January 1977

radio communication

journal of the Radio Society of Great Britain

AGM PRESENTATIONS

The President, John Allaway, G3FKM, presenting awards at the 50th AGM of the RSGB on 3 December 1976.

Top, l to r: the Gravesend Trophy to the Channel Contest Group; the Whitworth Trophy to D. F. Beattie, G3OZF; the Metcalfe Trophy to R. Treacher, BRS32525.

Centre, l to r: the G2QT Cup Winner's Cup to D. J. Andrews, G3MXJ, who also received the Somerset Trophy; the Frank Hoosen (G3YF) Trophy to a representative of the Mansfield RS; the NFD Shield to the Glenrothes & D ARC who also received the Scottish NFD Trophy—second from right is A. B. Givens, GM3YOR, who received the Maitland Trophy.

Bottom, l to r: the Edgware Trophy to the Verulam ARC; the Col Thomas Rose Bowl to A. J. Slater, G3FXB, who also received the Braaten Trophy; the Bristol Trophy to the Racal ARS.

(More photographs and report on page 50)









RSGB NEWS BULLETIN SERVICE

The RSGB news bulletin, callsign GB2RS, is broadcast every Sunday morning on hf and vhf, giving almost complete coverage of the British Isles. Its main purpose is to provide an outlet for amateur radio news items and announcements which, by virtue of their topicality or urgency, cannot wait for the next issue of *Radio Communication*.

The bulletin is prepared early on Thursday morning, and news items, marked "GB2RS news" should reach RSGB HQ by first post that day (telephoned items can also be accepted until 10am). No guarantee can be given of inclusion in part or whole of any item submitted and, once broadcast, items are not usually repeated.

SCHEDULE

Time	MHz	Location and coverage (hf) or beam heading (vhf) of station
0930	3·65	G2MI, Bromley, Kent (SE England)
1000	3·65	G8ML, Cheltenham (SW England)
	144·50	GM3UAG, Ellon, Aberdeenshire (NNW)
	144·50	G8GGK, Croydon, Surrey (NE)
1015	3·65	GI3GAL, Belfast (N Ireland)
	144·50	GI3TLT, Bangor, Co Down (N)
1030	3·65	G2CVV, Derby (N Midlands)
	144·50	G4DCH, Burnham-on-Sea (NW)
	144·50	GM3UAG, Ellon, Aberdeenshire (SW)
	144·50	G3PWJ, Brierley Hill (NW)
1045	144·50	G8CDP, Middlesbrough (NW)
	144·50	G8GGK, Croydon, Surrey (SW)
	144·50	G8BHQ, Stockport (NNW)
1100	3·65	G5VO, Bridlington (NE England)
1115	3·65	G3LEQ, Knutsford (NW England)
1130	3·65	GM3EHI, Bellshill, Lanarkshire (S Scotland)
1145	3·65	GM3HGA, Aberdeen (NE Scotland)

An rtty news bulletin, callsign GB2ATG, is also transmitted every Sunday at 1200 on 3·590MHz and at 1230 and 1245 on 144·6MHz. This bulletin carries items of interest to rtty enthusiasts.

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CONTENTS

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ABC
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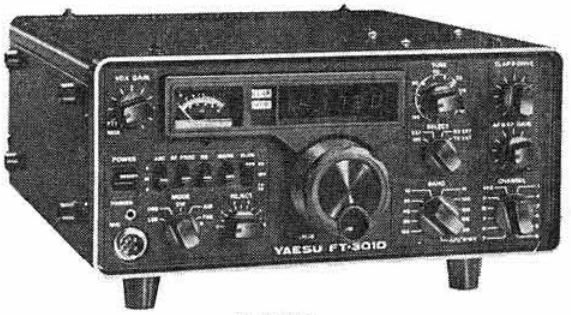
Closing date for contributions unless otherwise notified: 4th of month preceding month of publication.

Advertising, other than Members' Ads, should be sent to the above address marked for the attention of Mr C. C. Lindsay. Tel 01-686 5839 (ADVERTISING ONLY).

YAESU MUSEN

FT301 SOLID STATE HF GOLD



FT310D

YAESU's state of the art fully modular plug in board, all solid state, top to ten transceiver, with RF processor and rejection control. Bandpass tuning, with wideband PA provides single knob transceiver resonance. 4 models, 10 or 100W output, analogue or large digital readout, external VFO, monitor scope, 2 A.C. P.S.U.'s, etc.

FT301 FEATURES

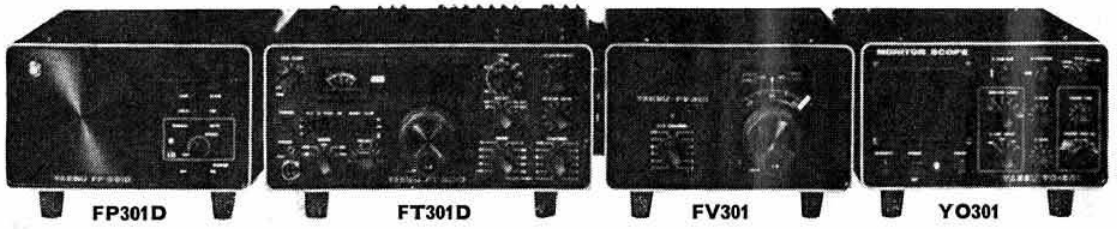
160-10 metre inclusive coverage
Multi mode USB-LSB-CW-AM-FSK
12VDC (234V with FP301)
11½" (14") × 5" × 11½", 22 lb
Silky smooth VFO drive
Readout to 100Hz (digital)
11 fix channels per band Seg
Semi break in with sidetone
4 models—100/10 DIG/analogue
RX on M.S.F. (5MHz) and CB
Front panel microphone gain
R.F. derived feedback circuit
Rejection tuning (I.F. passband)
RF speech processor
Adjustable carrier level
Adjustable 3 position A.G.C.
Clarifier (IRT with RT and TT)
600Hz, 2·4kHz, 6kHz bandwidths
Triple PA protection circuit
100kHz crystal calibrator
Switchable noise blanker

FT301 SPECIFICATIONS

Frequency range
160-10 metres
M.S.F. and CB receive
Modes
USB, LSB, CW, AM, FSK
Frequency stability
>100Hz/½H (A.W.U.)
<100Hz for 10% line change
Backlash
50Hz
Antenna impedance
50 ohms, nominal
Power requirements
234V AC with FP301
13·5V DC 1·1A RX 21A TX

Sensitivity
0·25μV for 10dB N + S/N at 14MHz
Selectivity
SSB 2·4kHz at 6dB (1·67:1SF)
AM* 6kHz at 6dB (2:1SF)
CW* 600Hz at 6dB (2:1SF)
FSK as SSB
Spurious responses
Image > −50dB
Internal spurious <1μV
Audio output
3W (int. and ext. speaker)
Audio distortion
<10% at 3W output

Input power
>200W PIP A3j
>200W DC A1 (50% duty)
>50W A3 and F1
Audio response
0·3-2·7kHz ±3dB
Carrier suppression
> −40dB
Sideband suppression
> −50dB
Spurious radiation
> −40dB
Dimensions
11½" (14") × 5" × 11½", 22lb



FP301D FT301D FV301 YO301

YAESU MUSEN

LINE SOLID STATE VHF FT221R

YAESU's state of the art, fully modular, plug in board, multimode, 2 meter transceiver renders over the board "rats nest" wiring obsolete. A 134MHz, VCO, automatic varicap tuning of transmitter and receiver, gives you an exceedingly clean signal, and a sensitive receiver. Having outstanding strong signal handling capabilities.

FT221R

FT221R FEATURES

144-148MHz inclusive coverage
Multi mode AM-FM-USB-LSB-CW
234V AC or 12VDC working
11½" (14") × 5" × 11½", and 22lb
Dual speed smooth VFO drive
Readout to better than 1kHz
44 fix channels (4 × 11) (2MHz)
Semi break-in with sidetone
Unique automatic tone burst
P.T.T. microphone supplied
Front panel adjustable VOX
Front panel microphone gain
ALC external phono socket
70W dissipation PA device
600kHz and another repeat shift
"S"/centre zero/output meter
Clarifier (IRT with RT + TT)
2·4kHz SSB 12kHz FM bandwidth
Adjustable sensitive squelch
100kHz crystal calibrator
Switchable noise blanker

FT221R SPECIFICATIONS

Frequency range
144-148MHz
600kHz and another shift

Modes
USB, LSB, CW, AM

Frequency stability
>100Hz 1½H (A.W.U).
<100Hz for 10% line change

Backlash
>50Hz

Antenna impedance
50 ohms unbalanced

Power requirements
234V AC 30W RX, 90W TX
12V DC 0·6A RX, 3A TX

Sensitivity
0·5μV for 10dB S/N at 145MHz

Selectivity
SSB 2·4kHz at 6dB (1·7:1 SF
AM as SSB
FM 12kHz at 6dB (2:1 SF)
CW as SSB

Spurious responses
Image > −60dB
Internal spurious <1μV

Audio output
3W (int. and ext. speaker)

Audio Distortion
<10% at 2W output

Output power
>14W PEP A3j
>10W F3, A1
>2·5W A3

Audio response
0·3-2·7kHz ±3dB

Carrier suppression
> −50dB

Sideband suppression
> −50dB

Spurious radiation
> −60dB

Dimensions
11½" (14") × 5" × 11½", 22lb

OUR AGENTS

Amateur Electronics,
508-514 Alum Rock Road,
Alum Rock,
Birmingham B8 3HX

South Midlands Communications Ltd,
S. M. House, Osborne Road,
Totton, Southampton SO4 4DN

Western Electronics (UK) Ltd,
Fairfield Estate,
Louth,
Lincolnshire LN11 0JH

South Midlands

TOTTON (HEAD OFFICE), LEEDS (SMC NORTHERN)

THE MULTI U11 A NEW DIMENSION IN 70 cms F.M.

A unique combination of frequency control by either 23 switchable or 4 instantly selectable auto scanning channels or an external VFO.
Both the Tx deviation and the Rx bandwidth are switchable accommodating 50 or 25kHz spacing. The main dial is channel numbered (e.g. 16 = 433·4, 20 = 433·5 etc.) and is illuminated only when a channel is crystalled up. Two R.F. stages in the receiver provide great sensitivity (0·5μV for 30dB NQ). The use of a band pass first IF (CF 45 MHz) gives high image immunity and low channel crystal drift. Further conversions to 10·7 and 455 prevent IF image whilst providing good pass and skirt selectivity. The transmitter of switchable 10/1W output draws only 2·5 or 1·3A (0·6 or 0·3A Rx) and has a netting of new crystal facility.
Other features include, diode RF switching, R.I.T., "on the air" lamp, PO meter, S meter, AFP reverse polarity protection etc. **With any 8 channels from: SU (0, 8, 12, 16, 18, 20) and RU (0, 2, 4, 6, 10, 14) Only £215 ex-VAT, ex-stock**

DIGITAL 11 now with SCANNER AND CRYSTAL T.B. OPTIONS

The Digital 11 offers complete 5kHz step coverage across 2 meters and now with the Scanner 33, 25kHz channels from 145MHz upwards covered in around 10 seconds. It offers full lock and lockout on all channels. The scanner stops on a required channel for 10 seconds, then unless locked moves on. The bright digital readout comes from 6 seven segment LEDs.

Selectable 10 or 1 watt output for simplex or duplex (up and down shifts), across 144-146 (rx to 149MHz) from a tiny 6½" × 2" × 7⅛". Easily underdash mounted with the supplied mounting bracket, or slipped in place of the broadcast wireless.

For strong handling, and low noise the R.F. mixer, first I.F. (16·9MHz) second mixer (and LO) are all FET's. The front end is tuned by varicaps by the DC output of the P.L.L. with superb selectivity provided by a 15 pole (±8kHz at −6dB ±15kHz at −70dB). Ceramic filter. LED lamps indicate if the P.L.L. is unlocked or the squelch open. The V.C.O. is directly modulated (for exceedingly linear deviation). Unitary 6 circuit block construction (for seviceability and screening). Selective calling socket (mic/LS/PTT etc) on rear panel. **Only £245, Crystal TB £10, Scanner £TBA**

The SMC73 General Coverage Receiver

The SMC73 is an all Solid State, Mains and 12V, communications receiver covering 550kHz to 30MHz in four overlapping ranges. Frequency readout is by two illuminated dials tuned by coaxial spun aluminium knobs, the larger for general coverage, the inner for amateur band (10-80m) band spread (set by use of internal 3·5MHz crystal calibrator).
FET's are employed in the R.F. Amplifier, mixer, VFO and BFO (these latter two stages being fed from independent stabilised supplies) ensuring good sensitivity, stability (electrical and mechanical) dynamic range, (helped by adjustable RF attenuator), and marked freedom from 'pulling' of both the local and beat frequency oscillators.
An internal loudspeaker (but with jacks for 'phones and external speaker), illuminated signal meter, SO239 (UHF) coax. socket and binding posts for antenna, switchable envelope (A.M.) and product detectors (SSB/CW) (provision on switch for possible fitting of FM demodulator), are all features of this exciting new low price receiver.

SMC73 Ex-stock, only £114.50 + VAT

SOLID STATE MOBILE LINEARS (VHF & UHF) FROM KLM & AMPERE

2 meter, SSB/CW/FM, RF sensing with manual override, "Microstripline"
12V D.C. 10W drive
2" × 6·5" × 10" (11") (VAT + 12½%)
(Over 15 different models—S.a.e. details)
PA144/160/BL 145MHz 160W output **£155**

2 or 70 Superb R.F. sensing, excellent bias arrangements, c/w mounting bracket.
12V D.C. 10W drive
2·5" × 5·2" × 7·5" (8·5") (VAT + 12½%)
APB82A 145MHz 80W output **£95.00**
APB57A 433MHz 45W output **£95.00**

Microwave Modules Transverters

From Ten, Six or Two Metres (a '101 etc, a '620B or a '221R).
10W output, balanced Tx mixers, low spurious content, high sensitivity with dynamic range. (VAT + 12½%) (full convertor range stocked S.A.E. details).

MMT144/28 or 50	2 metres	£79.00
MMT432/28 or 50	70 centimetres	£97.00
MMT432/144	Double conversion	£133.00

YAESU CLOCK

Analog clock with automatically advancing 24 hour time zone hour disc giving, at a glance, time in principal cities or time zone. Battery powered, self starting, shock resistant.

QTR24 only **£13.00** (VAT +8%) p & p 30p

COAX RELAYS

12V DC 50 ohm, Silver plated.
Ex stock P. & P. 30p (VAT 8%).
Power crosstalk (at 500MHz)

CX120	50W	35dB	Cable entry	£8.50
CX230	300W	40dB	BNC sockets	£18.25
CX600N	600W	40dB	N sockets	£TBA

COAX SLIDE SWITCHES

Up to: 1kW, 1·5GHz, 0·3dB loss, 1·2:1 VSWR, 50dB isolation, 50 ohm 'N' or 'PL' fittings.
Ex stock P. & P. 30p (VAT + 8%)

TWS120	1 in 2 out Nickel SO239	£4.90
TWS120G	1 in 2 out Gold SO239	£5.90
TWS150G	1 in 5 out Gold SO239	£TBA

KP202

WITH KCP2 CHARGER

The handheld KP202 with its 2W of RF and ½W of audio, immunity to image and IF breakthrough, offers performance to rival all walkie-talkies and many mobile 10W sets. The KP202 is supplied with telescopic whip, leather handle/whip case and F type plug. Accessories include automatic (R channels only) crystal tone burst (£10.00), flexi stubby antenna (£5.75), leather case (£4.75), base charger KCP2 £11.25), set of 10 ni cads (£8.50), F to UHF adapters (£1.45), F plugs, spare whips, spare hods, etc. EX-STOCK IN TOTTON

SIX CHANNELS FITTED S20 and S22 and any 4 of: S0, S21, S23, S24, R3, R4, R5, R6, R7, *only* **£104.75 (+ VAT)**

PLEASE NOTE—THESE PRICES *DO NOT* INCLUDE VAT (12½% or 8%)

Terms: Cash with order, or credit card holders just 'phone in for, if possible, same day despatch. Immediate H.P. available for card owners for amounts up to £225.00. Holders of current U.K. callsigns (where references have been provided) can be speedily cleared, or normal H.P. at competitive rates is available.

BARCLAYCARD

Access

Communications Ltd

AGENTS: ENGLAND, N. IRELAND, SCOTLAND, WALES

YAESU

YAESU MUSEN 2 Year Guarantee, 24 hour Securicor service

WE THINK IT THE BEST NOW IT COSTS LESS!

FT221R

FT221R ONLY £339 (+ VAT)!!

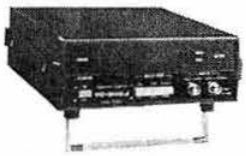
Thanks to our bulk buying policy, we have beaten inflation and the falling pound saving you £22.50 on *last year's* price! As an added bonus all new SMC FT221Rs cover 4MHz and are equipped with 600kHz and 1·6MHz shifts.

YAESU's state of the art, fully modular, plug in board, multimode, 2m transceiver renders over the board 'rats nest' wiring obsolete. A 134MHz, VCO, automatic varicap tuning of transmitter and receiver, gives you an exceedingly clean signal, sensitive receiver combined with good strong signal handling.

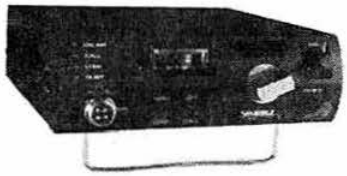
NEW!

YC500

500MHz counters 3 models: 10, 1, 0·02ppm AC and 12V DC, overall 25mV-20V and 50 ohm and 1M ohm inputs.



NEW!



FT223

2m, F.M. 23 channels. 12V DC-10W output c/w tone burst, mic, mounting bracket, smart sensitive and selective.

UNSURPASSED IN ITS CLASS!

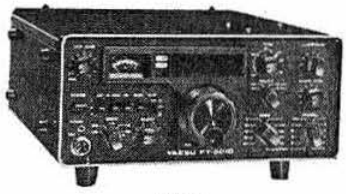
THE FRG7, GENERAL COVERAGE RECEIVER Ex-Stock

The FRG7 is a general coverage solid state receiver with specifications unparalleled in its price range. It uses a Barlow Wadley Triple-mix, drift cancelling loop for continuous, spin-tuned inclusive coverage of ·5 to 30MHz with calibration accuracy better than 5kHz. Frequency selection is accomplished by setting the RF (pre-selector and range switch), dialling up the required number of megahertz, then tuning the VFO knob as normal.

The receiver is sensitive (0·5µV for 10dB, S + N/N (SSB)) and stable (within 500Hz for any 30 minutes after warm up) with A.M., SSB and CW modes catered for. A 3 position audio filter, RF attenuator, dial lamp conservation switch, recorder and phone sockets are fitted. It is mains powered, but should the supply fail, or portable operation be required. 8 dry cells are automatically switched in.

A TRIO OF YAESU WINNERS ALL EX-STOCK IN TOTTON

FT101E
3 MODEL RANGE



FT301
4 MODEL RANGE

FR101
4 MODEL RANGE

BARCLAYCARD

FOR FURTHER INFORMATION ON ANY ITEM SHOWN OR IN OUR EXTENSIVE RANGE, SEND A LARGE SAE (10" × 12") OR 15p IN STAMPS TO RECEIVE OUR STOCK/PRICE LIST, S/HAND LIST, DATA SHEETS, FREE YAESU CATALOGUE, ETC.

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Head Office, Main Showrooms and all Mail Order enquiries to Totton

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SOUTHAMPTON SO4 4DN

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AGENTS (evenings) (ALL QTHR)
Brian Kennedy G3ZUL Droitwich (09057) 4510 **Peter Avill G3TPX,** Darton (022 678) 2517. **Ian McKechnie GM8DOX** Bridge of Allan (078683) 3223. **Howarth Jones GW3TMP,** Pontybodkin (035 287) 846. **Mervyn Anderson GI3WWY,** N.I. Tandragee (0762) 840656.

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YOUR SINGLE STOP SOURCE FOR:—

VERSATOWERS The telescopic, 20ft section, with full tilt over facility permits easy antenna adjustments. The low unit weight and superior design of solid ground post allows easy and cheap installation often without resort to concrete. Beware of false comparisons with other brands. Before buying a mast, we advise you to contact us giving full details. With 18 years experience in the design and manufacture of commercial masts and antennas, which are used from the frozen wastes of Antarctica to the deserts of the Middle East, supplied to Nato, the UN, the Red Cross, the British Antarctic Survey, HM Government and to all continents, in fact, to over 100 countries.

We stock the largest range of masts and antennas in the UK from the Versatower (copied but not equalled) to the products of Belgium, England and Australia detailed below.

ALIMASTS
TELESCOPIC LIGHTWEIGHT

3, 2 or 1·5m. Quick lock sections. Many versions 6 to 21 metres. Rigging extra. Carriage £2. VAT 8%.

7 × 2m	£38.75	6 × 3m	£42.50
4 × 3m	£28.50	7 × 3m	£55.75

HAMTOWERS
SELF-SUPPORTING

Galvanised lattice 10′ sections. Freestanding with climbing steps. Carriage £3.50. Ex-stock 8% VAT.

30′ c/w base grillage	£164.60
40′ c/w base grillage	P.O.A.

TELOMASTS
TELESCOPIC GALVANISED

10′ steel sections c/w guy rings, etc. Carriage £2. Ex-stock VAT 8%.

30′	£22.85 or £41.75 c/w rigging
40′	£29.75 or £53.75 c/w rigging
50′	£37.95 or £69.95 c/w rigging

TELETOWERS
Telescopic Galvanised Lattice and Tube Section. Carriage + 8% extra.

42′	£121.00 (Rigging Kit £28)
57′	£174.00 (Rigging Kit £28)
79′	£224.00 (Rigging kit £48)
101′	£303.00 (Rigging kit £76)

CUSHCRAFT VHF OMNI (Carriage 95p) VAT 12½%

RINGO RANGERS ARX 6dB gain (over ½λ), ultra low angle radiation, excellent 50 ohm match, uses 3 × ½λ in phase and 1/8λ stub. 145MHz version approx 9′ 6″ (&1½lb), 432MHz approx 3′ 6″ (illustrated centre right).

