tel: 051-677 8918 (until 7.30 pm)

MARK EQUIPMENT

V.H.F. U.H.F. ELECTRONICS

0803 55488 *G8ABP*

Plessey SL600 I.C.s. Brand new. SL610, 11, 12, **£1.75.** SL620, 21, **£2.65.** SL630, **£1.65.** SL640, 41, **£3.25.** SL622, **£6.70.** SL623, **£5.30.**
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KVG 9MHz XF9-B Filter with both carrier crystals & holders. **£24.50**
Coax Relay type 951 12 volt coil, 50 ohm, UR43, 470MHz. **£4.50**
2 Metre Lines Parallel line anode circuit QQV06/40 etc. 8" × ⅜" dia with disc tuning. Anode conn and insulators. Silver plated. **£6.02**
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All prices include VAT and postage.

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ambit international

Ambit specializes in linear technology, TOKO Coils, filters and inductors. And we know more about the devices we sell than any other retailer of electronic components—being actively involved with design and development in consumer and communications applications.
Our new style catalogue is a folder with a series of loose leaf data sheets, that provide up to the minute data and ideas on a whole range of devices. So from one source, you can gather information and ideas from all manufacturers involved in the business of wireless—consumer or communications. The first issue of data sheets cost 30p, and the folder costs 15p all inclusive. The charges are now refundable against purchases—details with the new style folder.

Items included are:
TOKO Ceramic filters. 6 or 8kHz @ 470kHz **45p**
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NE560/1/2/3	**£3.19**	LM38ON	**£1.00**	TBA651	**£1.81**
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Second Hand

NCX 3 £120, HW 32 £60, Trio 9R59 DS £45

VAT included in the price but carriage is extra

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G3ZY Woodhall Spa 52793

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NEW RADIO TELEPHONES. FM or Am. High, low and Marine bands. Catalogue on request.
LINER 2 Add on amplifier module comprising of 40 watts PEP amplifier and preamp for the RX. Extremely simple to use with any liner 2, but could be easily adapted for use with any TX RX requiring more power and better sensitivity.
With RX preamp **£47.42** carriage £1.00
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TIA 6B 400MHz 1 watt output **70p** carriage 5p
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24 way plugs	**40p**	F & E plugs	**45p**
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Normal delivery time within 5 weeks. Subject to Christmas postal delays.

SPECIAL CHRISTMAS AND NEW YEAR OFFER: ALL STOCK CRYSTALS ONLY £2.00 All new 2 metre channels as stock items

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70·26MHz	8·78250MHz	
145·00MHz	4·02777MHz	8·05555MHz
145·125MHz R5	4·03125MHz	8·06250MHz
145·150MHz R6	4·03194MHz	8·05389MHz
145·175MHz R7	4·03264MHz	8·08528MHz
145·500MHz S20	4·04166MHz	8·03333MHz
145·525MHz S21	4·04236MHz	8·03472MHz
145·550MHz S22	4·04306MHz	8·08611MHz
145·575MHz S23	4·04375MHz	8·03750MHz
433·200MHz	8·02222MHz	

RX CRYSTALS

70·26MHz	29·78000MHz	
145·00MHz	44·76666MHz	10·32464MHz
145·725MHz R5	45·00333MHz	10·37643MHz
145·750MHz R6	45·01666MHz	10·37821MHz
145·775MHz R7	45·02500MHz	10·38000MHz
145·500MHz S20	44·93330MHz	10·36036MHz
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Note: All above crystals in HC6/U, 10MHz crystals suitable for Storno Viscount. Rapid delivery service available. Crystals for P. M. R. use can be supplied. Please send S.A.E. for any enquiries and for price quote on any other frequency/specifications. **10% discount on orders of 5 or more crystals.** Add 10p for post and packing on orders under £12.

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C & C ELECTRONICS (REF. C)

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G. W. M. RADIO LTD.

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Terms: Cash with order. **Early closing Wednesday**

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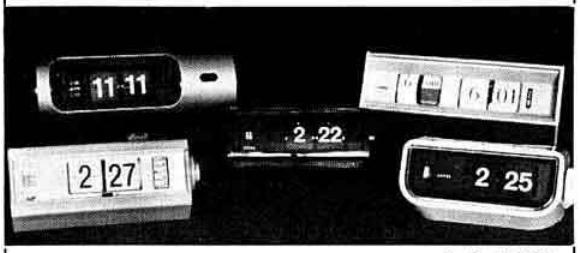

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All clocks tested and sent return post. Full refund if not completely satisfied.

We have the largest stocks but still advise you NOT to leave your Christmas order until the last minute. PLEASE STATE ALTERNATE COLOURS WHERE POSSIBLE.

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A Very Happy Christmas

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THEN IT'S TIME YOU TRIED THE

REVOLUTIONARY NEW DB-3 TRIBANDER

(Patents pending)

THE ANTENNA THAT MANY AMATEURS HAVE LONG BEEN WAITING FOR!

THE DB-3 is a HIGH-QUALITY, 3-ELEMENT YAGI, for operation of the 10, 15 and 20 metre bands. It is based upon the principle of the LOG PERIODIC antenna, and is a mini-version of this antenna, needing NO TRAPS, COILS or STUBS for startling three-band performance.

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LOW, NARROW ANGLES OF RADIATION give low-powered signals that 'Linear Amplifier' type of punch. GOOD F/B RATIOS reduce the QRM, providing outstanding contacts with DX stations. Power fed to the DB-3 is not wasted in traps, etc, but is directed where you want it—AT THE OTHER CHAPS ANTENNA!

JOIN THE DX SET NOW—AT A PRICE YOU CAN AFFORD.

£27.85 ONLY, BRINGS YOU ONE OF TODAYS TOP-PERFORMANCE ANTENNAS.

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