ARX2 Ringo Ranger 145MHz	£21.50	ARX450 Ringo Ranger 432MHz	£21.50
AR2 3dB Ringo Vert	£12.75	ABW144 2m Big Wheel ..	£14.50
AR25 QRO AR2	£15.00	ABW12S ABW harness ..	£7.30
CX1000 29MHz Ringo ..	£25.75	ASQ1 2m Squalo	£11.75

JAYBEAM 70 (4m), 144 (2m), 432 (70) (Car. £1) VAT 12½%

D5/2m 5 over 5 slot feed ..	£9.90	PBM14/2m 14 ele Para ..	£21.00
D8/2m 8 over 8 slot feed ..	£13.40	D8/70 8 over 8 slot feed ..	£11.30
5XY/2m 5 element crossed	£10.30	PBM18/70 18 ele Para ..	£13.75
8XY/2m 8 element crossed ..	£12.90	MBM48/70 48 ele Multi ..	£15.20
10XY/2m 10 element cross ..	£17.75	MBM88/70 88 ele Multi ..	£20.35
5Y/2m 5 element yagi ..	£5.40	12XY/70 12 ele crossed ..	£20.90
8Y/2m 8 element yagi ..	£7.00	4Y/4m element yagi	£8.50
10Y/2m 10 ele long yagi ..	£13.80	PMH2/70 2 way harness ..	£4.15
14Y/2m 14 ele long yagi ..	£17.85	PHM2/4m 2 way harness ..	£6.60
Q4/2m 4 element quad ..	£10.50	PMH2/C Circ. phasing ..	£3.60
Q6/2m 6 element quad ..	£14.00	PMH2/2m 2 way harness ..	£4.95
PBM10/2m 10 ele Para ..	£16.40	JBL 15/592″ Joint sleeve ..	£3.37

SMC TRAPPED DIPOLES (Post 45p.) VAT 12½%

S 500W P.I.P. 14SWG ..	£19.60	P 500W P.I.P. Cu/Terylene	
HP 1K P.I.P. 14 SWG ..	£21.75	braid c/w 75′ feeder, etc. ..	£21.75

MOSELY TRI-BAND BEAMS (Carriage £2.50) VAT 12½%

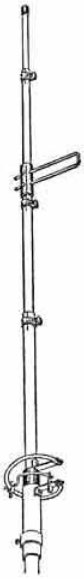
TA33 3 ele 200W R.M.S. ..	£64.00	TA32 2 ele 300W A.M. ..	£44.00
Mustang 3 ele	£82.50	Mustang 2 ele 1kW A.M. ..	£66.00

GEM QUAD FIBREGLASS (Carriage £2.00) VAT 12½%

GQ2E 2 element ..	£119.00	GQ4E 4 element ..	£238.00
GQ3E 3 element ..	£178.00	CK1Q 1 ele Conv. kit ..	£60.00

G WHIP HF MOBILE (Carriage 90p) VAT 12½%

Tribander 10–20m (+ LF)	£14.61	LF40, 80 or 160	£4.87
Multimobile 10/20 (+ MM)	£18.06	MM40, 80 or 160	£4.87
Flexiwhip 10m (+ FF)	£12.42	FF15, 20, 40, 80 or 160 ..	£5.04
Basemount ¼″ hole mount	£2.20	Telescopic whip for coils	£1.50



HY GAIN HF RANGE (Car. £1.00–£2.50) VAT 12½%

BN86 1:1 ferrite Balun ..	£12.00	TH2MKIII 10–20m 2 ele ..	£94.00
103BA 10m 3 element ..	£43.50	TH3JNR 10–20m 3 ele ..	£96.00
153BA 15m 3 element ..	£54.50	TH3MKIII 10–20m 3 ele ..	£137.00
203BA 20m 4 element ..	£103.40	TH6DXX 10–20m 6 ele total	£164.50
402BA 40m 2 element ..	£146.00	HY QUAD 10–20m 2 ele ..	£151.80
18V 10–80 Load Vert. ..	£24.50	DB1015A 10–15m 3 ele ..	£99.00
12AVQ 10–20m Trap Vert. ..	£33.50	LA1 Lightning arrestor gas	£20.30
14AVQ 10–40m Trap Vert. ..	£47.50	LA2 Lightning arrestor spark	£3.30
18AVT/WB 10–80m Vert. ..	£64.40	HY TOWER 10–80m Vert. ..	£162.80

BANTEX VHF WHIPS (Carriage 90p) VAT 12½%

70½ ¼, 70MHz fibreglass ..	£4.00	B5U ⅝λ 432MHz	£5.00
144½ ¼, 145MHz FG or SS ..	£3.50	UCL Mid loaded	£8.00
B5 5/8 145MHz	£6.35	TLM Trunk lip mount ..	£5.25
BGA FG ½ 2m fibreglass ..	£8.75	MB Magnetic Base	£8.50
BAG SS ½ 2m stainless steel	£8.50	Standard base unwanted deduct	£0.50

ROPES (Carriage extra) VAT 8%

3mm HT steel	yd. £0.13	X150 Rustproof 150m ..	£10.85
5mm HT steel	yd. £0.20	7 × 81g Galvanised 100′ ..	£2.20

AERIAL INSULATORS (Post extra) VAT 12½%

2½″ polyprop ribbed	14p	SMCP1 8″ carbon polyprop	85p
NTI 4½″ polyprop ribbed ..	45p	3″ porcelain ribbed	33p

AERIAL WIRE (Carriage extra) VAT 8%

14SWG hard drawn cu ..	yd. 10p	7/·044 cad cu standard ..	yd. 17p
Cu terylene braid	yd. 13p	7/·036 cad cu standard ..	yd. 13p

COAX PLUGS (p & p extra) VAT 8%

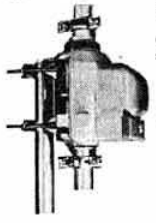
PL259 Standard UHF plug	£0.48	258 Back to back (female)	£0.80
UHF fixed reducer	£0.56	"T" adaptor (2F + 1M)	£1.20
"Solderless" UHF RG8U	£0.51	Right angle (1M + 1F)	£0.90
"Solderless" UHF UR43	£0.51	Phono/car to SO239	£0.55
UG** Reducers state UR43 or 70	£0.14	SO239 2-hole socket ..	£0.37

CABLES RF FEEDERS (Carriage extra) VAT 8%

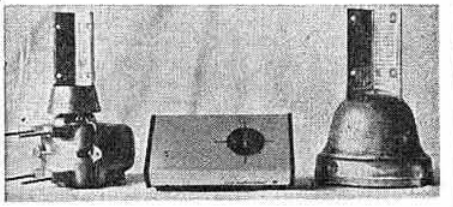
RG8/U 50 ohm Heavy ..	yd. 35p	UR39 75 ohm Medium ..	yd. 24p
UR57 75 ohm Heavy ..	yd. 36p	T3278 75 ohm Distribution ..	yd. 20p
74 ohm Flat twin	yd. 8p	UR43 50 ohm Solid Cent. ..	yd. 15p
300 ohm Ribbon	yd. 9p	UR76 50 ohm Strand Cent. ..	yd. 15p

ROTATORS

Ex-Stock in Totton for fast delivery. VAT: Rotators 12½%. Cable and deliv. 8%. Carriage (BRS or post) FREE. Securicor delivery £1 extra (mainland). All rotators supplied complete with appropriate control box and instr.



AR30 (illus. right near and centre)	£37.50
AR40 (illus. right centre and far)	£43.50
AR33 (de-luxe control AR40)	£49.75
CD44 (C.B. illus. left) med. duty	£89.00
Ham II (C.B. illus left) heavy duty..	£119.00
2010/220 Stolle though Rotator type	£41.25
5 core—AR30/40/33 2030 per yd	20p
8 core—CD44, Ham II per yd	32p



AEC METERS SWR, Power (Pr), Field Strength (F.S.) P & P 40p (VAT + 8%). Unless stated: SWR (± 10%), 1.5 to 160MHz, 50/75 ohm

SWR10	(TLH) single meter horizontal type	£8.15	SWR40	Single meter Vert. type with F.S.	£7.80
SWR20	(BLH) 50 ohm F.S., Pr. 10 and 100W FSD (±10%)	£9.90	SWR50A	(TRH) SWR (±5%) 3·5MHz up, Pr to 1kW (±20%)	£9.60
			SWR50	(BRH) as SWR50A (300μA) but 100μA meters	£11.20

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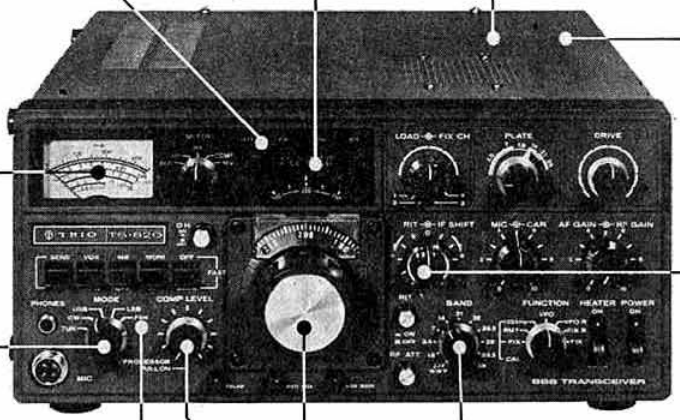
Northern Branch: The Chambers **No 3 The Parade, North Lane, Headingley, Leeds Tel. (0532) 78 2326. Hours of business: 9-5 Tues-Sat, 9-8p.m. Thursday.**

AGENTS (evenings) (ALL QTHR)
Brian Kennedy G3ZUL Droitwich (09057) 4510 **Peter Avill G3TPX,** Darton (022 678) 2517. **Ian McKechnie GM8DOX** Bridge of Allan (078683) 3223. **Howarth Jones GW3TMP,** Pontybodkin (035 287) 846. **Mervyn Anderson GI3WWY,** N.I. Tandragee (0762) 840656.

NEW

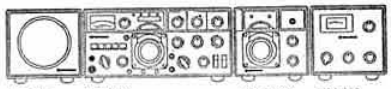
The DXpert

An all-new big brother for the TS520
TS820 from TRIO



The all new TS820 from Trio completes their HF transceiver range. This is the top-of-the-line transceiver which offers a significant advance in design and construction over all others. This is the "DXpert" from Trio.

- Full transceiver operation on all amateur bands from 160-10 metres (28-30MHz) on SSB, CW and RTTY; optional 2 metre transverter; optional external VFO for full split Tx/Rx operation.
- Outstanding performance on both transmitter and receiver due to fully balanced mixing combined with latest PLL techniques.
- First class frequency stability and large signal handling characteristics.
- All new precision dial drive mechanism with unambiguous mechanical readout. Optional digital frequency readout with memory facility.
- Fixed station or mobile operation with a complete line of matched system accessories for building the best possible complete station.
- RF speech processor with fully metered adjustable compression is built-in.
- IF pass band tuning allows the IF to be tuned across a signal without resetting the main dial.
- Five function metering system together with LED monitoring of all important functions gives unparalleled operator control.


SP-520 TS-820 VFO-820 TV-502

This brief advertisement can only touch upon the main details of the TS820. You have to handle it to appreciate its performance. See it soon at your local branch of Lowe Electronics.

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LOWE ELECTRONICS
Cavendish Road
Matlock, Derbyshire
Tel: Matlock 2817/2430

TRIO

The 2m First Family

Where quality is a prime requirement

Regardless of where you are: in your QTH, on the road, on vacation, on a hike: you will always find a QSO on the 2m band with TRIO VHF equipment. And no matter on which transmit and receive frequencies other 2m stations are operating, with TRIO equipment you can always join in, because you'll be qrv on all international fixed-frequency channels—either in simplex or via repeaters.

TRIO 2m equipment is designed for versatility and can be combined to provide station systems for mobile or fixed-station use, operating on line voltage, 12 VDC car batteries or conventional dry cells—just as you like. Take a close look at the two transceivers: the TR-2200GX is from a proven line—the TR2200 and the TR-2200G two of the most popular and best-selling 2m rigs on the world market. Like its predecessors, the

2m FM Portable Transceiver TR-2200GX

is a striking example of advanced technology, optimum performance, solid construction and unmatched reliability. In addition it offers plenty of features, 2m radio operators have been asking for:

2 watts RF output power—choice of fixed channel operation or continuous tuning through the entire 2m band by merely adding the External VFO-30G. Plus: 12 RX and TX channels (S20, S22 and R7 factory-equipped with crystals) to be fitted with crystals of your own choice; receiver and transmitter section with improved semi-conductor complement and higher power (TX input now 4 watts, RX input sensitivity now 0·4μV for 20dB S N : N); IF shape factor 2 : 1; improved squelch action; detachable telescopic antenna; built-in 1,750Hz generator, plus many others.

The TR-2200GX can operate on the following power sources; standard 1·5 volt penlight cells, rechargeable NiCad batteries (optional), 12V DC car battery or Power Supply Unit PS-5. Standard accessories: PTT microphone with hanger, carrying bag with shoulder strap, charger for NC batteries, battery holders, etc. A special mobile mount MB-1A is now available for easy and safe installation of the TR-2200GX in your car.

2m FM Mobile Transceiver TR-7200G

The TR7200G is the best selling 2m FM mobile transceiver in Europe. Some of the reasons why this is so may not be obvious from the basic specification. It's not just the high sensitivity (0·3μV 15dB quieting) or the superb finish, it's the full range of accessories and the finest service backup in the country. It's the little details like the LED under the channel number indicator that is RF powered and only lights when you have a receive crystal fitted. The "transmit" lamp gives the same function for the transmit crystals. This means that you no longer have to wonder which channels are operational when you are mobile. Did you know that by removing the rear panel accessory plug you can drop the receiver gain by 10dB to prevent the fellow next to you in the car park at the rally from blowing your head off!

Did you know that the swr protection system is not the "sudden death" variety but gradually reduces the Tx power with increasing SWR so that you are not put completely off the air when your mobile whip antenna gets wet. The same system protects the PA and driver from over voltage damage when the rig is used in a vehicle having a high charge voltage from the alternator.

Only Trio equipment has the unique tuning fork controlled repeater access tone generator to ensure access first time, every time.

All these features and more, can only be provided in equipment made to professional standards by a professional company. The Trio Corporation is the largest electronics manufacturer in Japan offering a range of amateur equipment and you, the customer, benefit every time.

The TR7200G comes to you complete with mobile mounting bracket, stand off feet for fixed station use, microphone, microphone bracket, cable manual and fitted S20, 21, 22, R6 and 7.

Extra channels available for TR7200G at £10 inc VAT for 3 channels, £20 inc. VAT for 6 if ordered at the time of equipment purchase.

Sole Importers
LOWE ELECTRONICS
119 Cavendish Road
Matlock Derbyshire
Tel: Matlock 2817/2430

TRIO

THE COMPLETE RANGE

Keep it to yourself, won't you, but did YOU know that we have the widest range of VHF and UHF equipment available to meet the most stringent requirements of the discerning amateur radio enthusiast, who is continuously endeavouring to keep his shack up to date without upsetting his bank manager.

It's no secret, though, that we have recently expanded our entire production capacity, enabling us not to just manufacture our standard range of first class VHF/UHF converters and varactor triplers, which have gained world wide acclaim over several years, but to arouse new interest by launching on to the market certain new products such as our 50MHz and 500MHz frequency counters, ÷10 500MHz prescaler and our latest range of all-mode linear transverters for 144MHz and 432MHz.
This month we are briefly reviewing this wide range, but please do not hesitate to contact us either by post or telephone for any technical details, or to request detailed data sheets for any of the products mentioned below.

144MHz.

MMT144/28 : 144MHz linear all-mode transverter.
Features: 10 watts RMS output power.
30dB receive gain.
2·5dB noise figure.
Aerial changeover achieved by a pin diode switch.
I.F. : 28–30MHz.
Price : **£79** + VAT.

MMC144/28 : Single conversion 144MHz receive converter with protected dual gate MOSFETs.
Typical gain: 30dB. Noise figure: 2·5dB.
OTHER I.F.'s : 12–14, 14–16, 18–20, 24–26, 28–30MHz.
Price : **£18** + VAT.

MMC144/28LO : As above unit but has an extra buffer amplifier at 116MHz for use in transverters.
Provides 5mW at 116MHz.
Price : **£20** + VAT.

MMC144/2 : Double conversion 144MHz receive converter which achieves good image rejection at low intermediate frequencies.
OTHER I.F.'s : 2–4, 4–6MHz.
Price : **£18** + VAT.

MMA144 : Low noise preamplifier with two independent outputs.
Typical gain: 18dB. Noise figure: 2·5dB.
ALSO AVAILABLE FOR 70 and 136MHz.
Price : **£13** + VAT.

1,296MHz.

MMC1296/28 : 1,296MHz receive converter utilising a hybrid ring mixer, with a matched pair of schottky diodes driving a MOSFET I.F. amplifier
Typical gain: 25dB.
OTHER I.F.'s : 28–30, 144–146MHz.
Price : **£25** + VAT.

MMV1296 : 1,296MHz varactor tripler.
Will accept up to 30 watts of 432MHz drive and achieves 60% efficiency.
Price : **£30** + VAT.

432MHz.

MMT/432/28 : 432MHz all-mode linear transverter.
Features: 10 watts RMS output power.
30dB receive gain.
3·0dB noise figure.
Aerial changeover achieved by a pin diode switch.
I.F. : 28–30MHz.
Price : **£97** + VAT.

MMT432/144 : 432MHz DOUBLE CONVERSION all-mode linear transverter.
Features: 10 watts RMS output power for 10 watts 144MHz input.
10dB receive gain.
3·0dB noise figure.
Aerial changeover achieved by a pin diode switch.
I.F. : 144–146MHz.
Price : **£133** + VAT.

MMC432/28 : 432MHz receive converter featuring 2 RF amplifiers and a MOSFET mixer.
Typical gain: 30dB. Noise figure: 3·8dB.
OTHER I.F.'s : 14–16, 18–20, 28–30, 144–146MHz.
Price : **£22** + VAT.

DIGITAL PRODUCTS.

MMD050 : Six digit 50MHz frequency counter.
Frequency range: 0·45–50MHz.
Input sensitivity: Better than 50mV RMS.
Price : **£62** + VAT.

MMD050/500 : Six digit 500MHz frequency counter.
Two ranges: 0·45–50MHz.
: 50–500MHz.
Combined version of MMD050 and MMD500P.
Price : **£79** + VAT.

MMD500P : Divide by 10 prescaler to give 500MHz capability when used with MMD050.
Fully TTL compatible.
Output level is 2·5 volts p.p.
Input sensitivity: Better than 200mV.
Frequency range: 50–500MHz.
Price : **£25** + VAT.

70MHz.

MMC70/28 : Receive converter for 70MHz.
Similar to MMC144/28.
OTHER I.F.'s : 4–4·7, 14–14·7, 18–18·7, 28–28·7MHz.
Price : **£18** + VAT.

MMC70/28LO : Similar to MMC144/28LO.
Features buffered local oscillator facility at 42MHz for transverter use.
Price : **£20** + VAT.

PLEASE NOTE
At the time of writing, the VAT rates applicable to the above products were likely to be changed.
However, the VAT rates applicable at the time of writing were 12½% on all the above products, with the exception of the DIGITAL PRODUCTS, which are 8%.
Just a phone call will put you in touch with our experienced sales and technical staff, who will be pleased to assist you with any queries you may have.
Incidentally, ALL of our products are FULLY GUARANTEED FOR 12 MONTHS.

MICROWAVE MODULES LIMITED

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Electronic Developments — new location

Our new factory is now operational and from here we will be able to supply you with our current range of high quality equipment. Please give us a ring or write to the address below with any queries you may have relating to your own particular application.

THE MAGNUM TRANSVERTER EDT 144/28: EDT 70/28: EDT 50/28

Our Transverter is fully YAESU compatible and may be operated with most other HF transceivers. Drive required at 28MHz up to 500mW. Power input up to 200 watts (50% efficient). Each Transverter is aligned using our SPECTRUM ANALYSER to obtain an extremely clean output spectrum. Microwave Modules receive converters are fitted to all our Transverters.

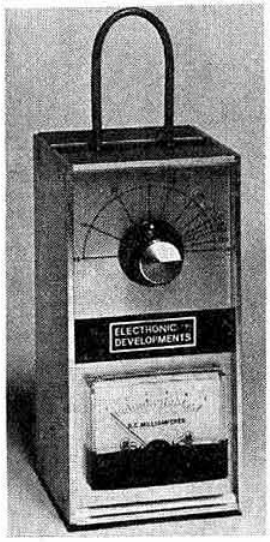
PRICE £112.50 inc VAT

THE MAGNUM LINEAR/PREAMP EDL 144

This Linear Amplifier has been developed by us to fill the need for a high power add-on unit for use with low power transceivers. The unit also contains a low-noise receive preamplifier which is equipped with an RF gain control. Mains operated. Drive requirement: 5-20 watts. CW and SSB, 5 watts maximum AM & FM. P.A. 50% Efficient. R.F. switched so no modification to transceiver is necessary.

PRICE £112.50 inc VAT

WAVEMETER 65 – 230MHz



General coverage VHF Absorption Wavemeter. Its high sensitivity makes it ideal for checking spurious outputs as well as the transmitted frequency.

PRICE £16.00 inc VAT

YOUR ORDERS, ENQUIRIES AND TECHNICAL QUERIES WILL BE DEALT WITH BOTH PERSONALLY AND QUICKLY

70CM LINEAR EDL 432

This 432MHz Linear is operated in grounded grid configuration and exhibits a gain of typically 10dB. With a drive input of 5 watts its output power is in the order of 50 watts which is more than adequate for OSCAR 7. Power requirements are 6·3V AC and H.T. 400-1000V D.C. Fitted with BNC Connectors.

PRICE £50.50 inc VAT

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DO YOU SOMETIMES FEEL YOUR RECEIVER NEEDS A LITTLE EXTRA URGE?
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DO YOU KNOW WHAT YOU WANT FOR THE NEW YEAR?

We have pre-amplifiers for everyone. HF-VHF-UHF. Why not join the 1000s of users of what are probably the most cost effective devices advertised in this journal?

THE SENTINEL H.F. PRE-AMPLIFIER

A success after one month, with people ordering their second unit and many orders being received following recommendations.

A wideband pre-amplifier covering 1-40MHz, gain 15dB, noise figure 1dB. Input and output Z 50 Ohms, supply 12V (9-15V).

They use the latest techniques with a UHF power transistor and voltage and current —ve feedback to ensure a high signal acceptance level, and a remarkably flat response. The box size is 2½" × 3" × 1⅛" and an internal c/o relay allows the unit to be inserted in a transceiver aerial lead, and is also used to switch the pre-amp out of circuit. Price: **£10.12** including VAT and ex-stock.

THE PA 10 printed circuit board version of the above-less c/o relay. Size only 1 cubic inch. Price: **£5.62** including VAT, ex-stock.

THE SENTINEL LOW NOISE FET PRE-AMPLIFIER

The 'Ultimate' in VHF pre-amplifier performance. Ex-stock, for 2 metres, 4 metres, Marine band and Satellite Band. Other frequencies to order. Selected FET provides: Noise figure-1dB, gain-18dB. Supply 12V (9-15V) 5mA. Size 2½" × 3" × 1⅛". Price: **£8.72** including VAT, ex-stock.

PA3 2 METRE DUAL GATE MOSFET PRE-AMPLIFIER

Designed to fit inside your transceiver. Only 1 cubic inch in size. This is the one everybody fits. N.F. 2dB, gain 18dB, supply 12V (9-15V) 5mA. Price: **£6.27** including VAT and ex-stock.

SM71 70cm PRE-AMPLIFIER

A 2 stage selected J FET Pre-amplifier giving a gain of 18dB a N.F. of 3dB. Price: **£10** including VAT and ex-stock.

TRANSVERTERS

EUROPA B. THE WORLD'S BEST SELLING 2 METRE TRANSVERTER.
Contrary to any rumours, the Europa B is continuing in full production.
The Europa B provides:

- ★ 200W Input 50% efficiency with 200mW drive.
- ★ Receive converter-2dB N.F. 18dB gain.
- ★ Cleanest output spectrum—80dB overall spurious responses.
- ★ Size only 9" × 4½" panel, 4½" deep.
- ★ Price: **£109.15** including VAT, complete to plug in Yaesu equipment and ex-stock.

EUROPA COMPLETE POWER SUPPLY TYPE CPS10—Price: **£45.00** including VAT and ex-stock.

NEW EUROPA TWINS:

The Europa 70 Solid State 70cm transverter. Price: **£95.00** including VAT
The Europa SS Solid State 2 metre transverter. Price: **£90.00** including VAT.
Both give 10 Watts using the latest SOE transistors rated to withstand infinite load mismatching.
Receive converter gain is 30dB and N.F. for 2 metres 2dB, for 70cms 3dB, IF 28-30MH.
VHF CONVERTERS 2 METRES, 4 METRES, 70cms, Satellite Band and Marine Band from stock. Other frequencies to order.

SENTINEL DUAL GATE MOSFET CONVERTERS

- ★ N.F. 2dB, Gain—30dB.
- ★ No oscillator frequency multiplication to reduce spurious signals.
- ★ Very high tolerance crystals, 5p. p.m. for calibration accuracy.
- ★ Strong signals and overvoltage and reverse polarity protection built in.
- ★ Standard IFs are: 2 metres: 2-4MHz, 4-6MHz. 28-30MHz. 4 metres: 28-28.7MHz.
- ★ Size only: 2½" × 3" × 1½" long except 2-4MHz and 4-6MHz which are double conversion and 4" long. Price only **£18.00** including VAT and ex-stock.

SENTINEL 2 METRE CONVERTER KIT 28-30MHz IF ONLY
A well proven kit supplied with printed circuit board, drilled and with all coils mounted to make assembly easy. Price: **£11.50** including VAT. IF it doesn't work send it back with **£2.25** and we will fix it.

SENTINEL X 2 METRE CONVERTER

A de luxe version of the Sentinel. Performance spec. is the same but it contains an external mains power supply and a front panel RF gain control.

- ★ Size: 5" × 1½" front panel, 4" deep.
- ★ Stock 2 metre I.F.s: 2-4MHz, 4-6MHz, 28-30MHz. Price: **£22.00** including VAT.

SENTINEL M.F. Another Dual Gate MOSFET 2 metre converter which converts to medium wave in 2 switched bands. Price: **£20.00** ex stock.

SM70 70cm CONVERTER This is a very high performance 70cm to 2 metre FET converter. Price: **£18.00** including VAT.

SENTINEL 70 70cm-28-30MHz converter. Noise figure—3dB. Gain—30dB. Price: **£18.00** including VAT.

SSM Z MATCH 80-10 Metres matches 15-5000 Ohms, 2kW at 50 ohms, **£28.00** including VAT. Size: 8½" × 4" front panel, 7" deep.

SSM IAMBIG MORSE KEYER

C MOS circuit for use with "squeeze" or single paddle keys, price **£33.75** including VAT. Twin paddle key to complement our keyer **£11.25** including VAT.

12 months guarantee on all units. We offer same day COD (£50 limit)

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If you require more detailed information or help, we are a telephone call or a letter away, so do not hesitate to ask.
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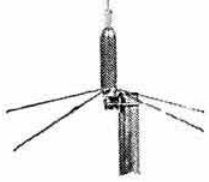
THE CHOICE OF DISCRIMINATING USERS

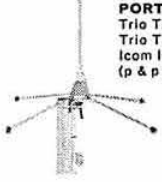
ASP655

130-174MHz ½w 3dB Gain. DC Grounded, Base Station Ant.
Power Capability 100W.
Termination SO-239.
Complete with mounting brackets for masts up to 1¾" O.D.
Available now.
£14.44 plus 75p carriage



ASP659UK

425-440MHz 5dB Gain Base Station Colinear
Power capability 100W
Termination Female 'N' Type connector.
Complete with mounting brackets for masts up to 1¾" O.D.
Available now, **£15.49** plus 75p carr.



NEW!

HELICALS FOR THE FOLLOWING PORTABLES

Trio TR2200GX	£3.85
Trio TR3200	£3.35
Icom IC-215	£3.85

(p & p for helicals 40p)

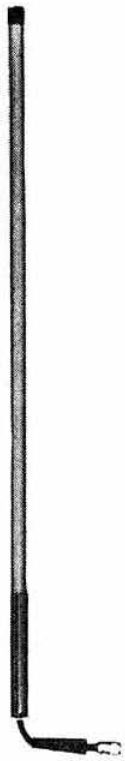
FOR AMATEURS WHO DEMAND THE BEST

ASPA680UK ▶

144-148MHz 6dB gain DC Grounded Base Station Colinear.
Power capability 350W,
Length: approx. 12'
Weight: approx. 4lb.
Rated wind velocity: 118 mph.
Termination: Male 'N' Type Connector.
Available now.
£47.25 plus £2.00 carriage.

ASPN701UK ▶

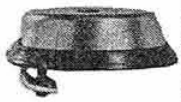
430-440MHz 12dB Gain. DC Grounded Base Station Colinear.
Power Capability 250W,
Length approx. 18'.
Weight approx. 9·5lbs.
Rated wind velocity 128 mph.
Termination Male 'N' Type Connector.
Available now.
£105.00 plus £2.50 carriage.



MOBILE ACCESSORIES

ASP332

Gutter mount suitable for use with ASP629, ASP393 complete with 10' RG-58U cable and PL-259 connector **£8.09** plus 50p post and packing.



K-203

No hole boot mount. suitable for ⅜" hole snap in mount, easily adaptable for other mounts.
£3.70 plus 50p post and packing.

ASPR332

Gutter mount suitable for use with ASP677, ASPE667, easily adaptable for use with other antennas. Complete with 10' RG-58U cable and PL-259 connector.
£8.09 plus 50p post and packing.

New Magnetic Mount ▶

Shown with ASP629, but also fits ASP393, ASP677 and ASPE667. Complete with 10' RG-58U cable.
£9.19 plus 50p post and packing.

VAT of 12½% to be added to above prices.

Please send SAE for catalogue of complete range.

FOR MOBILE ANTENNAS PLEASE SEE PREVIOUS ISSUES.

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Founded 1913 — Member society, International
Incorporated 1926 — Amateur Radio Union

PATRON: HRH The Prince Philip, Duke of Edinburgh, KG

The national society representing all UK radio amateurs

Membership is open to all those with an active interest in radio experimentation and communication as a hobby.

Annual membership rates: UK—£8 (including VAT); Unlicensed members under 18 years of age, £3. Overseas—£8.

Applications for membership should be made to the general manager, from whom full details of Society services may also be obtained.

GENERAL MANAGER AND SECRETARY
G. R. Jessop, CEng, MIERE, G6JP

EDITOR
A. W. Hutchinson

RSGB PRICES and MEMBERS' DISCOUNT

Prices

As a consequence of constantly rising production costs, the RSGB has had to increase the selling prices of its publications and other items (excluding, *for members only*, the two latest books: *Radio Communication Handbook* and *RSGB Amateur Radio Call Book*) with effect from 1 January 1977.

This increase does not apply to American publications sold by the Society as these have been kept under constant review during the past few months because of exchange rate changes.

Discount

From the same date as this increase, however, the Society is introducing a **10 per cent discount for members only** which will be allowed on all purchases and magazine subscriptions (excluding subscriptions to *Ham Radio Magazine* and *Ham Radio Horizons*) from RSGB headquarters and RSGB bookstalls at rallies, conventions and similar events. Overseas members may only obtain this discount on goods ordered or bought from RSGB headquarters.

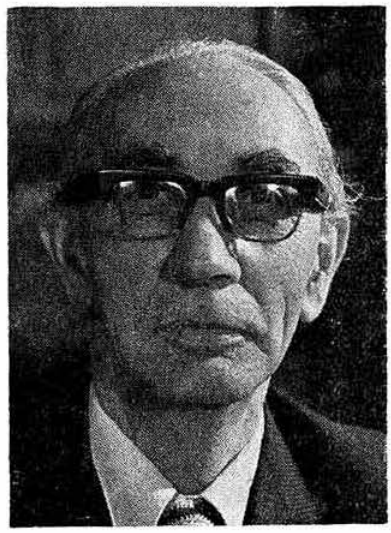
The discount will not be allowed on purchases from non-RSGB bookstalls, trade stands or shops.

To obtain the discount, it is important that the procedures given below are followed:

1. **Orders by post from RSGB headquarters**
   (a) Include with the order the address label from a recent *Radio Communication* wrapper so that membership of the Society can be verified.
   (b) Using the by-post price list published in the latest issue of *Radio Communication*, calculate the total cost of the goods ordered, deduct 10 per cent, and include a remittance for the balance.
2. **Cash purchases**
   When purchasing goods over the counter at RSGB headquarters and from RSGB bookstalls, it will only be necessary for a member to produce his current membership card.

First membership cards were sent out in December, and these will remain valid until the next membership subscription is due. A new card will be issued on renewal and this will also serve as a receipt for the subscription.

A message from the Society's President



Having accepted the great honour of becoming your 43rd President I am only too well aware of the responsibility the office entails. It is in the spirit of service to the membership that I take over from our good friend and servant of the Society, John Allaway, G3FKM.

The year ahead is distinctive as the Silver Jubilee Year of Her Majesty the Queen and it is only fit and proper that the Society, having as its Patron His Royal Highness the Duke of Edinburgh, should be involved. It is therefore essential that it should be our aim to make every effort to ensure that events held in the Society's name are memorable and worthy of the occasion.

The Presidential Installation later this month will be held in the Houses of Parliament. This venue is unique and deliberate. I hope it will mark an even closer link with authorities and a greater recognition of the Society's place as an important section of the British community. Not always has the Society received the recognition and publicity that it deserves.

The world would be a happier and more peaceful place if the world-wide brotherhood involved in amateur radio existed in international affairs. Of course, differences arise but these are resolved in friendly fashion.

Some may look to a new President as a "new broom". I look forward to the duties as a servant of the membership presiding over a Council which is in itself acting in members' interests, having been freely and democratically elected.

Forward to 1977 in a spirit of goodwill!

George (Lord Wallace of Coslany) BRS3003634

QTC

amateur radio news

Radio Amateurs' Examination

The Society has received enquiries from members intending to take the Radio Amateurs' Examination in May 1977 in relation to the conditions for the new Amateur Licence A. While it is in the interests of intending candidates to obtain the latest issue of *How to Become a Radio Amateur*, candidates will not be penalized by giving their answers to Question 1 based on the conditions for the former Amateur (Sound) Licence A.

Copies of *How to Become a Radio Amateur* may be obtained from the Home Office, Radio Regulatory Department, Radio Regulatory Division, Licensing Branch (Amateur), Waterloo Bridge House, Waterloo Road, London SE1 8UA, or by sending a large stamped addressed envelope to Society headquarters.

GB2RS

Some 35 members responded to the invitation to state a preference for the use of a.m. or fm on the vhf transmissions. These indicated a 2:1 majority for the retention of a.m. and accordingly no change will be made. A number of replies indicated that the use of ssb for the 144MHz broadcasts would be preferred.

With effect from 1 January, the hf broadcast is now being made on 3·650MHz instead of 3·600MHz. This has been done to avoid interference from and with rtty transmissions.

Intruder Watch

The powerful interference from the USSR noted previously has, at the time of writing, become less frequent in appearance but has not yet ceased. The signal caused a half-page report in the *Washington Star* which was picked up by most of the USA press outlets. This report extensively quoted G3PSM, the IARUMS co-ordinator.

Feedback from the Home Office following reports by G5XB, the RSGB Intruder Watch organizer, shows that telex messages have been sent to the USSR, China and Egypt asking for the cessation of interference in exclusive amateur bands. In several cases the USSR-based interference has ceased but there has been no success following representations to Peking.

In addition to its primary function, the Intruder Watch is a source of valuable information which is being collated and prepared for WARC 1979. Any administration unwise enough to refer to the 7MHz band as an exclusive amateur service allocation can be given an answer backed by facts and evidence.

In order to assist in the identification of the less usual transmission modes the Society has provided the Intruder Watch organizer with a suitable oscilloscope. We would like to acknowledge the help of Scopex Instruments Ltd of Letchworth in the provision of a 4D25 oscilloscope for this purpose.

Regional Representative, Region 1

Following the election of Mr B. O'Brien, G2AMV, to Council, nominations are invited for the resulting vacancy as Region 1 representative.

Not later than 31 January 1977 any five corporate members resident within Region 1 (Cheshire, Cumbria, Greater Manchester, Isle of Man, Lancashire, Merseyside), may nominate any other qualified corporate member resident in the region for the office of regional representative by delivering their nomination in writing, together with the written consent of such person to accept office if elected, to the general manager at RSGB headquarters. Each such nominator shall be debarred from nominating any other person for this election.

In the event of no nomination being received from the corporate members in Region 1 by 31 January 1977, the Council reserve the right to make an appointment.

In the event of more than one person being nominated, a ballot will be conducted, details of which will be published in the March 1977 issue of *Radio Communication*.

Say again your call

The RSGB Records Department likes to keep up-to-date with members' callsigns. If you are changing from a G8 to a G4, or from a receiving number to a G8 or G4, please let the Records Department know as soon as possible. The callsign on file, which is the callsign you should always use in correspondence with RSGB headquarters, appears in the top right-hand corner of your *Radio Communication* address label.

Phase 2 UHF repeaters

Several proposals for Phase 2 UHF repeaters have now been received and are undergoing technical vetting and approval by the Society's VHF Committee and Repeater Working Group. The proposals will be submitted to the Home Office on 1 February.

Interference Committee, 1977

The strength of the Interference Committee has become rather depleted and members with an interest in interference matters who would care to offer their services are asked to contact Mr P. F. Jobson, G3HLF, 41 The Avenue, Gravesend, Kent.

FDK Multi-U11 review

We have received the following information from Waters & Stanton Electronics regarding the FDK Multi-U11 which was reviewed last month:

"All FDK Multi-U11s supplied by us are now fitted with a separate automatic tone-burst. The existing test tone facility can be used for accessing Continental repeaters where, generally speaking, a tone of several seconds is required initially to switch the repeater on. Before despatch to customers, the peak deviation is pre-set to 5kHz when in the narrow mode. All UK repeater channels are supplied as standard plus the popular simplex channels.

"The apparent filter selectivity anomaly was caused by a tilt at the top of the filter response. Further down the skirt, the response was within specification and although in practice, as confirmed by your reviewer, this tilt was not noticeable, all further units will be checked for this point before despatch."

COUNCIL ELECTION RESULTS

The results of the ballots to fill the eight vacancies on Council from 1 January 1977 were as follows:

Ordinary members

P. Balestrini, G3BPT	1,602
J. Bazley, G3HCT	1,313
R. Bellerby, G3ZYE	982
T. Darn, G3FGY	860
D. Hoult, G4OO	977
C. A. Jones, G8FGD	449
C. H. Parsons, GW8NP	1,481
D. A. G. Pedder, G3LFX	734
R. F. Stevens, G2BVN	2,189

Zone B member

J. Anthony, G3KQF	221
R. W. Fisher, G3PWJ	203

Zone G member

A. M. Allan, GM3ZBE	128
F. D. Hall, GM3BZX	99

Votes received, 2,872. Late entries, 27. Spoilt votes, 22

Messrs **P. Balestrini, J. Bazley, C. H. Parsons, R. F. Stevens, B. O'Brien** (Zone A, unopposed), **J. Anthony, W. F. McGonigle** (Zone F, unopposed) and **A. M. Allan** were accordingly elected to serve on Council for the three years 1977-79.

"Solid-state BC221 frequency meter"

Mr R. S. N. Rau, VU2CX, author of this article published in the August 1976 issue of *Radio Communication*, advises us: (a) that on p594 under "Beat frequency amplifier", sixth line, the resistor value should have read 4·7kΩ; and (b) that any difficulty in getting the crystal oscillator (TR3) to oscillate may be overcome by connecting a 3–10pF capacitor between the gate and drain—pins 5 and 6, Fig 2.

Slow morse practice transmissions

G3LEQ has recently commenced an additional transmission on Sunday evenings at 1830gmt on the same frequencies as on Sunday mornings, (*Radio Communication*, November 1976) but beamed towards Liverpool and the Wirral. He will continue this new transmission through the winter months only if an enthusiastic response is received in the shape of reception reports.

Because of poor conditions in the winter months, GM3CRY has replaced his Tuesday transmissions by transmissions on 3,550kHz ± QRM at 1415gmt on Sundays. He would appreciate hearing from anyone making use of his transmissions, particularly regarding reception contions at the new time.

Both G3LEQ and GM3CRY are QTHR.

Facts and figures

The Home Office advises that the following numbers of amateur licences were in force at 30 November 1976:

Class A	15,948	Class B/M	2,461
Class B	6,156	Class F/M	23
Class A/M	4,166	Television	318

The callsign record received from the Home Office dated 19 November 1976 gives the latest callsigns issued in the G4 and G8 series as G4FNG and G8MOU respectively.

1977 Presidential Installation

The installation of Lord Wallace of Coslany as 43rd President of the Radio Society of Great Britain will take place on

Saturday 22 January 1977
7 for 7.30pm

in the

Members' Dining Room,
House of Commons,
London SW1

Admission will be by ticket only. Tickets will be limited to two per member, and the total number available will also be limited.

Single ticket.....£2.50 **Two tickets.....£4**

Dress: informal (men, lounge suits)

Applications for tickets should be addressed to: The General Manager, RSGB, 35 Doughty Street, London WC1N 2AE.

New callsign series

The ITU announce that they have allocated provisionally the callsign series S8AA-S8ZZ to the Transkei. This was in response to a request from the Republic of South Africa.

"Ham Radio Horizons"

This new monthly magazine produced by the publishers of *Ham Radio Magazine* is directed at the amateur radio beginner or anyone interested in the less technical aspects of the hobby. The first issue is scheduled for January 1977 and subscriptions can be accepted at the sterling equivalent of $10, £6.50 at the time of writing. Subscription requests should **not** be sent to RSGB HQ but addressed to Ham Radio Magazine (UK), PO Box 63, Harrow, Middlesex HA3 6HS. Please clearly indicate that the subscription refers to *Ham Radio Horizons.*

Reigate ATS, G5LK

With the kind permission of Mrs G. Knight, the Reigate Amateur Transmitting Society has been issued with the callsign of the late Leslie Knight, G5LK, who was for nearly 20 years secretary of Redhill & Reigate RSGB Group. The club intends to use G5LK in contests to perpetuate the memory of Leslie Knight.

Poole ARS

At an inaugural meeting held at Poole Technical College on 29 October 1976, it was agreed to form the Poole Amateur Radio Society. The club will meet on the last Friday in the month at 7.30pm at Poole Technical College. The secretary is Graham Tizzard, 153 Millfield, Creekmoore, Poole, Dorset.

Correspondents wanted

Two teenaged Italian amateur radio enthusiasts would like to correspond in English with British amateurs in their own age group. They are: Moreno Giacoppo, Via Campo Mare 64026, Roseto Degli Abruzzi, Teramo; and Michele Mule, Via Cappolini i.s. 439/F, 98100 Messina, Sicily.

A young French amateur, Alain Ferrier, F6CBD, would also like to correspond in English with UK amateurs. His address is 12 Place Kléber, Champs-Elysées, Province de l'Ile-de-France, 02500 Hirson.

Nets, present and projected

Rotarians of Amateur Radio hold a net on Sundays from 9.30 to 11am on 3,692kHz. Further information can be obtained from G8ON, QTHR.

An attempt is being made to organize a net for the Professional & Businessmen's Clubs in the UK. Information can be obtained by calling G8ON after the above Rotary Net or writing to him.

Found and stolen property

A Heathkit transceiver type HW202, No 032973, was found in the Upminster police district on 26 November and the owner has not been traced. Will the lawful owner or anyone who can assist please contact the Metropolitan Police K Division Police Station, 223 St Mary's Lane, Upminster, Essex, RM14 3BX; tel Upminster 20123, and quote reference Form 66/46.

A Sommerkamp FR100B receiver was stolen from the Birmingham University RS during the weekend 4-5 December 1976. Distinguishing features include 10m fitted as an optional extra and modification to the band-switch bearings. Any information concerning this equipment should be given to the Students' Union, Edgbaston Park Road, Birmingham 15.

Braille magazine project

GM3GNX is seeking support to promote a braille magazine for visually handicapped amateurs. It is hoped to publish the RAIBC magazine *Radial* and articles from *Radio Communication* and other magazines.

For further details contact Leslie Fraser, 37, Witchhill Road, Fraserburgh, Aberdeenshire, AB4 5NR.

Parachuting

Mr M. J. Rutty, G3UPV, would like to hear from radio amateurs who are also free-fall parachutists. His QTH is 144 Chapmanslade, Westbury, Wilts.

Left: M Mohamed Mili, ITU Secretary-general, re-inaugurating K2UN, the United Nations Amateur Radio Club Station in New York. With him is Mr Max de Henseler, HB9RS/W2, President UNARC. M Mili was attending the UN General Assembly *Photo: F8RU*

The Smith Chart

An easy to use calculator for solving antenna and feeder problems

by L. A. MOXON, BSc, CEng, MIEE, G6XN*

THERE are many aspects of radio antennas which to the average amateur appear to be shrouded in an impenetrable fog of mathematics but, in fact, most antenna problems with which the amateur is likely to be faced can be tackled without much knowledge of mathematics. Most people can visualize a wave travelling through space and are ready to accept, for example, that field strength at a distance is proportional to current multiplied by the length of antenna wire through which it flows, without needing to master the intricacies of Maxwell's equations. As the author has tried to show elsewhere [1, 2, 3], usually all that is needed is knowledge of a few such basic principles, common sense and access to the appropriate data.

Transmission lines are another story, and for a long time the author—having an impressive record of failures in mathematics examinations—was content to leave them to the experts. They usually seemed to work, after a fashion anyway, and the antenna was the interesting part! In fact, although feeder matching can usually be achieved by experimental methods, use of the Smith Chart is straightforward, saves time and reduces the risk of mistakes. The delightful simplicity of the chart is, alas, belied by a somewhat fearsome appearance, and the aim of this article is to penetrate the disguise so that the chart can take its rightful place in the armoury of readers faced with problems of antenna design and feeder matching.

The application to antennas, as distinct from feeder systems, has been largely overlooked and is of particular interest as it provides an insight into many peculiar aspects of antenna behaviour and often saves a lot of arithmetic. Moreover it has particular relevance for amateur applications since it reveals at a glance how to tune any odd bit of wire to resonance even when, for example, the wire has to be bent to fit it into a confined space. For this application the antenna has to be regarded as a transmission line with the appropriate value, or values, of characteristic impedance assigned to it. Unfortunately this information, although given in professional textbooks, is not readily available to the average amateur. It would in any case be impossible to present accurate data covering all possible ways of bending an antenna wire, but with the aid of intelligent guesswork the data presented here should be adequate for most purposes.

It is necessary at this point to say a little about "j notation" if only to assure readers, who may have only just survived their first glance at the chart, that they are not going to be asked to master yet another new concept. Nevertheless, j does appear on the charts produced commercially and it is felt that most readers, after working through a few examples using the charts, will find it useful as shorthand since it is much easier to write "$50 + 35j$" than "50Ω of resistance and 35Ω of inductive reactance". This is the general form in which the chart produces answers to questions, and at first glance it may look like an unfinished sum requiring an understanding of j for its completion. In fact, the 50 and the 35 are "different kinds of ohms" and tend to be of more interest when they are separated than after they have been added.

Typically the 50Ω represents the radiation resistance of an antenna, or some other load into which one wishes to deliver power, and the 35Ω is a reactance which needs to be removed by tuning, ie by connecting an equal and opposite reactance in series. Conventionally a negative sign is used to denote capacitance, and in this case the chart indicates the use of 35Ω of capacitance so that the complete answer to the problem becomes $50 + 35j - 35j = 50\Omega$ which provides a good match to standard low impedance cable. For the present purpose this is all the reader needs to know about j, although a further acquaintance with it gives added flexibility in the use of the chart and is essential to a proper understanding of many aspects of electrical and radio technique. An attempt to provide a simple explanation of j has been included as an appendix.

In this article the chart is presented as an impedance diagram since impedance is a familiar concept to most readers, and, as the examples prove, this approach is adequate for a wide variety of applications. Nevertheless, an understanding of admittance enables the chart to be used as an admittance diagram and as a simple calculator for making impedance-to-admittance conversions, which greatly extends its usefulness. This should present no difficulty to readers once they are familiar with the basic concepts, and is to be the subject of a later article under different authorship.

In many cases the chart requires an input which can only be derived by direct measurement of impedance or admittance at whatever points happen to be accessible in an antenna or feeder system. This is also to be the subject of a later article but in the meantime it is hoped to show that good use can be made of the charts even if the reader is equipped with nothing more than an understanding of the difference between resistance and reactance, some simple form of swr indicator or rf voltage probe, and a few odd lengths of cable. If open-wire feeders are used the only instrument needed consists of a small pick-up loop, rectifier and meter. Holding the pick-up loop at a roughly-constant distance from the feeder, it can be moved along the line to determine the swr and the positions of the current minima, with sufficient accuracy for most purposes.

Properties of lines

Most readers will be aware that if, for example, a 50Ω resistance is connected to one end of a 50Ω line, the impedance observed at the other end will also be 50Ω, and this holds true for any length of line. For any other termination, the observed impedance varies with line length; for example, Fig 1 shows what happens when the 50Ω resistance is replaced by one of 25Ω, corresponding to a standing-wave ratio of 2·0. These are the curves which would be traced out by walking backwards down the line towards the transmitter, observing the apparent value of the "load impedance" as seen from each point on the line. In the absence of line losses, the pattern repeats itself every half-wavelength,

* 1 Stoner Hill House, Froxfield, Petersfield, Hants.

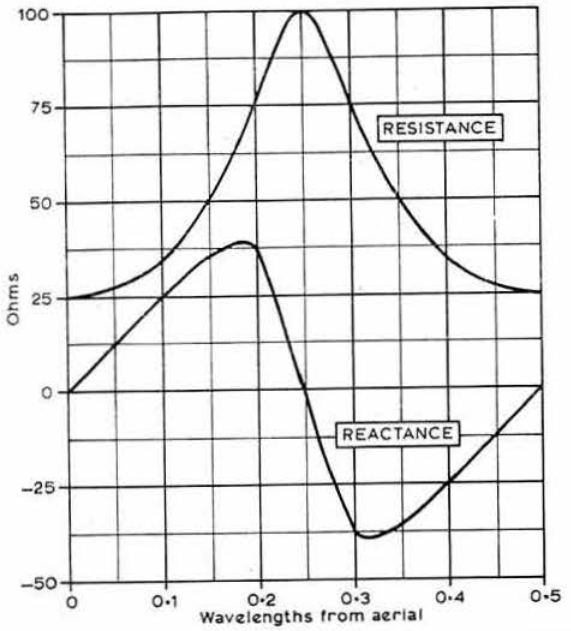


Fig 1. Variations of resistance and reactance along a 50Ω feeder when connected to a resonant antenna having a feed point resistance of 25Ω (swr = 2·0)

and a given resistance always has the same value of associated reactance although the sign of this changes from positive to negative at intervals of $\lambda/4$.

Reactance can therefore be plotted against resistance, as shown in Fig 2. The fact that this particular plot happens to be a circle need not unduly concern the reader, who is asked to note only that a pattern has been traced out which repeats itself at $\lambda/2$ intervals. A distance (measured in wavelengths) scale can be marked off as illustrated round it so that, given any point on this pattern, the impedance at any other point on the line can be obtained merely by moving the correct distance round the pattern. All points on the line, including the antenna itself, must fit on to this pattern so that if the antenna impedance and line length are known, the impedance at the transmitting end can be read directly from Fig 2.

It is then a simple matter to devise, for example, a matching network such that the antenna is presented to the transmitter as a matched load. Alternatively, from measurements at the transmitter the antenna impedance can be read from the chart and used to determine whether, in order to improve the swr, the antenna need be lengthened or shortened, or some other adjustment made.

The circle diagram

So far only one value of swr has been considered, though obviously a family of circles could be drawn covering a fairly wide range of values. Useful though this might be, the diagram in this form leaves much to be desired: the scales are too cramped at their lower end and cover too small a range of impedances; different sets of curves are needed for each value of feeder impedance, and the non-linear nature of the distance scale makes it rather inconvenient to use.

To overcome these problems the obvious first step is to make the resistance and reactance scales non-linear, expanding the lower ends and compressing the upper ends. In this way any desired range of values, even extending all the way from zero to infinity, can be accommodated. The next step, rather less obvious, is aptly described by G3MYT as "bending the graph paper". In effect, the reactance scales are bent round so that they form a complete circle with their ends, now scale-marked infinity, meeting at infinity on the resistance axis as shown in Fig 3, which is the basis of the Smith Chart.

Fig 3 is identical to Fig 2 except for the distortion and bending of the scales, which has been done in such a way that the impedance plot remains circular although the wavelength scale marked round it is now linear. In other words, movement round the circle of any given number of degrees always corresponds to the same fraction of a wavelength whatever the starting point. A further advantage of the new diagram is that the circles of constant swr now share a common centre and make use of the same wavelength scale, which is usually marked around the outer circumference of the chart.

To make Fig 3 into a useful tool one further step is necessary—the addition of suitable scale lines as in Fig 4. In the case of Figs 1 or 2 the reader could easily fill these in for himself since the originals were plotted on ordinary squared paper, ruled with sets of equally spaced parallel lines at right angles. Unfortunately when the graph paper is "bent" these lines get bent with it and, since by definition parallel lines meet at infinity, the scale markings appropriate to Fig 2 all converge on the point marked ∞ when transferred to the Smith Chart. To avoid undue congestion at this point, therefore, most of the lines have to stop short, and the curious pattern results from this convergence plus the obvious practical need to maintain a reasonably uniform density of scale lines throughout the diagram.

The bending of the scale lines should cause no difficulty if it is appreciated that lines of constant resistance are circles or parts of circles which touch at infinity but also pass through the appropriate point on the resistance scale (ie the vertical line in the centre of the diagram), and lines of constant reactance are arcs of circles centred off the diagram but also meeting at infinity as explained earlier.

Another important respect in which Fig 4 differs from

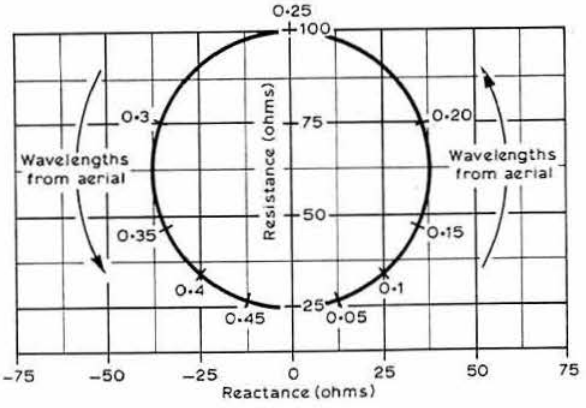


Fig 2. Similar to Fig 1 except that reactance is plotted against resistance

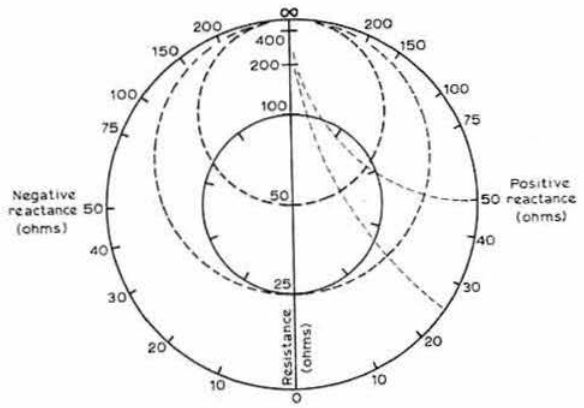


Fig 3. The Circle Diagram or Smith Chart. This is similar to Fig 2, except for "bending the graph paper", the centre line being the resistance scale. Two lines of constant resistance and two of constant reactance have been shown dotted. The inner circle is drawn for an swr of two and the markings on it are steps of 0·05λ

Fig 3 is the scaling, which suggests that it has been drawn for a rather improbable line impedance of 1Ω. In fact, this is another bit of clever trickery and overcomes the remaining defect of Fig 2 which, as readers may recall, was the need to prepare different charts for different values of line impedance. The method is known as "normalization" and is a simple standard conversion process of the kind with which anyone who travels abroad is familiar—the difference being that instead of converting pounds into francs or miles into kilometres, when entering on to a Smith Chart ohms have to be converted into "zednoughts", Z_0 being the symbol used to represent the line impedance. For example, if the line impedance is 50Ω, then 50Ω is one Z_0, and if the line is used to connect a transmitter operating at 14MHz to a load consisting of 100Ω of resistance plus a reactance of 85Ω (ie an inductance of 1μH), the chart is entered at the point corresponding to $\frac{100}{50}$ (ie 2 zednoughts) on the resistance scale and $\frac{85}{50} = +1{\cdot}7$ on the reactance scale. Putting this into j notation the impedance is $(100 + 85j)$ Ω and becomes $(2{\cdot}0 + 1{\cdot}7j)$ after normalizing to 50Ω. In the latter case there is no need to fill in the unit of impedance since a Z_0 is the only one recognized by the chart.

It may have been noticed that Fig 4 is upside down with respect to Fig 3. This is a matter of convention and has no other significance.

The charts illustrated in Fig 4 are available in graph-paper form from any stationer stocking Chartwell Graph pads D7510*. They can be used as graph paper for the permanent recording of such experimental results as the variation of antenna impedance and swr across a band of frequencies, but for the present purpose the chart is of more interest as a calculating device. For this purpose one method is to glue it onto a hard surface and employ a rotating cursor of transparent material with marks corresponding to the points on the resistance scale (greater than one) over which they

*Alternatively, members may obtain five sheets by sending a stamped addressed envelope of A4 size to the editor at RSGB HQ.

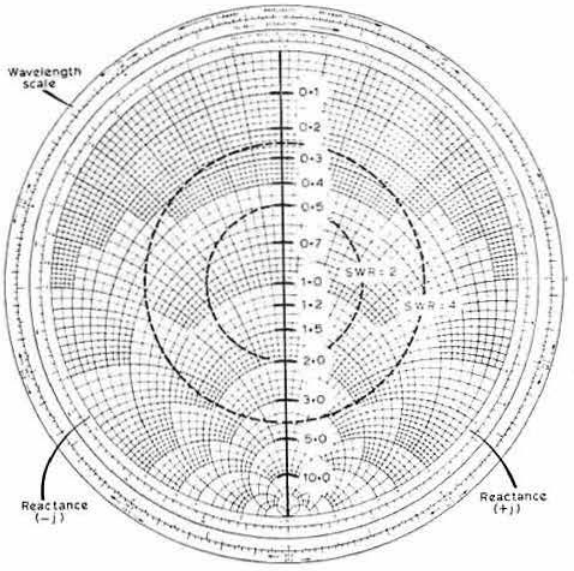


Fig 4. Typical Smith Chart. Resistance scale markings have been added or emphasized. If concentric circles are drawn as illustrated, each circle represents a constant value of swr and passes through (a) the corresponding value of resistance and (b) its reciprocal

pass. As the cursor is rotated, the points marked 1·5, 2, etc describe circles representing these values of swr.

An alternative requiring less effort (and therefore preferred by the author) is the "swr overprint". This consists of a set of conveniently spaced circles and radial lines as shown in Fig 5. The circles represent constant values of swr, and the radial lines provide a convenient method of reading distances round the circles in terms of the distance or wavelength scale which is marked on the periphery.

The overprint is superimposed on the chart using red ink which distinguishes it clearly from the other scale markings.

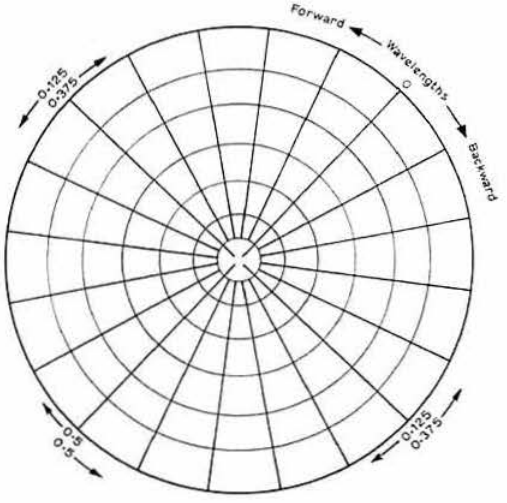


Fig 5. SWR overprint. Radial lines are intervals of 0·025λ

Ideally, for the purpose of this article, Fig 5 would have been superimposed on Fig 4 but when this is attempted in monochrome the result can be described only as a disaster!

Typical calculations using the overprint consist of plotting an impedance point on the chart, proceeding round the nearest swr circle for the right fraction of a wavelength, and reading the new values of resistance and reactance. If the reader wishes to make his own charts in this form, the lines can easily be drawn in and, if any other marks are made in pencil and rubbed out when no longer required, each chart can be made to last a long time.

Two other scales will be noticed on the chart, attenuation and angle of reflection coefficient, but these can be ignored for the purpose of the present article.

Application to antennas

It is common practice to make a clear distinction between "antennas" and "transmission lines". This attitude appears to be reflected in the prevailing usage of the Smith Chart which is of course quite correctly regarded as a "transmission line calculator". Nevertheless, as mentioned earlier, the antenna can also be regarded as a transmission line, and from the point of view of tuning and matching there are important advantages in so doing. The alleged "bandwidth" of an antenna is usually not that of the antenna but some combination of antenna and feeder system, and in dealing with such a combination the Smith Chart can be particularly useful.

In treating the antenna as a transmission line, it is essential to think of it as a line which has been unfolded so that, for example, a $\lambda/4$ line turns into a $\lambda/2$ dipole. This unfolding must of course lead to an increase in the characteristic impedance (Z_0) since it reduces the capacitance, and the load resistance (being identifiable with the radiation resistance) is usually small compared with Z_0 so that the swr is high. As well as being an antenna, the wire remains basically a transmission line whose length is half that of the antenna, and if Z_0 and the radiation resistance are known, the Smith Chart can be used to discover the impedance at the centre or ends of the wire. The wire may be bent into any shape, in which case different parts of it may have different values of Z_0, and in dealing with these cases the performance of the Smith Chart is particularly impressive since each change of

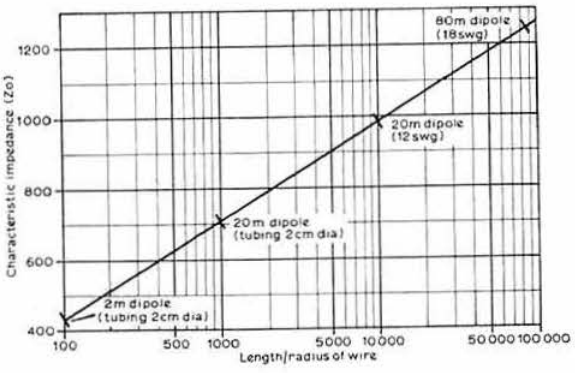


Fig 6. Characteristic impedance of straight antenna wires. Points marked on the curve are typical examples. (Note that the addition of 120Ω gives the Z_0 of parallel wires spaced by the length of the antenna; this is useful in calculations which involve antennas with bent ends)

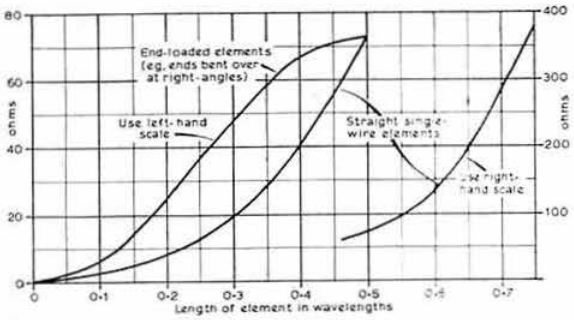


Fig 7. Radiation resistance expressed as an equivalent series resistance at the centre of the element. These are the figures required when working with the chart in its impedance form as described in this article. Unlike the equivalent parallel resistances they are independent of a wire diameter. For beam antennas the multiplying factors given in Ref 2 are applicable

impedance along the antenna and feeder system can be regarded merely as a frontier at which we have to change currency, ie normalize to the new impedance.

The main difficulty so far has been lack of impedance data; this is readily available for transmission lines, but access to professional textbooks is usually needed in the case of antenna wires. Fig 6 rectifies this omission to the extent that it should cover most cases of importance for amateur applications. Data on radiation resistance is widely available but usually relates to positions of current maxima; given this information, however, the radiation resistance referred to the antenna terminals, when the antenna wire is not a resonant length, may be roughly determined with the help of the chart. However, from this point of view values of R tend to be rather on the low side, and if the distribution is known they may be derived more accurately by using the usual I^2R formula, I being the current and R the radiation resistance at any point in the system, and I^2R the same for all points. This has been done for single wires with lengths up to $3\lambda/4$ in Fig 7, which also includes the case of elements which have been physically shortened by bending back the ends of the wires. In the case of full-wave dipoles the terminal resistance is best obtained from the current loop radiation resistance (180Ω) by regarding the antenna as a $\lambda/4$ transformer obtaining Z_0 from Fig 6 and evaluating $Z_0^2/180$. In principle the chart can be used for this purpose by entering it at the point $\frac{180}{Z_0}$ and proceeding round it for a $\lambda/4$. This procedure, incidentally, demonstrates the inversion of impedances whereby they turn into admittances, a particularly important feature of the chart as will be explained in the next article.

If $Z_0 = 900\Omega$, $\frac{Z_0}{180} = 5$, and use of the chart produces the answer in the form $5Z_0$, ie $5 \times 900 = 4{,}500\Omega$ which, as some readers may be quick to point out, could have been obtained with much less trouble by simple arithmetic. The situation is very different, however, if even a small amount of reactance is introduced, ie if the antenna is no longer exactly resonant. Arithmetic is then no longer applicable, but the Smith Chart takes the situation in its stride, indicating how much retuning is required and confirming (in the present case) that when this has been attended to there will be little change in the value of impedance.

References

[1] "Evaluating aerial performance", L. A. Moxon, *Wireless World* February and March 1959.

[2] "Supergain aerials", L. A. Moxon, *Radio Communication* September 1972.

[3] "Gains and losses in hf aerials", L. A. Moxon, *Radio Communication* December 1973.

[4] F. E. Terman, *Radio Engineers Handbook* 1943 edition.

Appendix

Use of "*j*"

Most readers will be familiar with the fact that when 10Ω of resistance is added to 10Ω of reactance, the impedance offered to the passage of an electric current is not 20Ω but something less. To avoid doing the sum, the impedance in this case would usually be written down in the form $10 + 10j$, the j being merely a form of shorthand to indicate that the answer (if needed) may be obtained by adding the two quantities "at right angles". For example, if we represent them by drawing two lines at right angles using a scale of 1in to an ohm and then make this into a complete right-angled triangle, the length of the line which completes the triangle is 14in, and 14Ω is the answer to the problem. Suppose, however, that before adding the two lengths, the second one is turned through a right angle not once, but twice. It is now going in the opposite direction and the sum of the two quantities is zero, ie it is the answer to the sum "10 minus 10".

Turning the second quantity through two right angles has, in effect, multiplied it by (−1) and with this picture in mind the reader will probably have little difficulty in identifying -1 with $j \times j$ or j^2, so that j can be considered as shorthand for $\sqrt{-1}$. This is not a "real" number since, however useful it may be to the mathematician, there is no such thing in nature, hence the usual description of the $10j$ as the "unreal" part of the impedance. It is also unreal in another sense—when a current flows through the circuit, power is consumed only in the resistance. If the j term is positive, it represents an inductance, in which case energy is stored in a magnetic field and then released.

When a voltage is applied to an inductance the power going into the magnetic field constitutes a load in the source and the flow of current is impeded until the field has been built up to a value corresponding to whatever maximum current the circuit is capable of supporting. In other words, the current is said to lag behind the voltage, and in ac circuits this lag is a quarter of a cycle, or one right angle, hence the j. Conversely the current going into a capacitor is initially large but drops to zero when it is fully charged, so the current is ahead of the voltage and the j is of opposite sign, ie negative, though the + and − are dictated only by convention.

Although the reactive part of an impedance does not consume power, it limits the flow of current and prevents a generator from delivering all the power of which it is capable. Fortunately it can usually be neutralized by a reactance of opposite sign—the process known as tuning. Reactance is therefore the basis of selectivity, and performs other useful functions, so it should not be regarded merely as something to be got rid of—even though this is what one is usually trying to do when using the Smith Chart for the solution of an antenna or feeder problem. It is important to realize that when working with complex impedances, ie those containing both resistance R and reactance X, the two parts play quite different roles. In general it is more useful to know the separate constituents of an impedance than its absolute magnitude which can of course easily be worked out from them, being given by $\sqrt{R^2 + X^2}$ or by graphical methods as described earlier. When, therefore, an impedance is given in the form $R + jX$ this is not an unfinished sum, but a particularly informative bit of shorthand.

Moreover, since j can be handled like any other algebraic symbol, it enables those whose knowledge of mathematics extends no further than simple algebra to tackle quite elaborate calculations involving complex numbers, such as coupled circuits, aerials (including close-spaced beam elements), phase shift networks, and the series/parallel conversions mentioned earlier; expressions for the latter are to be found in *Radio Communication Handbook*, 4th edition, p13.28, but the manipulations can be very cumbersome and those with experience of using them will be the first to appreciate the delightful simplicity of the Smith Chart for this purpose. This will be explained in another article.

Since expressions containing j carry implications of direction or phase, the associated calculations are known as vector algebra but in its simpler forms this differs from ordinary algebra only to the extent of substituting a "minus" for j^2, as explained earlier.

Examples

(1) *There is just room to erect a 28ft horizontal dipole. How does one tune it to resonance on (a) 14MHz, (b) 21MHz? To avoid objections by neighbours the wire must be invisible and to achieve this it is decided that the diameter must not exceed 1mm. Assuming an accurate match at 14·25MHz how bad will the swr be at 14·0MHz? Some 75Ω cable is readily available: will this be satisfactory, or will the swr be too high?*

From Fig 6, Z_o = 1,040Ω, and imagining the antenna to be folded in half, it is short of λ/4 by about 0·06λ. Since the radiation resistance is obviously going to be small compared with Z_o, the appropriate circle of constant swr will be near the outer edge of the chart. Fig 8 shows that moving forward from the resonant point (low impedance) by 0·06λ reaches point P which yields a reactance $-0{\cdot}4j$.

For resonance, ie to get back to point 0, this requires a series inductive reactance of the same value, ie 0·4 zednoughts or 416Ω, which is an inductance of 5μH. Up to this point concern has been only with tuning, and the radiation resistance which from Fig 7 is 42Ω and therefore small compared with Z_o can be ignored. For the purpose of illustration it will be assumed that some cable is available which matches this exactly.

Going from 14·25 to 14·0MHz, a line 28/2ft long shrinks by 1·8 per cent or 0·004λ. This is rather small for reading off the chart but it can be seen that it is equivalent to a reactance change of about 30Ω, giving point Q. Ignoring a very slight shrinkage in the radiation resistance, the antenna impedance as seen by the feeder is now $42 - 30j\Omega$ which normalizes to $1 - 0{\cdot}72j$ giving the point S on the chart. A circle through this point intersects the resistance axis at the points 2·1 and 0·48. Either of these figures could in principle be used to represent the swr, but observing the usual convention the higher figure is chosen and 2·1 is the required answer.

Next suppose 42Ω cable is unobtainable but that 75Ω is readily available. Re-normalizing for 75Ω impedance gives the point T, ie 0·55 (resistive) for 14·25MHz, and U, ie $0{\cdot}55 - 0{\cdot}4j$ at 14·0MHz. Corresponding values of swr as read from the chart (points T′, U′) are 1·8 and 2·06 respectively, so that if anything there is a slight improvement at 14·0MHz.

At 21MHz the antenna half-length is longer than λ/4 by 3ft, ie 0·068λ. Proceeding round the chart in the opposite direction by this amount we arrive at the point $0{\cdot}45j$, ie 470jΩ which requires a series capacitance of 17pF to bring it to resonance, and since from Fig 7, R = 114Ω the swr in 75Ω cable is then 114/75 = 1·5.

(2) *At 14MHz, according to the usual formulas, twice the length of a half-wave dipole is 66ft, but the length of wire in a quad loop is 70ft. Why the difference?*

The quad loop consists of two stacked dipoles with their ends bent over at right angles so that the overall physical length is halved. The bent-over portions constitute a very wide-spaced open wire line and the Z_o for this can be obtained from almost any handbook, but comparing formulas given in [4] (pp174 and 865) it is found that Z_o for parallel wires spaced by an amount 1 is always 120Ω more than that of a single wire of length 1, assuming similar wire in both cases.

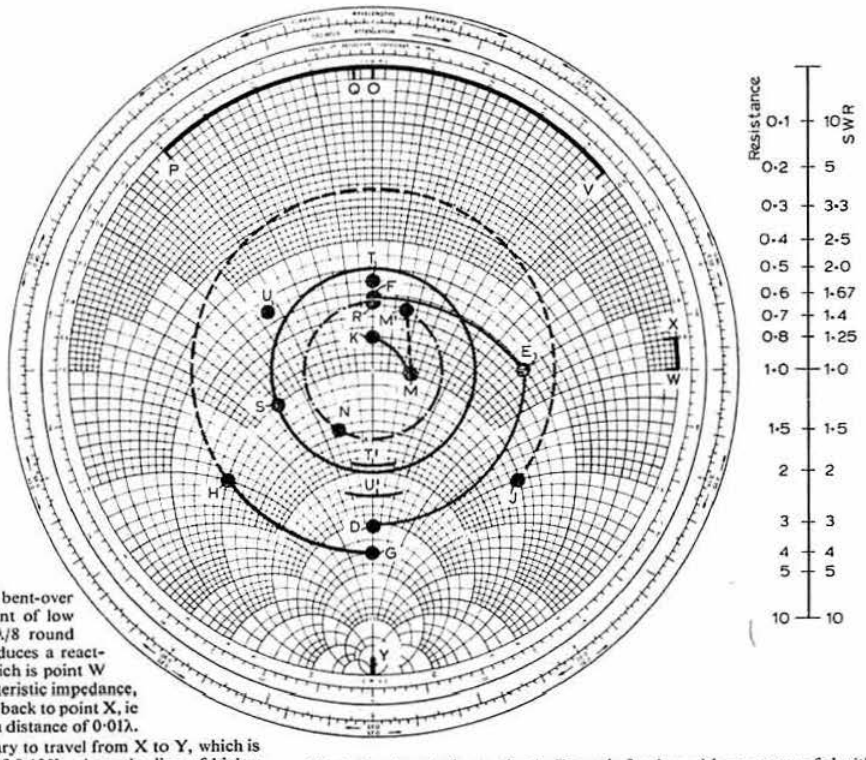


Fig 8. Illustration of examples: (1) Points P, Q, O, V and S, T, U, U′, T′, V (2) X, W, Y (4) D, E, F (5) G, H, J (6) K, M, M′, N, R To help interpretation the resistance/swr scale has been repeated on the right of the diagram. Note that resistance and swr scales are identical for values greater than 1. For resistances less than 1 the swr is the reciprocal of resistance

Consider the wire gauge to be chosen so that the impedance read from Fig 6 is 1,000Ω. In this case for the bent-over ends, Z_0 = 1,120Ω. Starting from a point of low resistance and moving a distance of λ/8 round the circle in an inductive direction produces a reactance equal to *j*, ie 1,000Ω inductive which is point W in Fig 8. Normalizing this to the characteristic impedance, 1,120Ω, of the bent-over ends brings this back to point X, ie 0·89 which, read from the outer scale, is a distance of 0·01λ.

For resonance, therefore, it is necessary to travel from X to Y, which is a distance 0·125λ + 0·01λ, ie a total of 0·135λ, along the line of higher impedance. The total length of wire which has to be added for a single bent dipole is 0·02λ, or twice this, amounting to 2·8ft, for a complete quad loop. This is increased to 3ft by doubling the wire gauge, and the slight remaining discrepancy can be explained in terms of mutual impedance between the two "dipoles" of which the loop is composed.

This example illustrates an important practical point which seems to have evaded the textbooks and has confused some writers of descriptive articles—namely that bending an antenna wire, whether it be over at the ends or in at the middle, alters the length required for resonance. Moreover, this effect is frequency dependent so that different corrections will be required at fundamental and harmonic frequencies, thus disturbing the normal harmonic relationship of the antenna resonances. Elsewhere the author has given an example of this in which a 14MHz quad loop is tuned by a λ/2 stub, so that resonance also occurs at about 21MHz where the total electrical length of the system is roughly three half-waves. Due, however, to the effect demonstrated by this example, the stub has to be shortened by 31in for use on 21MHz, a result readily predictable by using the Smith Chart in the manner described.

(3) *A wire beam using two closely-spaced inverted-V elements is fed with open-wire line using a delta match. Because of the low radiation resistance the dimensions of the delta are small and so the whole of the feeder system can be regarded as having a Z_0 of approximately 600Ω. Moving along the line with a simple loop indicator the swr is too large to be measured accurately, probably six or more. The line is a very long one, some 200yd, and from previous experience it is considered advisable to reduce the swr to less than three. The driven element must be lowered for adjustment, but what has to be altered and in what direction? The horizontal part of the delta, or the length of the element, may be either too short or too long, so there are four possible adjustments.*

This example has been freely adapted from an actual experience, and the first step is to locate the position of a current minimum since with a high swr these points are much more sharply defined than the maxima. Suppose the minimum is located at a distance of 3λ/8 from the element. Starting from a high resistance (but zero reactance) point on the chart, move three-eighths anti-clockwise, following the direction of the arrows which (depending on the chart) may be labelled either "forward" or "towards load".

This enters the region of capacitive reactance, which means that the element must be too long; the capacitance represented by the outer portions of the elements evidently being more than enough to tune out the inductive reactance of the horizontal part of delta.

(4) *A situation similar to that in Example 3 arises with an antenna fed with coaxial cable. It is impossible to run an rf probe along the inner conductor and no impedance bridge is available. Is there some alternative, and if so, what?*

Prepare two extra lengths of cable cut to electrical lengths of λ/8 and λ/16. With either, both, and neither of these connected in series with the feeder at its accessible end, observe in each case the relative rf current or voltage at the point nearest to the transmitter. (A small loop of wire, say, 2cm diameter connected in series with the inner conductor can be used for coupling into the same rf current indicator as the one used in the previous example). In this case, by temporarily increasing the length of the feeder it is possible to locate approximately a point of minimum current. Assuming the total electrical length of feeder is known, and provided there are no complications such as may result from using a balun or gamma match, determine whether the antenna is too long or too short by the procedure as before.

If an swr indicator is available the actual impedance at the antenna terminals can be obtained as illustrated by the following example. Suppose the swr is three and the current minimum is 2·125λ from the antenna terminals. Starting from three on the resistance scale we move forward 2·125λ and read off the answer 0·6 + 0·85*j*. By using the appropriate series capacitance the *j* term may be removed and the swr reduced to 1·67, which is acceptable so that there is no need to alter the antenna length. This operation is illustrated by points D, E, F in Fig 8. In this case baluns etc do not introduce complications provided the compensation is applied on the feeder side of them. As an alternative to the current indicator a voltage probe or oscilloscope may be used, in which case the position of the minimum occurs at a current maximum.

(5) *This is similar to Example 3 except that it is assumed to be inconvenient to lower the element for adjustment, and the swr has been measured as approximately 4·0. This is tolerable in the relatively short length of line from the element down to ground level, or thereabouts. The distance from the antenna to the nearest accessible point is 3λ/8 and this is also the position of the current minimum. What should be done to achieve an swr of 1·0 in as much as possible of the feeder?*

The current minimum is four on the resistance scale, G in Fig 8. Moving *clockwise* round the chart, ie towards the transmitter since climbing the mast is impossible, it is found that after travelling a distance of 0·075λ the resistance circle 1·0 is intersected at H. At this point the reactance is −1·5*j* and a perfect match can therefore be achieved by connecting

Continued on p29

Some experiments with high-frequency ladder crystal filters

by J. A. HARDCASTLE, G3JIR*

Part 2. Test equipment

Introduction

In order to be able to report some meaningful results it was necessary that the measurements made on the experimental filters should be highly accurate, both in respect of frequency and of insertion loss, and the author was fortunate in having access to a digital frequency meter and a sensitive rf voltmeter, as well as a suitable signal generator. Even so, the performance of the rf voltmeter was inadequate in respect of sensitivity at 9·6MHz, and the test set to be described was made to overcome this deficiency. However, the potential constructor should not be put off by this expensive array of test equipment, because it is possible to substitute a vfo or vxo for the signal generator and a station receiver for the rf voltmeter.

Insertion loss test set

The general arrangement of the equipment for this test is shown in Fig 11, the section between A and B being a simple superhet receiver specially designed for the measurement of the stopbands of crystal filters. The full circuit is shown in Fig 12 and is described section by section.

Buffer amplifier

TR1 is a grounded base amplifier and provides an impedance transformation from the 50Ω output of the signal generator to the 250-750Ω impedance range of the filters being tested. The collector circuit is broadly tuned to 9·6MHz by L1 and its output impedance is approximately 1·8kΩ. This stage is designed to handle the high level of signal required for measuring filter stopbands, and an output of 1·4V (4V peak to peak) into a 150Ω load is available for 0·4V input—a level which most signal generators are capable of supplying.

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RF amplifier

Following the filter is TR2, another grounded base stage similar to the buffer amplifier, and also broadly tuned to the filter frequency. The input impedance is very low, approximately 10Ω, hence the need for a series matching resistor for the filter. Grounded base stages were chosen for these first two stages for their ability to provide rf amplification without instability problems over a wide range of source and load impedances.

Mixer

A fet mixer, TR3, is used to convert the input frequency to an i.f. of 1MHz. Because the test set was planned to be capable of use at any frequency in the hf range no internal oscillator was provided. A crystal oscillator, a vfo or yet another signal generator may be used according to availability. There is only one tuned circuit at 1MHz because in this case only limited selectivity is required in order to prevent the selectivity of the filter under test being enhanced by the test set.

The local oscillator level is set at 120mV rms, the minimum level at which the mixer will operate correctly. This level is usually specified as half the pinch-off voltage of the fet, but the 2N3819 which was used required −2·6V for cut-off and an oscillator level of 0·42V (1·3V peak to peak) caused too high a level of 10·6MHz signal to appear at the output. This is a consequence of having only one tuned circuit at the i.f.; however, a lower oscillator level and a 10·6MHz rejection circuit combine effectively to remove this unwanted signal.

Further gain at the i.f. is provided by TR4, which will give an output of 2·5V (7V peak to peak), into a 2kΩ load. The relatively low output impedance of this stage allows the use of a couple of feet of coaxial cable to connect to the rf voltmeter without too much reduction of the gain of the stage. An emitter follower could have been used to match to the cable but it would have been an additional stage and, more importantly, emitter followers have a tendency to oscillate when feeding a capacitive load.

Performance

The bandwidth of the test set is 50kHz at −3dB, and 85kHz at −6dB, which is sufficiently wide not to affect measurements on a narrow-band filter.

Measurements may be made over the full range of a bandpass filter from one stopband to the other, without changing the signal generator output level attenuator. This is a result of the test set being designed to handle a wide range of signal levels. It has proved to be of considerable operating convenience, because the signal generator frequency was found to shift when the output attenuator was adjusted. This produced disconcerting effects when making

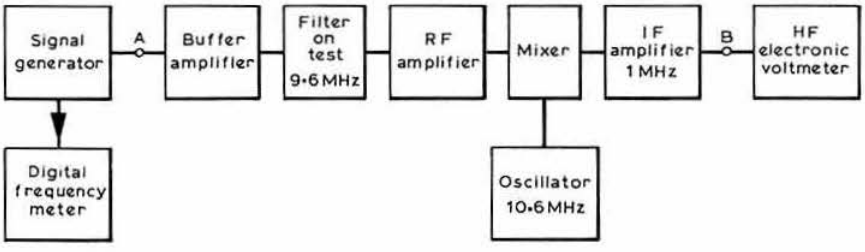


Fig 11. General arrangement of filter test set

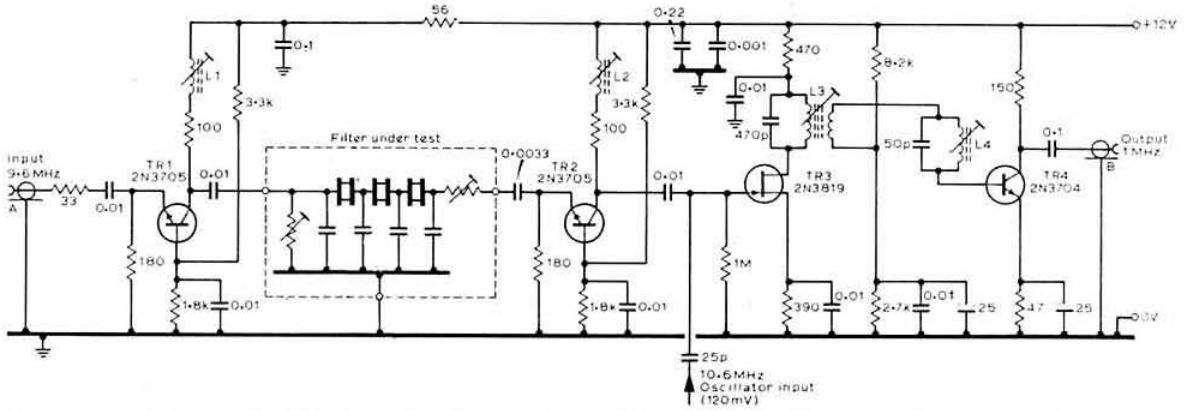


Fig 12. Circuit details of filter test set. Coil details: L1, 30t; L2, 30t; L3, primary, 62t, secondary, 12t; L4 33t; all 36swg enamelled copper wire on ¼in diameter former with iron dust core

measurements near the edge of the passband, a small adjustment of the attenuator causing the signal to disappear altogether! Now the output may be set to a level required to measure the stopbands and no further adjustments need be made to it as the frequency characteristic is measured. As the output level from the test set falls as the signal is tuned from the passband to the stopband, the rf voltmeter is switched to a more sensitive range. Having only one range switch to change considerably speeds up the measurements.

RF voltmeters

A number of rf voltmeter designs have been published [1, 2, 3]. The main requirements for the purposes of this article are a sensitivity range of 1mV-2·5V and a frequency range up to at least 1MHz.

Receiver as detector

As mentioned earlier a receiver may be used as a detector and if a switched attenuator is available a set of readings may be obtained almost as readily as when using an rf voltmeter. Fig 13 shows how the rf voltmeter has been replaced by the switched attenuator and receiver.

Tune the vfo to a frequency in the stopband and, without the filter in circuit, tune the receiver to this frequency. Now insert the filter and adjust the receiver sensitivity to give a mid-scale S-meter reading, with the attenuator set to zero. Then tune the vfo toward the passband and retune the receiver to peak up the signal. As the passband is approached it will be necessary to increase the attenuator setting in order to maintain the S-meter reading constant. Note the attenuator reading and the frequency at each point; as before, this will enable an attenuation characteristic to be plotted for the filter. Again the need for continually retuning the receiver must be stressed, because failure to do this will result in the selectivity characteristic of the receiver being plotted, rather than the filter under test!

Fig 13. Filter measurement using receiver

References

[1] "Silicon transistor millivoltmeter", D. E. O'N. Waddington, *Wireless World*, March 1966.
[2] "Linear scale millivoltmeter", A. J. Ewins, *Wireless World*, December 1970.
[3] "*Wireless World* ac millivoltmeter", *Wireless World*, June 1964. □

The Smith Chart

(Continued from p27)

+1·5*j* in series, ie 900*j*Ω which is an inductance of 10·6μH. If the idea of a pair of large coils which need weather protection is disliked, continue a further 0·35λ towards the transmitter, once more crossing the 1·0 resistance circle point J. This time the reactance is +1·5*j* and requires a series tuning capacitance of 12·7pF, eg a pair of 25pF capacitors in series, one in each wire so that the line remains balanced.

More often than not, in cases such as the last example it is preferable to connect matching components or stubs in parallel with the line. The discussion so far has given no indication of one of the most valuable features of the chart, namely the ease with which parallel/series substitutions can be made—assuming familiarity with admittance, which is the reciprocal of impedance, and use of inverting properties of the chart to effect this type of transformation (to be explained in the next article).

(6) *An antenna for 14MHz has an impedance of 40Ω, providing an acceptable match to 50Ω cable. Unfortunately only 95ft of 50Ω feeder is available and the total length required is 106ft. What will be the effect on swr if λ/4 of 75Ω feeder is used to make up the required length? Where is the best place to put it? Should it be at the transmitting or the antenna end of the 50Ω line, or somewhere in between? More 75Ω feeder is available if it can be used to advantage, and the velocity factor for both cables is 0·67.*

The electrical length of the 50Ω feeder is 2·125λ, which from Fig 8, goes from the antenna, point K to a point M on the chart, an impedance of 0·97 + 0·22*j*. Adding on the λ/4 of 75Ω cable this value must be normalized for the new impedance, multiplying by 50 and dividing by 75, ie multiplying by two-thirds to give an impedance of 0·65 + 0·15*j*. This is point M′ and fits on to a swr circle of 1·6 which is the value applicable to the 75Ω line. If it is desired to know the impedance at the transmitting end of the line, this can be found by proceeding λ/4 round the 1·6 swr circle to the point N.

Next suppose the extra length is placed at the antenna end of the line. The starting point is now 40/75 but is inverted by the λ/4 line to become 75/40 at the start of the 50Ω cable. Normalizing to 50Ω involves a multiplying factor of 1·5, bringing the resistance and therefore the swr up to 2·74 which is much higher than before and applies to most of the feeder run, whereas the previous highest value 1·6 applied only to the last 11ft.

Much time can be spent in trying to improve on the first result, since the chart allows experimentation on paper with a wide range of cable lengths and positions, but the following is a good solution. Proceeding from the antenna at 50Ω for λ/8 and then changing to 75Ω again gives point M′. After a distance of 0·476λ the point R is reached. This is a resistance of 0·63, ie 47·5Ω and re-normalizing to 50Ω this becomes 0·95, providing an swr of 1·05 in the 50Ω cable which may be used for the remaining 90ft to the transmitter. □

D • •

An active audio bandpass filter

by N. DAVIES, G8IBR*

The requirement

It is often useful to tailor the audio response of a piece of equipment to produce the minimum bandwidth necessary for communication. For example, the production of a filter with steep-sided responses from 300Hz to 3kHz can reduce the stringency of a specification for an hf ssb filter, as the two sidebands would be separated by 600Hz where almost nothing exists. Also, 90° phase shift networks are usually only 90° from 300Hz to 3kHz. A design for such a filter was produced by D. G. Haigh and R. Jeffers [1]; the purpose of this article is to show how it was adapted for amateur use.

Theory and application

Their article gave the design of an LC filter which would do the job but which would have involved winding five inductors quite accurately (Fig 1). These inductors were then replaced by positive impedance converters, the circuit of which is shown in Fig 2. If port 2 is terminated with a resistor R we can say L = kR, where L is the inductance looking into port 1 and $k = \frac{C\,R1R3}{R2}$. The values used by Haigh and Jeffers were: C, 0·01μF; R1, 300Ω; R2, 6·0kΩ; R3, 10kΩ. These give a value for k of 5×10^{-6}, but which required a modification of R3 to 9·6kΩ to remove the imperfections in the amplifiers and produce this figure. This is a method which may be accepted in thick film circuits but is not suitable for the amateur.

A positive impedance converter was built using two 741 operational amplifiers and the nearest preferred values (270Ω, 5·6kΩ, 10kΩ and 0·01μF). Its inductance was found using a tight tolerance capacitor to resonate with it, measuring the frequency and then calculating (Fig 3). The new value of k was found, the resistor values in the original Haigh and Jeffers filter were modified to accommodate this new

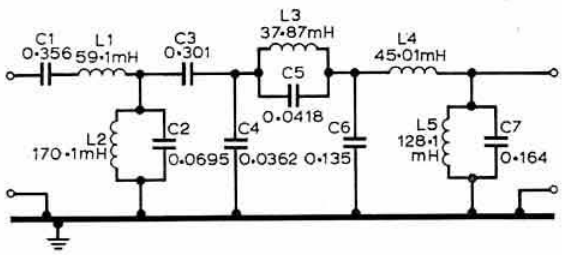


Fig 1. The Haigh and Jeffers circuit

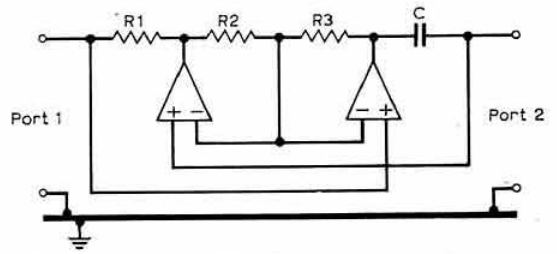


Fig 2. Circuit of the positive impedance converters used to replace the inductors in Fig 1

factor, and a complete filter was built using 741s in TO5 cans.

This filter worked but was very bulky, and an attempt had to be made to reduce it to a more practical size. A positive impedance converter was built using two amplifiers from an LM324, which consists of four operational amplifiers in a 14-pin dual in-line ic. This oscillated on its own and nothing could be done to prevent it. The next attempt using dual 741s in mini dual in-line packages, MC1458CP1s, was totally successful. The k factor was measured and found to be $4{\cdot}6 \times 10^{-6}$. From this, new values for the filter resistor were found and the design committed to a printed board layout. This came out at 2·5 by 4·25in and fitted the small ITT diecast box.

Practicalities

Because all the components for the filter are calculated values they have been made up with two in parallel. By taking the nearest preferred value high for resistors and low for capacitors, and adding in parallel the preferred value that brings the value nearest to the desired one, the final result is within one or two per cent. The resistors should be two per cent metal oxide type and the capacitors five per cent if possible. The two filters constructed had mainly five per cent capacitors with the odd one at 10 per cent and one at two per cent. It is felt that with 10 per cent capacitors the final result would still be very acceptable. Obviously the smaller of the two values can have quite a wide tolerance.

The whole filter was run on a single 12V rail with a potential divider consisting of two 120Ω resistors decoupled to earth with 1,000μF. This effectively provided ±6V for the amplifiers. The input is coupled in through a capacitor in any case, and a large capacitor is needed in series with the output. The filter requires a 600Ω source and load impedances.

The overall circuit is given in Fig 4 and the components list shows both the ideal and the practical values of components. The overall response is shown in Fig 5. The printed

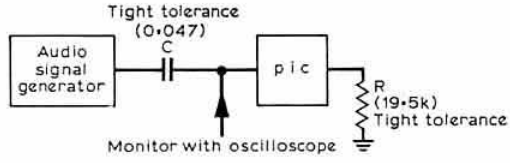


Fig 3. To determine the inductance of the pic:
(a) find peak at monitor point and note frequency;
(b) $f = \frac{1}{2\pi\sqrt{LC}}$**, calculate L;**
(c) L = kR, calculate k

*1 Jarvis Field, Little Baddow, Chelmsford, Essex.

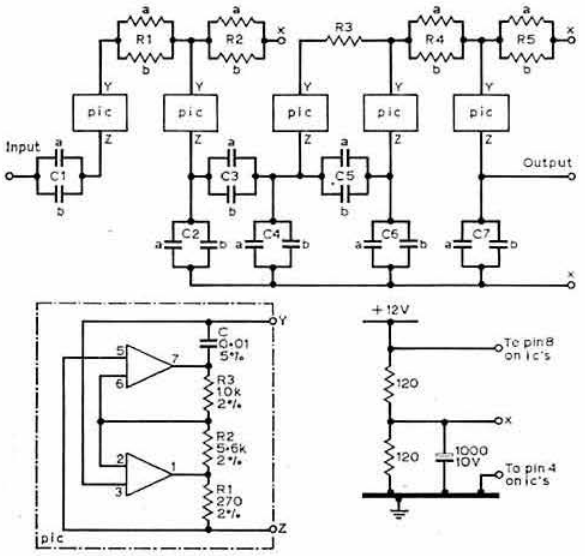


Fig 4. Overall circuit of the filter

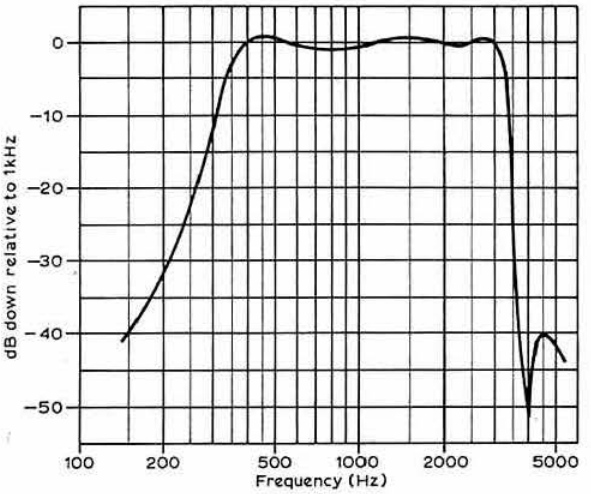


Fig 5. Overall response

board layout used is shown in Fig 6. All the capacitors were radial lead type on 0·4in centres.

Conclusion

The performance of the filter is extremely good and anyone should be able to make one work, using virtually no test equipment. The size and cost are a considerable improvement over those of a passive component filter.

Reference

[1] "The design of an audio frequency active RC bandpass filter for a specific engineering requirement", D. G. Haigh and R. Jeffers. *Radio and Electronic Engineer* August 1972, Vol. 42. □

Components list

Pic			Filter	Required value	Values used (a)	(b)
R1	270Ω	2%	C1	0·356μF	0·33μF + 0·022μF	
R2	5·6Ω	2%	C2	0·0695μF	0·068μF + 1500pF	
R3	10kΩ	2%	C3	0·301μF	0·15μF + 0·15μF	
C	0·01μF	5%	C4	0·0362μF	0·033μF + 3,300pF	
			C5	0·0418μF	0·022μF + 0·022μF	
			C6	0·135μF	0·1μF + 0·033μF	
Amplifier			C7	0·164μF	0·15μF + 0·015μF	
MC1458CP1 (Dual 741)						
			R1	12·84kΩ	15kΩ	82kΩ
			R2	36·98kΩ	39kΩ	680kΩ
			R3	8·232kΩ	8·2kΩ	not required
			R4	9·784kΩ	10kΩ	470kΩ
			R5	27·84Ω	33kΩ	180kΩ

Power supply
Pot chain 2 × 120Ω
Capacitor 1,000μF 10V

Terminations
600Ω resistors
50μF in series with output to isolate dc

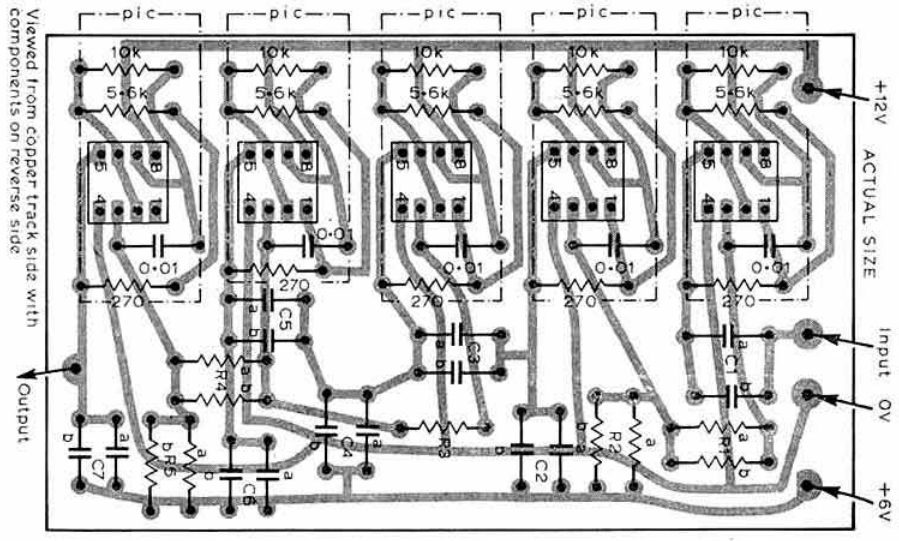


Fig 6. Printed circuit board layout

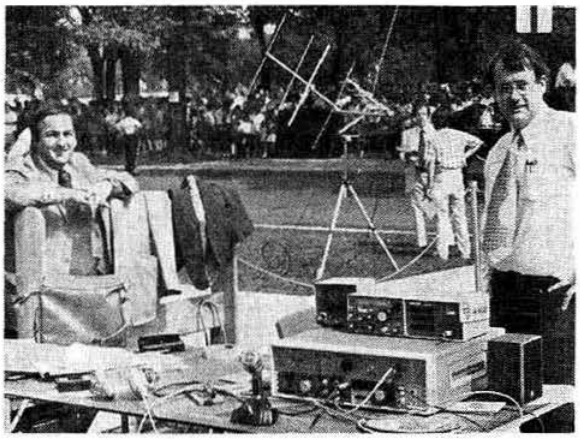
oscar news

AMSAT 1976 annual report

Membership of AMSAT during 1976, its eighth year of operation, increased from 2,366 (members and member societies) to 2,585, a growth of nine per cent.

Oscars 6 and 7 continued operation throughout the year, attaining their fourth and second birthdays respectively. Some further degradation in Oscar 7's battery is apparent, which may cause the spacecraft to shut down during periods of high Mode B use. However, there is still no indication that either satellite is approaching its end.

A number of interesting experiments were conducted with the two spacecraft during the year. The Canadian government's Communications Research Centre and NASA's Goddard Space Flight Centre independently used them for experiments to demonstrate the feasibility of using small satellites to locate downed aircraft (emergency locator transmissions).



Roy Rosner, WB4UOX, (left) and Dr Tom Clark, WA3LND, (right) with the Northern California DX Foundation prototype emergency Oscar satellite terminal used in Mode A and B satellite demonstrations at the dedication of the Smithsonian National Air and Space Museum in Washington DC. Speaking at the dedication was the President of the USA, and portions of the President's speech were relayed via Oscar 6 and Oscar 7. In the "Hall of Satellites" in the museum is a model of Oscar 1

The USA FCC granted permission for American Oscar users to transmit ASCII encoded signals through the two satellites. Stations were able to remotely access a computer in Canada via Oscar 7, and remote data collection experiments were also conducted using ASCII code.

Experiments were conducted between researchers at the University of Arizona and the National Institutes of Health, with other stations participating, in the relaying of electrocardiograms via Oscar 7, both in analog and digital form. Mobile-in-motion experiments were also conducted, and included the transmission of ECGS, simulating operation from an ambulance.

From the Technical University of Budapest telecommand station in Hungary, bulletin transmissions were made to simulate "broadcast" satellite operation to small home receivers using fm and ssb-with-carrier emissions.

Special low-power tests were conducted with Oscar 7's 432·15-to-145·95MHz linear transponder in which all users were asked to limit their powers to 10W erp. The results were highly successful, with many long-distance communications taking place between ground stations using ERPS in the 1-10W range. These low-power tests are now scheduled two days a month on Oscar 7.

The Oscar 6 telecommand stations at the University of Surrey and the Technical University of Budapest increased their effectiveness and progressed toward automating their stations. Telecommand stations in Australia, Canada, New Zealand and the USA also continued their operation.

Significant progress was made during the year on the AMSAT Phase 3 project, the development of a new generation of amateur satellites for near-synchronous and high-altitude elliptical orbits. A prototype computer was delivered for use in on-board spacecraft control, and telecommand and telemetry processing. Some associated software was also developed, including command decoding and morse code telemetry encoding programs. Analyses of the Phase 3 elliptical orbits were completed, along with detailed studies of the radiation environment. An extensive design review was held during May, with experimenters from Australia, Canada, Germany and the USA in attendance.

An operations conference was also held during May attended by telecommand station operators from Australia, Canada, England and the USA. Virtually every aspect of Oscar 6 and 7 operations was discussed, including experimental programmes, telemetry data analysis results and telecommand procedures.

Current activity

Work is continuing on the Phase 3 spacecraft prototype. The preliminary design document has been nearly completed by the AMSAT-Deutschland group, describing the design of each sub-system and the trade-offs involved. Work is proceeding on the 144 to 432MHz and 432 to 144MHz linear transponders and on identifying a source of suitable solar cells. Launch possibilities are also being explored for the 1979-1980 time frame. A suitable perigee kick motor has been located for use in injecting the spacecraft into its final orbit, and work is proceeding on the active attitude control system.

A second project, AMSAT-Oscar-D (A-O-D), is also underway. Two transponders are under construction for this mission. One is a 144 to 28MHz transponder similar to the ones now in operation in Oscars 6 and 7. The second transponder is a new 4W 144 to 28MHz linear unit developed by the Japan AMSAT Association (JAMSAT). The spacecraft structure and module housings are being fabricated by members of the Project Oscar group in California.

The AMSAT small-terminal project is also continuing under the sponsorship of a grant from the Northern California DX Foundation. The portable Oscar terminals under development are small enough to be carried by hand and cost about $1,000.

As an aid to Oscar satellite users, the Satellabe-3 Oscar orbit plotter is now in production and available commercially. The Satellabe can also be used with meteorological satellites of the NOAA ITOS series in sun-synchronous orbits. An

improved version of an Oscar 6 and 7 orbit book listing all the satellite passes for 1977 has been prepared, and is expected to maintain an accuracy within a few seconds in time and fractions of a degree in longitude.

The AMSAT-UK group has a 21 to 28MHz linear transponder under development for possible flight in a future Oscar mission, and a prototype unit is nearing completion. In Japan, the JAMSAT group has developed an engineering model of an all-Japanese amateur spacecraft, including structure, transponder, telemetry, telecommand, power regulators, and experiment control logic micro-computer sub-systems.

QRP test

During January and February 1977 a number of normally OFF Wednesday orbits of Oscar 6 will be turned ON for a special QRP test; the 144 to 28MHz transponder being turned on for as many ascending and descending node passes as possible on 5, 19 January and 2, 16 February. Stations participating in this QRP test should run no more than 10W erp and should so indicate during their transmissions. All other stations are asked not to transmit in the uplink passband of 145·900 to 146·000MHz during the test. The Wednesdays chosen for the tests fall on odd days of the year which also happen to be Mode-AX days for Oscar 7. Since the orbits of both satellites begin to overlap in January and February it has been decided that Oscar 7 will be switched to Mode BX for these tests in order to avoid confusion which might result if the 144 to 28MHz transponders of both satellites were on at the same time. The 432 to 144MHz transponder of Oscar 7 should **not** be used during Wednesday Oscar 6 QRP tests or on any other Wednesday unless so scheduled by AMSAT.

Until further notice all orbits of all Oscar 7 Mode B Mondays will be on for QRP purposes only. Stations using the 432 to 144MHz transponder on these days should run no more than 10W erp. All Mode B users are strongly urged to use as far below the maximum recommended 100W erp as possible to help to keep the Oscar 7 battery voltage above the point at which the low voltage sensors switch the transponder into Mode D, the battery recharge mode.

A-O-D launch

The ITOS-I launch has been cancelled and it is now hoped that the A-O-D satellite may be launched aboard the LANDSAT vehicle in late 1977. LANDSAT is planned for a 920km orbit and a 103min period. □

TECHNICAL ARTICLES

Technical articles on subjects of amateur interest are always welcome and should be submitted to: The Editor, *Radio Communication*, 35 Doughty Street, London WC1N 2AE.

All articles received are reviewed for technical merit by the Technical & Publications Committee, or an acknowledged expert on the subject, before acceptance. Payment will be made for all articles published.

The editor will be pleased to send prospective authors a copy of the *RSGB Style Guide* and to give any other advice and assistance requested.

EQUIPMENT REVIEW

Western PM-2000 power meter

by R. F. STEVENS, G2BVN

In the autumn of 1965 a new method of power measurement for ssb transmitters was introduced by the Post Office (who then administered the amateur service) after discussion with the RSGB. Basically this involved the application of two sine wave tones to give a mean rf output under linear conditions of 200W (on bands where the maximum dc input power was 150W) and the maximum vertical deflection from this condition was noted on an oscilloscope. When the tones are replaced by speech the maximum deflection on the 'scope should not be greater than that noted with the two-tone input. This has remained as the accepted method of determining power output for the ssb mode.

The PM-2000 power meter from Western Electronics is an instrument designed to provide accurate indications of output power between 3·5 and 30MHz when using either a.m. or ssb. It is the latter possibility that will obviously create the greatest interest. To achieve this the conventional through-line wattmeter configuration is supplemented by a peak reading voltmeter. For measurement of vswr the forward and reflected powers can be read directly from the meter and the ratio determined from a graph appearing in the instruction booklet.

When compared to a known accurate instrument at frequencies of 3·5 and 30MHz and with cw power levels of 20W and 200W the PM-2000 indications were within five per cent of the standard. Using ssb the peak envelope power was correctly indicated as four times the single tone level. A sample power meter was submitted informally to the Home Office for examination and their view was that it seemed to be quite a suitable instrument for amateur use.

Technical details

Measurement modes:	power—rms and p.e.p.; forward and reflected.
Power ranges:	0—200W/500/1000/2000W
Impedance:	50Ω
Accuracy:	7%
Power requirement:	100, 117 or 230V ac (for p.e.p. measurement only)
Connectors:	SO239
Dimensions (mm):	203 wide by 102 high by 132 deep
Weight:	1·75kg

The instrument is attractively finished in black crackle with a recessed front panel. The high power scale on the meter has a length of about 80mm and the indication is clear. Mains input and rf connections are on the rear panel.

The PM-2000 is priced at £48.60 and is available from Western Electronics (UK) Ltd, Fairfield Estate, Louth, Lincs LN11 0JH; tel: Louth (0507) 4955. □

technical topics

Pat Hawker, G3VA

THE other day, reading an excellent and informative article on optimum hf receiver design by Ulrich L. Rohde, DJ2LR (*Ham Radio* October 1976), I found myself thinking "how good is good enough?" The solid-state techniques described by DJ2LR are basically those which have gradually gained acceptance for the very highest quality professional general-coverage receivers costing thousands of pounds: up-conversion to vhf, roofing as well as selective crystal filters, elliptic filters, etc. While we would certainly not wish to deter anyone from tackling the design and construction of such an advanced receiver (though we still feel that for an hf *amateur-bands* receiver an i.f. of 9 or 10·7MHz is probably high enough and presents fewer problems) we suspect that only a handful of amateurs could or would complete such a project, although of course many will wish to understand such trends.

How good is good enough?

For many years the electronics of communications equipment has been getting progressively more and more complex and less and less within the economics (and sometimes the understanding) of the average amateur. Yet the competitive nature of amateur operating has encouraged the view that we all need "optimum" equipment. Sometimes it seems that everyone is having to run faster and faster to stay in the same place; not only ever more complex receivers and transmitters but also all the ancillary equipment to go with them.

Now if an amateur wants to buy a fully-equipped, all-mode, highly-professional station, that is his or her affair; my concern is rather that we need to reassure newcomers that they do not *have* to spend a mint of money to take any sort of active or useful part in the hobby—plus sometimes a worry that the whole hobby may eventually blow itself up by trying to become too professional, at professional prices.

Recently *IEEE Spectrum* (October 1976) devoted an entire issue to the theme "What went wrong?" presenting many of the stories behind major professional projects that never came to fruition, or ran into serious and unexpected problems in attempting to push too hard on the frontiers of knowledge: the 3D radars that proved "too big and too expensive"; the US Navy's 600ft radiotelescope for which cost estimates built up and up to over $200 million until finally the whole scheme was abandoned; the poor reliability of early cardiac pacemakers where human fluids knocked out batteries, transistors, resistors and capacitors in months rather than the calculated years; the commercial disaster of Bell's two-way Picturephone videotelephones; the "slow sad death" of evr (electronic video recording on film); the emitter-coupled-logic that was confidently expected to wipe other logic families off the electronic map; the continuing struggle to establish extremely low frequency communications with their need for hundred-mile antennas. Pages and pages of American projects that could be matched on this side of the Atlantic by Blue Streak; the murdered TSR2; the Mark V radiotelescope for Jodrell Bank; the Post Office's confident prediction in the 'fifties that it would never need cross-bar telephone exchanges but would go straight to fully-electronic switching; and of course the technologically successful but financially disastrous Concorde.

So, sure; as amateurs we need good equipment; and we need many of the latest techniques. But we also need occasionally to ask ourselves just how good is good enough. If not we risk "galloping obsolescence" and biting off more than we can chew in seeking "optimum" equipment. Then again, do we really need to eliminate manual controls and adjustments and human skills in dreaming of running our stations from microprocessors and electronic memories? After all, amateur radio is still a hobby for *humans*—not yet for computers.

Direct-reading ohmmeter

An ingenious direct-reading ohmmeter with a linear scale, so allowing a standard meter to be used without special calibration, has been described by V. Ramprakash in *Electronics* (11 November 1976). It consists basically of just a 741 op-amp, a 1mA fsd meter, a zener diode, a germanium diode to protect the meter and a few resistors: Fig 1. The meter is self-zeroing and insensitive to supply voltage variations. An open-circuit or infinite unknown resistor (Rx) "pins" the meter needle beyond fsd but the germanium diode shunt clamps the voltage across the meter to a safe value. A short-circuit across Rx (ie zero ohms) results in zero meter current.

As shown, the unit measures 100kΩ fsd but it is a simple matter to add additional ranges; this is done on the basis that Im is equal to Rx/Rc where Rc is a standard (one per cent) resistor. By switching to an Rc of 10kΩ the range becomes 10kΩ fsd, etc.

The current Im equals (Vo − Vz)/Rm where Vo is the voltage at the output of the op-amp, Vz the drop across the zener diode (in this case 3V) and Rm the total resistance in the meter circuit (in this case 2·9 + 0·1kΩ, but other meter resistances can be used if the fixed resistor is adjusted so that together these total 3kΩ).

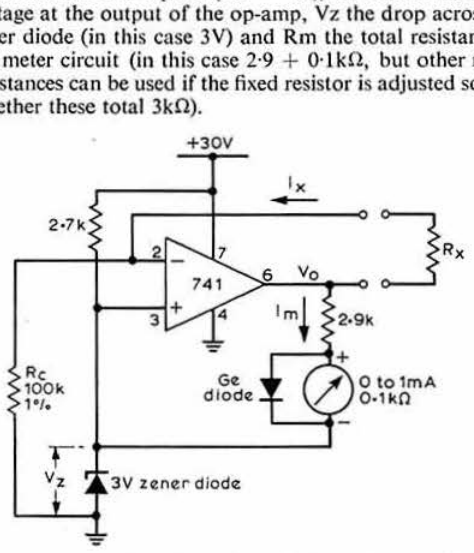


Fig 1. Direct-reading ohmmeter which needs no calibration other than the basic linear scale. The meter reading in milliamps is the value of the ratio Rx/Rc and with the values shown 1mA fsd is equal to 100kΩ. Other ranges require only switching the value of Rc. (V. Ramprakash in *Electronics*)

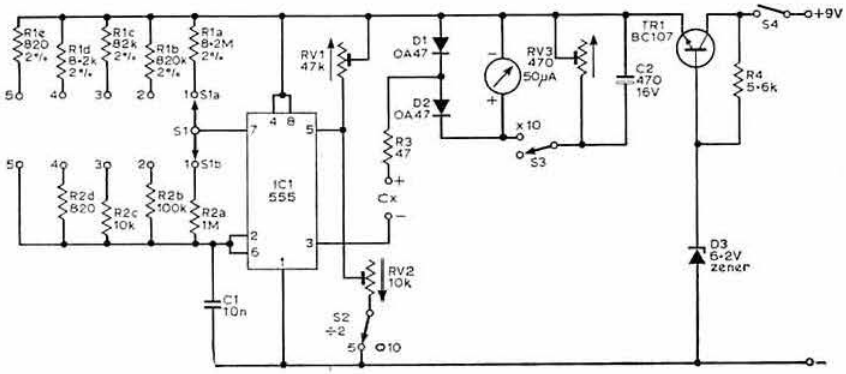


Fig 2. Circuit diagram of the multi-range capacitance meter described by Alan Willcox in *Television*. The arrows against the preset potentiometers indicate the direction of movement with clockwise rotation. This unit can measure capacitors with values from a few picofarads to about 10μF. D1, D2 OA47 gold-bonded germanium diodes. D3 BZY88 C6V2 400mW 6·2V zener diode. Resistors are 5% tolerance except where closer tolerance is indicated. Typical instrument case is RS Components type 21 and meter can be 50μA 86 × 78mm (SEW MR65P, Laskys)

If Rx is short-circuited, Vo automatically rises to 3V and no current flows through the meter. A possible problem might arise from the temperature co-efficient of the zener diode but altogether this seems an attractive little test unit.

Direct reading capacitance meters

Some years ago details were given in *TT* (and can still be found in *ART*) of a simple capacitance meter in which the output from a crystal oscillator is passed through the unknown capacitor and the output rectified and measured. This was intended for capacitor values up to about 2,000pF, and subsequently G3GRF pointed out how the same unit could be used to measure low values of resistance and inductance.

A rather more flexible, if more complex, direct-reading capacitance meter has been described by A. Willcox in *Television* (May 1976), suitable for values of a few picofarads up to about 10μF. In the August 1976 issue of *Television* the same author described a second capacitance meter, based on slightly different principles, covering from 10 to 4,000μF.

The basic principle of the first unit (Fig 2) is to charge the unknown capacitor to a fixed voltage (4·5V) and then to discharge it into the meter circuit; the average current is directly proportional to the capacitance: the whole process being continuously repeated by the astable operation of the 555 timer ic. The meter needle remains steady, although some vibration can be observed on the higher capacitance ranges. The unit (which draws only 3mA battery current) delivers unidirectional voltage to the capacitor under test; this means that the unit can be used to measure polarized capacitors, such as electrolytics, and it will also cope with reverse-biased semiconductor junction capacitances which can be a useful guide to the f_T of an unknown transistor.

To avoid overloading the meter movement, large value capacitors should not be connected with the range switched to a low capacitance range: it is therefore useful to arrange the switch so that one starts at the highest value range, rotating the switch clockwise until reasonable deflection is obtained, and the value read off.

The five S1 positions give fsd ranges of 1μF, 0·1μF, 10nF, 1nF and 100pF. S3 provides a "× 10" extension, for example providing up to 10μF on the 1μF range. S2 is a "divide-by-two" facility, providing fsd ranges of 0·5μF, 0·05μF etc. The 50pF "divide-by-two" range is unlikely to be accurate, but it does allow estimations of values down to 1 or 2pF.

The unit (Fig 3) for electrolytic capacitors functions by supplying a constant charging current to the unknown capacitor and then measuring the voltage attained after a specified time determined by the 555 device. RV1 is adjusted to provide 2mA through the test terminals. In this case the

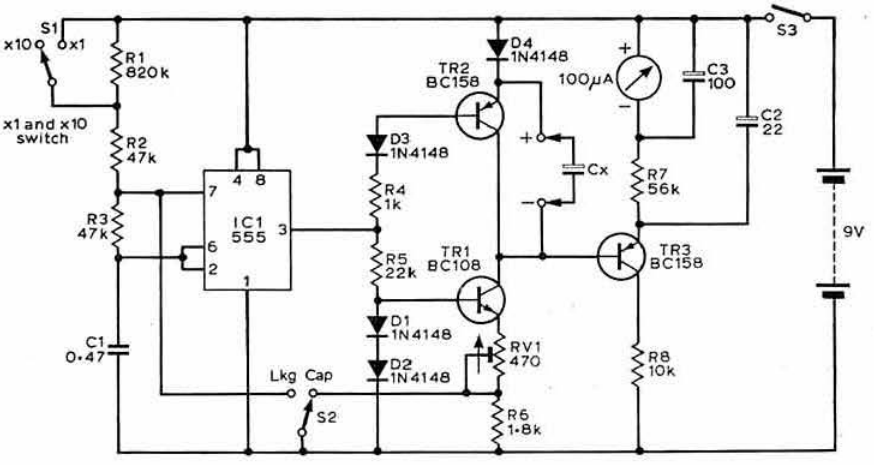


Fig 3. Circuit diagram of the *Television* electrolytic capacitor tester for measuring values from 10μF to about 4,000μF. R1, R2, R3, R7 should be 2% tolerance, other resistors 5%. C1 0·47μF polycarbonate; C2 22μF tantalum; C3 100μF tantalum. D1 to D4 1N4148 or similar silicon diodes. Meter 100μA 86 × 78mm (SEW MR65P, Laskys etc). Suitable case is Type 21 RS Components. To calibrate connect 1kΩ 2% resistor to test sockets and adjust RV1 until meter reads 30μF with S2 in "Capacitor" position. If tolerance of timing components is in doubt it may be better to set RV1 using standard 10 or 100μF tantalum capacitors which are usually reasonably close to nominal values

capacitance calibration is not linear but is in the usual "ohmmeter" form; however, the "leakage" facility does provide a linear (20kΩ) ohmmeter range. Capacitors smaller than 10μF can be measured by connecting them in parallel with a 10μF "reference" capacitor, although it will be appreciated that this unit is intended as a companion to the lower-value multi-range unit.

The original articles on these two units ran to seven-and-a-half pages and included a full description of the way the units function as well as constructional details, but it is hoped that these very brief notes will at least draw attention to ways in which the 555 timer ic (NE555V, MC1445P, LM555CN etc) can be used in simple test meters.

Electrical safety regulations

TT (October 1976) noted safety guidance stemming from ZL2TBH in New Zealand. This stimulated John Haydon, G3BLP, to comment that most of the guidance was basically in line with the main UK safety standard BS415 which has a number of important amendments. This in fact is now a tougher specification than the international IEC65, though eventually both standards should come into line as a result of EEC rationalization. G3BLP also mentions some instances where he has come across imported equipment that does not appear to meet this standard.

Local manufacturers face particular problems in meeting BS415 in respect of mains switches and mains transformers, both in effect requiring approval at the BSI test facility at Hemel Hempstead, with the result that new safeguards have been incorporated in these components. G3BLP notes that BS415 appears to go farther than New Zealand in defining "live" points with the warning note: "the maximum current of 0·7mA (peak), while safe, is within the perception range of some people. Under some conditions where a comfort limit is desired, a value of 0·3mA (peak) should be used".

While all of us must support efforts to improve electrical safety for the ordinary consumer, there is perhaps some danger of going too far when it comes to amateur equipment. For instance, few people yet seem to be aware of the recent coming into force (at the wholesaler and retailer levels) of *The Electrical Equipment (Safety) Regulations 1975* covering mains-operated domestic radio/tv equipment, etc. This covers, in very general terms, goods held in stock for sale, including both new *and secondhand* items. The regulations call for equipment to be safe, from the aspects of (1) electric shock; (2) excessive heat; (3) harmful radiation; (4) emission of toxic gases, and (5) certain mechanical hazards. It requires that warnings in English be provided "where it is necessary for the safe operation of the equipment . . . that the user should be aware of any particular characteristic of the equipment".

An associated *Administrative Guidance Document* (Dept of Prices and Consumer Protection) has also been issued. This does not have the force of law but can be quoted in legal actions brought under the regulations. This document draws specific attention to BS415:1972 (up to and including Amendment 4). Taken together this would suggest that dealers may find it advisable to ensure that all their goods comply with BS415, or they could be at risk from actions brought by customers suffering injury, including any arising from modifications carried out by original owners, or during any refurbishing in the retailer's workshop, of British, surplus and imported equipment.

I do not pretend to know to what extent (if any) amateur radio equipment falls within the scope of this new legislation (though it will be remembered that for VAT purposes much amateur equipment *does* count as consumer equipment). But if it does, then it could conceivably play havoc with the secondhand market and possibly with imports. There can be very little old equipment that fully meets BS415 with its tough amendments. And what is the position of the amateur who occasionally disposes of equipment through "Members Ads"? I can see us ending up with a need for a monthly column of legal advice!

Antenna round-up

Both G. R. Thomas, 5B4CA, and Gian Moda, I2SWX, were rather surprised at the comments on the double-bazooka/coaxial dipole based on the long article by Walt Maxwell, W2DU, in *Ham Radio* (August 1976). Both these users of this system send along notes, swr measurements or Smith Chart diagrams to underline their own feeling that this is a useful approach that should not be condemned. My own feeling is that probably everyone is right: the W2DU article, as I read it, reflects a concern that there have been some over-strong claims made for this system (not, I hasten to say, by 5B4CA in the August *TT* item) and that the extra bandwidth can be achieved in other ways rather more cheaply and with fewer problems. Certainly I hope that my facetious "don't" comment is not taken as suggesting that the double-bazooka does not work: there is plenty of evidence that it can result in a somewhat broader bandwidth—the argument is whether there are not simpler ways of doing this.

Bernard Howlett, G3JAM, was interested to see the antenna "shaped like a football goal" (*TT* October 1976, Fig 3(a)) although he is not entirely happy at it being called a "half quad". He recalls that he tested a similar configuration on a 600MHz model table as long ago as 1950, and subsequently used one on 3·5MHz when he obtained his licence: two earthed 30ft vertical sections and a 60ft horizontal section running over the house, windom fed. However, he soon found that due to electrolytic action causing rapidly increasing earth resistance it worked better without the earthing, with voltage points at the ends. On 1·8MHz the wire was earthed at one end and shunt fed one third from this end. By changing the earthed end, reversible directivity could be obtained and the system proved very satisfactory. His original experiments had been to show that a normal dipole with current at the centre could be successfully "inverted" to have the voltage at the centre.

Incidentally the "normal" rather than the "inverse" configuration turned up recently in a note by C. M. Wintzner, F0AXP in the German magazine *QRV* (No 9, September 1976); Fig 4.

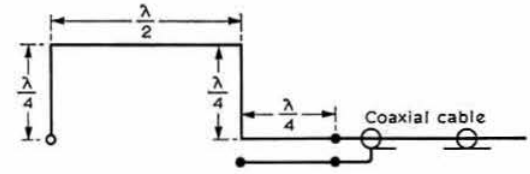


Fig 4. An "up-over-and-down" antenna described by F0AXP in *QRV* and representing the "inverse" of the grounded system mentioned in the October 1976 *TT*

Inverted-V and Chireix-Mesny

This conveniently brings us to another form of "long-wire" antenna that is closely related to the Bruce form of inverted-V but has been largely forgotten: the Chireix-Mesny antenna. This was developed originally as an alternative to the Marconi-Franklin beam arrays made up of large numbers of vertical dipoles, parallel to one another. In the Chireix-Mesny array the $\frac{1}{2}\lambda$ dipoles are disposed in the form of saw-teeth, rather like a series of 2λ quad elements. This has the advantage over the Franklin that each dipole element may be driven directly by the one preceding it. Fig 5(a) shows a large Chireix-Mesny array which would require vast space for hf but might well be worth investigating for vhf or uhf. From the point of view of the radiated field, such a sawtooth network is equivalent to an array of parallel dipoles. Fig 5 (b) forms the basis of the "zig-zag" antennas used at vhf/uhf for television broadcasting,

Ted Cook, ZS6BT, points out that a 90° inverted-V (Fig 5(c)) consisting of two $\frac{1}{2}\lambda$ elements is, in effect, an elementary form of Chireix-Mesny array and can be fed as in the up-over-and-down configuration of Fig 4 to form a vertically-polarized monobander (the system would work on the harmonic bands when voltage fed but it would no longer be a Chireix-Mesny arrangement).

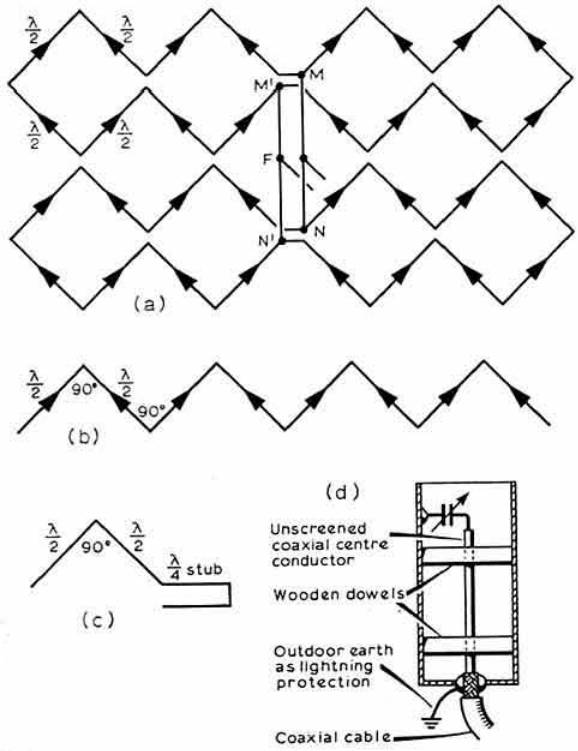


Fig 5. (a) A large Chireix-Mesny array of half-wave dipoles arranged in saw-tooth configuration and providing vertically-polarized signals with broadside directivity. Such an array might have applications at vhf or uhf. (b) Simplified Chireix-Mesny array which can be end fed. (c) Showing how the saw-tooth configuration reduces to a 90° inverted-V as used by ZS6BT. (d) The ZS6BT gamma-derived stub match (*TT* August 1974) provides a convenient means of connecting a coaxial-cable to the quarter-wave stub (it would also be suitable for use with the antenna of Fig 4)

He has been using two such arrays: one on 14MHz and the other (with a V reflector spaced $0{\cdot}1\lambda$) on 28MHz. The performance of the 14MHz antenna, he finds, is roughly similar to a *half-wave* vertical, but appears to be less noisy and less prone to fading. On 28MHz his system forms a vertically-polarized broadside beam. The wires can be supported by a single mast (preferably not a metal one) or hung below a horizontal wire antenna.

By using his "stub match" (*TT* August 1974) he achieves perfect matching without disturbance of the phase.

In all end-fed "long-wire" arrays, the dipole sections closest to the feed-point radiate rather more power than those farthest away, leading to a degree of asymmetry in the radiation patterns. This is well illustrated in *ART* where a considerable number of long-wire patterns are presented showing the effect of feedpoint on radiation—a factor (as Hector Cole, G3OHK, has recently pointed out to me) often ignored in the standard radiation patterns shown in the handbooks. It is the reason why really long "long wires", such as the Beverage, do not need a terminating resistor since by the time the wave reaches the far end virtually all the power has been radiated. It also means that the impedance at the end of a multi-band long wire reduces at the higher frequencies, although this can be taken care of in most matching networks.

Speech processor switching

From N. Hoult, G4CIK, comes a method of automatically switching a speech processor unit to reduce battery drain and at the same time providing protection against the wrong battery polarity, using the push-to-talk (ptt) line; it has low voltage drop (less than 0·5V in the prototype). It was originally designed for use with an FT101B transceiver and Datong clipper but should have general application provided that the speech processor and the battery supply to the transceiver relays both have negative earth. G4CIK writes:

"Circuit operation is as follows (Fig 6): with the clipper battery connected the correct way round, the clipper switched *on* and the ptt *released*, TR1 is cut off and no power reaches the clipper (TR1 is a silicon device and has very small leakage current); R2 diverts any current away from the emitter-base junction, preventing it from being amplified by TR1. When the ptt switch is depressed, diodes D1 and D2 conduct, operating the transceiver relays and turning TR1, and hence the clipper unit, *on*. C1 and C2 suppress rf pickup on the ptt leads (a problem on vhf with the prototype). If the transceiver does not already have a diode connected across its

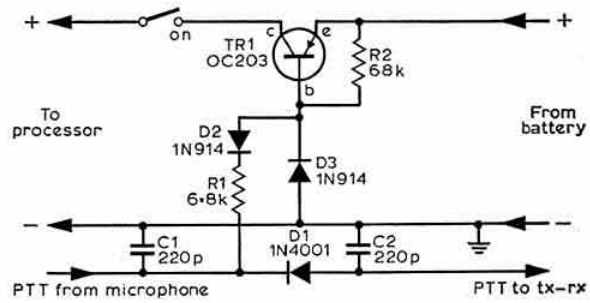


Fig 6. G4CIK's speech processor switching/polarity protection unit with battery correctly connected

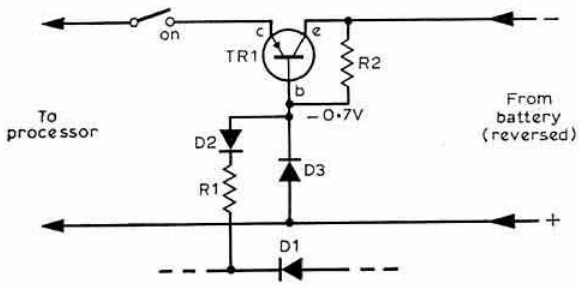


Fig 7. What happens if the battery is wrongly connected. Note that the transistor symbol is drawn to indicate operation and not actual leads of the "symmetrical" device

changeover relay, it would be advisable to add one to protect TR1 from switching spikes. It will be seen that with the clipper battery correctly connected, the circuit provides a simple switch with a drop of $V_{ce(sat)}$ (ie about 3V) in the *on* position.

"Should the battery be reversed, the circuit is effectively as shown in Fig 7. Since TR1 can be regarded as symmetrical the collector and emitter have been interchanged to illustrate the operation. TR1 acts as an emitter follower and, as its base is clamped at about −0·7V by D3, the output voltage is virtually zero regardless of the position of the ptt switch.

"The circuit thus provides both switching and polarity protection with less voltage drop than a conventional series diode. D1 prevents the clipper from being switched *on* when the transceiver is turned *off*. This does mean that the device works only on ptt mode and it will not work on vox etc.

"The only critical component is TR1 which must be one of the older type of diffused silicon transistor rather than a modern planar type. However this includes transistors having V_{be} and V_{cbo} ratings of above 12V (eg all the OC200 series except the OC202). D4 must be capable of handling the relay currents (ie a 1N4000 series device is preferable to a 1N914); otherwise the components are non-critical."

Hum notch filter

In theory, of course, it is better to eliminate hum at its source —but we have all come across the receiver or other piece of equipment that has a hefty 50 or 100Hz component in its output which is particularly troublesome when using headphones in circumstances where full hum elimination may not be possible. In *Amateur Radio* (August 1976) Ron Cook, VK3AFW, provides a filter that he says can put a sharp 40–60dB null into the audio output without the need to modify the receiver itself in any way. With close-tolerance

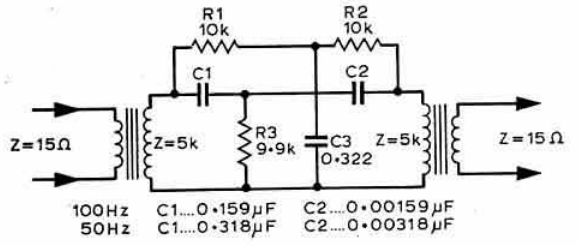


Fig 8. VK3AFW's hum notch filter

capacitors (carefully trimmed either by shunt capacitors or possibly by the technique of grinding or filing down the value of ceramic disc capacitors) the null can be placed at either 50 or 100Hz: see Fig 8.

Duo-band "bow-tie" beam

Ken A. Taylor, G4EEC (who passed his RAE in his 70th year and his morse test in his 71st!) sends along details of a duo-band system for 14 and 21MHz based on the VK2ABQ mono-band "bow-tie" described in *TT* September 1974. He comments:

"For an old man, the VK2ABQ X-type tribander seemed a bit too difficult to construct and handle on my own, but it seemed within my powers to make a bow-tie for two bands as shown in Fig 9. It performs very well despite adverse conditions here.

"The location is surrounded by parkland with huge beech and redwood and other forest trees all within about 100 yards, although there is a small gap to the west. Though about 150ft above sea level, it is not possible to hoist the antenna higher than 16ft but it has given good results into the USA and Canada on both bands with 200W p.e.p. ssb. It has stood up to some high winds and the cost was very low as befits an 'oap'. I avoided the original 'wood and nails' construction outlined by Fred Caton and used six varnished canes for spreaders clamped to the 2 by 1in timber by vee clamps of dural sheet with rustless screws (two 1½in long clamps per cane)". Other construction details will be found in the caption to Fig 9.

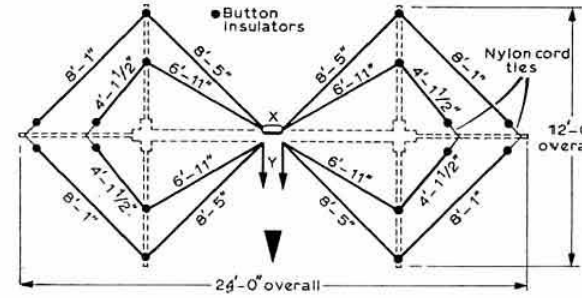


Fig 9. Two-band (14 and 21MHz) "bow-tie" antenna built by G4EEC and based on the VK2ABQ mono-band design (*TT* September 1974). Main support beam is 2 by 1in varnished softwood with 18 by 2 by 1in crosspieces and spreaders of 6ft varnished canes. Note that the loops were tuned with a single turn coil at Y against a gdo by folding back the wires where the nylon ties are indicated and altering the tie lengths to suit. Wire size is 18swg enam for outer loop, insulated pvc flex for inner loop. Point X egg insulator as anchor point for centre of loop. Point Y feed point for 50Ω coaxial feeder (no balun was used). Length of loop for 14MHz 33ft (swr 1·2:1, 14·15 to 14·275); 21MHz 22ft 1in (swr 1·15:1 for 21·2 to 21·3MHz). Height of antenna at G4EEC is only 16ft

Another "two-element" technique that makes use of the "phase centre" concept rather than fixed spacing is the use of a vertical mast radiator with a sloping wire running up to the top of the same mast but insulated from it. While such a system does not give very high forward gain it can put a useful notch in the backward direction. Such a system is used by the IBA for the Pennine Radio station (1,277kHz) at Bradford and also as a reserve antenna for the London stations, which normally use a four-mast directional array simultaneously on 1,151kHz and 1,546kHz.

Light(e)ning the risks

Almost 33 years ago, during the final days of the Normandy campaign, when there seemed to be a thunderstorm every evening, a fellow amateur was up on the roof of our signals van re-connecting an antenna when suddenly there was a terrific crack and simultaneous flash. Fortunately it was a near miss and he came down, shaken but unhurt. But since then I have always had a sneaking feeling that lightning is not just a mythical risk, particularly when operating radio in isolated places, though fortunately far less so in the UK than in such countries as Australia and South Africa.

If you are not put off by a touch of the macabre, a detailed paper on "Death by lightning" by Dr R. H. Golde and Professor W. R. Lee *IEE Reviews*, October 1976, provides a cool assessment of the risks and some simple ways in which these can be reduced.

The authors show that while the number of deaths from lightning has been steadily going down, the fatalities among hikers, climbers and other outdoor enthusiasts has increased notably over the past 25 years: a fact that should not be forgotten by those who like to operate /P from high places. And about two or three people are injured for every fatality.

The paper examines in considerable detail the medical aspects of electric shock from lightning and notes that the usual forms of resuscitation etc can be applied, often successfully. It also points out that many young lives could be saved if some simple precautions were taken. These seem worthy of wider circulation:

"An upright person acts like a lightning conductor, and thus attracts a lightning strike over a distance which, as a first approximation, is proportional to the square of his height above the ground. It is, therefore, much safer to squat down than to stand up or, worse still, stand on top of a vehicle or structure. To increase one's height by carrying an umbrella, held upright, is foolish, better to get wet than killed (*ie get an ungrounded mast or whip antenna down—G3VA*). Swimming in a thunderstorm is dangerous, but a sailor in a boat with a metal mast can be readily protected by proper bonding of the mast and the rigging to a metal keel.

"The risk of side flashes must be avoided by keeping a distance of several feet when walking or standing in a group, by not standing near the trunk of an isolated tree and by keeping away from large metallic objects, both indoors and outdoors. Tents can be readily protected but, in any case, it is a wise precaution to keep the greatest possible distance away from the tent pole and the wet fabric. When standing, feet should be kept together and, when squatting, the knees should be drawn up closely to reduce 'step voltages'.

"Whenever possible, shelter should be sought in an all-metal vehicle or in a building."

Lightning and equipment

The main worry for most amateurs however is the damage that lightning can do to equipment. R. C. Marshall, G3SBA, has drawn my attention to an article "Lessening lightning's effects" by A. K. Guthrie (*IEEE Newsletter of the Vehicular Technology Group*, July 1975). This emphasizes that "all lightning strokes are not created equal" and that "equipment survival" protection can usefully be based on catering for the more frequent less-powerful discharges, even if these cannot guarantee protection against the occasional truly-massive stroke. Remember, although the currents can be fantastically high their duration is brief: typically reaching the crest current in 2μs and decaying to 50 per cent of this value in about 40μs.

Equipment is often connected to antennas by coaxial cable which unfortunately represents a good solid conductor. Any protection is, in effect, a *filtering* process: every ampere taken to earth through a shunt path is one less reaching the vulnerable equipment. The policy, the author suggests, should be *shunt*, then *isolate*. In other words, having made the shunt paths to ground as attractive as possible, the route into the equipment should be made unattractive by adding isolation, in the form of impedance.

To summarize briefly some of his advice:

Shunt techniques: use an antenna with directly grounded elements; solidly bond the grounded portion of the antenna to the grounded support structure (paying special attention to outriggers); optimize tower grounding—ground until you run out of ideas or money; ground coaxial cable shield to the tower at point of takeoff (essential when jacketed cable is used); add auxiliary grounds to transmission line as convenient (especially at supports and building entries).

Isolation techniques: bring the coaxial cable off the tower with the minimum bending radius permitted by the specification of the cable; introduce as many right angle bends in the cable run as you can; route cable through conduit; wind semi-flexible cable into a coil of several turns of any convenient diameter near the entry into the equipment cabinet.

Equipment: To deal with the surge that does reach the equipment, the cabinets should be effectively grounded with heavy gauge leads (eg No 6 awg). Earth leads to offer a good path should be short, fat and as straight as possible (large radius curves if a change in direction is necessary); in the clear (to avoid mutual inductance effects) and not in conduits or close to other conductors. Finally bring the coaxial cable into the cabinet alongside the earth lead, binding the outer core to the earth wire at the cabinet entry.

It is worth noting that virtually all antenna elements can be grounded (eg plumber's delight techniques or by means of stubs) and this is a precaution that is particularly important in lightning-prone areas. Remember that high broadcast antennas and professional communications stations are designed to survive direct strikes—including even the more vulnerable semiconductor transmitters.

Revitalizing ni-cads

A word of thanks to all the many readers—including G8KIS, G3WGN, GM4ENF, G2DRT, G8EWX, G3OAG, G8DPS and G5VO—who commented most knowledgeably on W1CER's suggestion of using potassium hydroxide to revitalize ni-cad batteries. Almost all agreed wholeheartedly with BRS24568 ("Your Opinion", July 1976, p537) that the chemical needs careful handling. Further, as Dr Binns, G8EWX, points out, the American hint was probably intended for large ni-cad batteries with screw-on caps and not British ni-cads which are mostly of the sealed button type. To sum it up—this is clearly not a tip for this side of the Atlantic—and if they are wise our American friends should handle this stuff with care and keep it well away from their eyes—otherwise instead of a revitalized battery they will have a medical emergency! □

4-2-70

Graham Knight, GM8FFX*

A station's true performance

Remembering that much of what is recorded in these columns relates to individual station achievement (often in conditions which the professionals would regard as impossible) it may be no bad thing to start this new year by listing those stations which have attained the ultimate in operating proficiency by earning themselves the RSGB Four Metres and Down Supreme Award. Since the first Supreme Award was made to G3MCS in 1970 a further 15 have achieved the gold label status. They are G5NU, G3ZYC, G3COJ, G4BEL, G5DF, G3DAH, G3ZMD, G3NHE, GD2HDZ, G5UM, G3XBY, G3JXN, G3EHM, G3BW and G3OHC.

It will be recalled that in the report of Council (*Radio Communication*, November 1976) the view was expressed that the decrease in the number of FMD certificates last year was due to the increasing use of repeaters. It is stating the obvious, though the point may need reiterating, that working a station in Kent via GB3PI from Norfolk, is not working Kent at all, but Hertfordshire where the repeater is sited. Working a station by proxy using a repeater is no measure of a station's true performance.

This is in no way to denigrate repeaters, which *within their limitations* have their uses, but to suggest that during the coming year more effort be put towards achieving real dx by direct station-to-station contacts, with their greater personal satisfaction and as their end product a well-deserved FMD certificate.

To further encourage direct contacts this column will in future include a table headed "Real DX 1977" which will record the best dx contacts made this year on each of the 70, 144, 432 and 1,296MHz bands. As what constitutes the best dx in January is vastly different to the best dx in December, there should be a changing pattern in the callsigns and distances recorded throughout the year.

Meteor scatter

G3CCH at Scunthorpe continues his weekly skeds with SM3BIU and SM5EJN with considerable success. John is working on a new 40-element array for ms work.

G3POI in Kent has worked the following stations by ms during the last few weeks: I3LGP, OE5JSL, UR2RX, SM2AID in QRA square LZ, YU2CBM in QRA square ID, and Clive's best dx during the year—UB5WN in QRA PK52J. This station is well into the Ukraine at an amazing distance of 2,113km.

LZ2NA participates in a vhf net on 14·320 on Saturdays and Sundays between 1200 and 1500gmt and is often heard arranging contacts on this frequency.

FM dx

GM8FFX, Aberdeen, worked G4DHA, G4AUP, G8LBC, all in Cornwall; G8CKZ, Southampton; G8BKR in Bristol; G8JHL in Manchester; G8FQO in Surrey; PD0ATR and DB1XI on nbfm. No other fm dx reports received.

*PO Box 49, Aberdeen.

DX news

An extremely high barometer reading of 1,042millibars on Thursday 18 November heralded spectacular openings on both the 144MHz and 432MHz bands. The good conditions continued to the weekend, with pronounced ducting from the south-west to the north-east. Colin, G3XCS, and Ian, G4DHA, both in Saltash, were among the many stations in Devon and Cornwall to work LA6HL in Stavanger on 144MHz ssb. During the same period GW4CQT, near Cardiff, GW8BXQ in Pembroke, G8LUF in Winchester and G4LZC in Poole were all working several GI, EI and GM stations.

Harold Meezra, BRS34348, at Chatham, stuck to 432MHz for the opening and was rewarded with more than 50 stations heard in three hours. Outstanding signals were GM8DMZ/P, GI8KIA, GI8HXY and GI8EWM. From GI8EWM comes news that Steven worked more than 30 stations with his 10W of ssb from a Modular Electronics transverter. He reports 70cm activity from GI8KIA, GI3RXV, GI3JLA, GI8DMX, GI8LDM and GI4EIZ along with EI5P and EI8BZ in Dublin, EI6AS in Co Tyrone and EI9D in Co Wicklow. Almost all these stations were worked by G3VPK in Essex, who seemed to have a pipeline to the west.

G8IXN in Camborne near Redruth, Cornwall, worked SK6AB and SM6HYG on 432MHz ssb. SM6HYG was in QRA square FS58F located 100km north of SK6AB in Gothenburg, Sweden. It is particularly interesting to note that although the Chalmers University Group at SK6AB were running high power to a special bay antenna of eight phased 46-element beams, their signals were weaker than those of SM6HYG.

Carl was running 10W from a Microwave Modules 144 to 432MHz transverter to a single antenna. Due to the selective ducting he was able to exchange 5 and 8 reports with Keith while Tor, at SK6AB, was S5. Perhaps Keith's QSO with SM6HYG is a new record from England.

Four metres

EI4CB, Dublin, continues to be active on both cw and ssb. Dec is intrigued by the fact that 19 of the stations taking part in the 70MHz open were using at least five-element antennas and three had nine-element beams. GD3UMW remarks on a recent visit to the mainland when he was astonished at the level of fm activity around 70·5MHz. G3ZEM and G3YUV, both in Cleveland, are building transverters for 70MHz and should be popular with the county hunters. GM4AOR, Edinburgh, reports hearing GB3SU at S7 on 19 November. The only station Ken worked was G4DZU near Leeds with 599 reports both ways.

A.M. revival

A considerable revival of interest in a.m. has been noticed over the last few months. More than 20 stations are active in the Edinburgh area alone and there are large numbers around Newcastle and Middlesbrough. G6WR is an excellent signal on a.m. from Whitehaven leading a group in Cumbria. Indeed a recent mobile trip from Scotland down the east coast to London and back via the west revealed there is almost always an a.m. QSO on 144MHz no matter where you are located in Britain. As a number of OK and SP stations were worked on a.m. last year perhaps it is not yet time to sell the UM4 transformers.

Beacons

The Durham beacon is active again with a new callsign, GB3NEE (North East England), on 144·935MHz. The transmitter is running 50W erp beaming north and south and has already been heard in Sweden and France. At the time of writing, the keying has a slight ripple but it is good to have this old friend back on the band.

The Home Office licence has now been issued for three beacons at the Redruth, Cornwall site. GB3CTC will be the callsign used on all three beacon frequencies of 70·675, 144·915 and 432·970MHz. During the 20 November lift the signal from the new beacon on 144·915MHz was reported at S7 in Stavanger.

GM3ZBE has almost completed the beacon GB3LER. It will be installed at Lerwick in the Shetland Islands and will be on 144·965MHz. Two eight-element beams will be used, one firing north-east for aurora and the other beaming to the south.

From G8IZS comes news of CT2BK on 144·057MHz from the Azores. Dave, the beaconkeeper, is well known to Oscar users as CT2BS.

The G8BCL-G3TQA team who gave us GB3EM on 432·910MHz is now setting its sights on 1,296MHz and thinking about GB3MLE. More details later.

The grape-vine

GI3TLT the beaconkeeper at GB3GI is thinking of one for 432MHz . . . . . G3ZIV has almost completed his 1,296MHz ssb rig . . . . . G8LBC recently drove from Plymouth to Carlisle by a special route so Colin could work via all 144MHz repeaters . . . . . G8FUF up to 400W on 432MHz ssb . . . . . GB3CS set back by a power supply failure . . . . . Wrong that the talk-in at Leicester stayed on the fm calling channel for the best part of three days . . . . . G4CXL/M now running 400W . . . . . PA0VV has worked over 1,500 British stations . . . . . G3NSM has received cards for 144MHz from UA1-113191 in Archangel and UC2-0078 in QRA PM45E.

Aurora

The winter's season got off to a slow start on Sunday 31 October, the short-lived 30min event beginning at 1600gmt. GM3ZBE worked several Norwegian and Swedish stations on the key. GB3VHF could be heard via the aurora but no G stations were contacted. No second phase appeared and no visual aurora was observed from Alex's site 15 miles north of Aberdeen.

Exactly one week later on Sunday 7 November, stations in the north-east of England reported auroral contacts in the afternoon. G3USF at Keele University is mystified by this "phantom aurora" at a time when no out-of-the-ordinary solar activity was recorded. He would be pleased to hear from stations who logged auroral contacts on that day.

A visual aurora was observed by GM3ZBE on Thursday 11 November but no radio event occurred.

"Firsts" and "longests"

Following recent observations in *4-2-70* about metre-wave records, it is now possible to add that: on 1,296MHz on 17 August 1976, the believed first contact between Scotland and Sweden was made when GM8BJF of Edinburgh worked SK6AB. The path distance was 933km, which itself may constitute a further UK record.

Contests

The 144MHz CW Contest was well supported and conditions were fairly good with many stations working distances of over 600km. G3NNG/P, Surrey, had 40 contacts at 2000gmt while G3YYF/P, Hastings, was near to 50 at midnight. Just before the contest ended GW3WOH/P at Beacon Hill was at 65 QSOs.

The 432MHz Cumulatives finished off in great style as they coincided with the 20 November opening. Paul, G8AGU, operating portable near Okehampton in Devon, worked more than 50 stations including three in Scotland and one in Sweden. G8LOW/E at Matlock, made 52 contacts while G3VPK in Essex worked over 60 including many GI stations. GM8DMZ/P, Mull of Galloway, reports huge pile-ups during the contest. Alex was on his first-ever outing on 432MHz and could not believe the 5/9 signals from all over the south of England.

The 144MHz Fixed Contest took place on 5 December and again activity was at a high and sometimes hectic level. Conditions were good for so late in the year. G3POI in Kent, G8LUF (Winchester), G6YB/A (Bristol) and G8HQJ (Sussex) were all loud signals at Aberdeen during the contest. Vicky, G8HCL, at Weybridge, was at 206 contacts by 1600gmt.

Awards

Outstanding among the latest FMD certificate allocations to be reported by the vhf awards manager is the achievement by G3OHC of Sutton Coldfield of the coveted Supreme Award, obtainable only after securing three Senior certificates or two Seniors plus one 23cm Standard. Graham submitted a claim for the 432MHz Senior No 31 which, added to the 144MHz and 70MHz Seniors which he already held, automatically qualified him for the Supreme. In his opinion the 432MHz Senior was the easiest of the three to obtain: "It took only five months to get the nine countries and 40 counties and another five to get the cards, though I had to resort to direct cards with a begging letter for the last half dozen or so. When 70cm was open last July and August, contacts with dx were far easier than on 144MHz."

Another unusual award was that made to G4BYV for achieving 3 plus 20 on the 1,296MHz band, earned by consistent and methodical operation from his Norfolk site.

Both G4BYV and GM8BJF now appear in the Microwave Award bracket with Nos 1 and 2 respectively for contacts beyond 600km on 1,296MHz.

A 144MHz Standard Certificate has gone to G8KLN of Sussex.

G3ZNZ, North Humberside, has been awarded the UKW-Europa Award by the German Amateur Radio Club. Bob worked 20 countries and 136 QRA points to earn his First Class Award. It is available in three classes and the award manager DK50D, Nordwiesenweg 15, D3204 Nordstemmen, West Germany, will forward details on request.

Late news

SM6HYG worked 10 G stations during the 70cm Cumulatives. Now that GB3TW, the Tyne and Wear repeater, is active (input 145·125MHz), GB3NEE will move to 144·130 MHz. G3WZT worked FC6ABP in Corsica on 144MHz. Details next month.

Finally, thanks to all correspondents this month. Please send news and views to GM8FFX, PO Box 49, Aberdeen. □

microwaves

Dain Evans, G3RPE*

Microwave dx records

Although most new microwave records were reported when established, it is some considerable time since they were last summarized. The writer's probably inaccurate set of records are given in the table and it would be appreciated if any amendments (especially Region 1 records) could be sent in so that a corrected version accurate to the end of 1976 could be published early this year. The main uncertainties in the table are with 1·3GHz. The UK record is possibly a contact between GD3HDZ and HB9AMH, details of which are not to hand. The moonbounce record may be a PA0SSB-VK3AKC contact.

UK and world microwave records, October 1976

GHz	UK record	World record	EME
1·3	G3LQR-SM5CCY October 1976 1,100km	WA2LTM-W9WCD 26 October 1973 1,240km	WB6IOM-G3LTF 27 April 1969 8,838km
2·3	G3LQR-OZ9OR 30 June 1976 760km	G3LQR-OZ9OR 30 June 1976 760km	K4RJ-W6YFK 22 November 1972 3,219km
3·4	G3LQR-PA0DBQ 18 June 1975 225km	ZL2WB-ZL2TMI 2 February 1975 383km	—
5·7	G3BNL-G3EEZ 23 April 1973 158km	W6IFE/6-K6HIJ/6 18 June 1970 344km	—
10	G4BRS-GM3OXX 14 August 1976 521km	G4BRS-GM3OXX 14 August 1976 521km	—
24	G3BNL-G3EEZ 14 September 1975 154km	G3BNL-G3EEZ 14 September 1975 154km	

Microwaves at Amsterdam

As noted in last month's *Radio Communication*, the writer attended the IARU Region 1 VHF Managers Meeting in Amsterdam during October as a so-called microwave specialist. The main purpose was to suggest to the meeting that, given the effort over the next year or two, it is quite possible for amateurs to make a significant change in their use of the microwave bands which could well influence our position at WARC 79. To this end, an RSGB paper entitled "Developing the Microwave Bands", containing ideas and philosophies which, although familiar to UK amateurs, were less so to amateurs from other countries, was presented. The main recommendations made in the paper were as follows:

(a) That a determined effort be made to encourage a rapid growth in microwave activity, with effort not otherwise directed concentrated on the 1·3 and 2·3GHz bands, and on 10GHz where extra effort would be expected to be most productive because of the already substantial experience available. It was also suggested that deliberate efforts should be made to catalyse at least some activity at frequencies above 40GHz since this was now the pioneering part of the radio spectrum, and any activity by amateurs in this region would be expected to have a great impact.

(b) That it should be recognized that, by deliberately exploiting low-loss propagation modes, remarkable distances can be worked using equipment generating power even at the milliwatt level, provided that suitable operating techniques are developed. A map summarizing paths covered on 10GHz using equipment of this size attracted much attention at the meeting.

(c) That efforts be made to ensure that the contribution that amateurs can make is not limited by unsuitable licensing conditions: in particular, the capacity to work by tropo-scatter should be regarded as a reasonable basis for setting minimum licensing power levels.

(d) That a small organization be set up in each country with *primary* responsibility for the development of microwaves within its own country, and for liaison with other countries.

Bearing in mind that this meeting was basically concerned with vhf, the general reaction to these microwave matters was perhaps predictable: enthusiasm from those familiar with the progress being made in opening up these bands, rather blank faces from others.

What may come to be regarded as a significant step forward was the adoption of the RSGB/DARC proposal that each country should nominate individuals who would act as focal points for microwave activity. They would seem to have already acquired a number of problems:

(1) At present we have no formal method for ensuring that that most important commodity, information, circulates from country to country. This means that many who might be tempted to come on to microwaves do not do so because they are unaware of its potential. Much effort is wasted by people all over the world duplicating the learning processes of others, building yet another 2·3GHz converter to add to the dozen or two designs already available. What is really wanted is just one or two proven bug-free designs of sets of equipment for each of the bands and lots more operating. Surely an excellent way of doing this is for individual countries to adopt a band in the way that DARC has accepted responsibility for 2·3GHz and RSGB for 10GHz.

(2) It must be admitted that the writer was surprised at the number of countries represented at the meeting whose national administration had allocated reduced bands at low power or even none at all. It would seem to be worthwhile firstly to determine the precise licensing conditions in each country in Region 1 and, secondly, to make available information on how amateurs with allocations were taking advantage of them for use as ammunition by those countries without them.

(3) Bandplanning on microwaves has problems which stem from having too many megahertz rather than too few. A provisional band plan for 1·3GHz is already available from the 1975 Warsaw Conference. DARC has been given the responsibility for producing a plan for 2·3GHz: although their allocation covers 2,300–2,350MHz only, their planning considerations nevertheless will cover the more common 2,300–2,450MHz allocation, within which some countries allow pulse modulation techniques. They will also bear in mind any implications on planning the bands at higher frequencies. In the UK we have the rather odd situation of having narrow-band crystal-controlled equipment operated

Continued on p43

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

State Opening of Parliament

FOLLOWING the State Opening of Parliament on 24 November, the Society's President had the honour to move an Humble Address to Her Majesty The Queen in the House of Lords.

In his speech, Lord Wallace made the following remarks which will be of interest to all members of the RSGB:

"YOUR lordships may be interested to learn that we have on the Opposition benches a fully qualified radio ham in the presence of the noble lord, Lord Orr-Ewing, whose call sign is G5OG, which colloquially is termed, "George Five Old Girl". I make no comment on that. But I would say that unfortunately for the Government benches he is so active in this chamber that amateur radio activity has had to be suspended.

"In Jubilee year I shall have the honour of acting as President of the Radio Society of Great Britain, whose members have done much to advance modern methods of communication and which, through its Raynet organization of skilled volunteers, establishes vital communications for the public services in times of emergency and disaster—a little known but vital example of voluntary service. Voluntary service to the community must be encouraged to play an increasing part in the life of the nation, particularly at this time."

After Lord Pitt of Hampstead had seconded the motion, the Opposition spokesman, Lord Carrington, made a speech in which he had this to say about Lord Wallace:

"THE noble lord, Lord Wallace, is of course a practised parliamentarian, a former Member for Chislehurst and for Norwich, associated with a number of urban district councils, county councils, Government Whip and delegate to the Council of Europe. In fact, the only thing the noble lord has not been is a member of the Conservative Party.

"I had always assumed that Wallace was a Scottish name, but I can find no trace of Scottish descent in the noble lord's ancestry. So far as I can judge, he is not one of those Wallaces whom the Scots bled with or for or about, and being English I have never quite understood what that verse was about. The noble lord, on the contrary, was born in Cheltenham, a place I had always hitherto associated with colonels and Conservatives. He then, apparently, emigrated to Kent where he now lives. He sounds very much to me as if he is one of those unrepresentative people who come from the south of England and, apparently, are not acceptable to anybody who does not.

"The noble lord has called himself Lord Wallace of Coslany. I thought that was rather better; that might be celtic. It might be one of those places which are pronounced differently from the way they are spelt—perhaps "Coony" or "Cany"—the kind of places that are designed to embarrass those who are not in the know about how they are pronounced. But not so. Coslany, says *Who's Who*, firmly and unequivocally, is in the city of Norwich.

"One of the noble lord's activities outside Parliament, of which I know something, is his work for the Commonwealth War Graves Commission, an organization for which I have the profoundest admiration and with which for a short time I was associated in an honorary capacity; and I know what an amount of work he does for that. The noble lord is interested also in allotments. He visits Malta and knows it well.

"The noble lord is interested in social welfare and hospitals and, as he has told your Lordships this afternoon, he is an enthusiastic radio ham—a hobby, no doubt, which allows him to communicate with himself as he carries out this bewildering number of jobs. The noble lord is a comparative newcomer to this House but I think that by now he knows he is a very welcome Member of it."

The Society was invited to send two representatives to the House of Lords to hear the movement of the Address, and Mr R. F. Stevens, G2BVN, Council member, and Mr G. R. Jessop, G6JP, general manager, had the honour to attend as guests of Lord Wallace. □

Microwaves

(Continued from p42)

at the top end of the 10GHz band as agreed internationally, with wide-band equipment concentrated at the low end.

(4) Contests present a rather difficult problem on microwaves and somehow these will have to be sorted out. While it is accepted almost without question that contests promote activity and therefore are automatically a good thing, UK experience sometimes suggests the contrary. How this comes about is that while, for example, a contest covering all bands above 432MHz might be perfectly satisfactory in countries where 1,296MHz is regarded as "advanced" and 2·3GHz as "way out" and higher bands are not involved at all, some UK amateurs find themselves in the position of trying to cope with eight bands at one time. What happens is that effort tends to be concentrated on the one or two more popular bands, which means that the less popular bands fail to get the stimulus a contest is intended to provide. As another example, a good case could be made for a contest in the UK which covered the 5·7, 10 and 24GHz bands only; this would not generate very much interest in some other countries. □

BOOK REVIEW

Solid state short wave receivers for beginners by R. A. Penfold. Published by Bernards (Publishers) Ltd. 115 by 180mm, paperback. Obtainable from booksellers, price 95p.

Chapter headings in this new book, following a general introduction, are: Ultra simple receivers; General purpose receivers; Portable receivers; Amateur band receivers and Ancillary equipment. The accent is on simplicity of design and availability of components. The descriptions and diagrams are clear but generally there is little guidance on practical layout. Could be of interest to those as yet inexperienced in receiver construction.

Sporadic-E observations in 1976

by R. A. HAM, FRAS, BRS15744*

THE 1976 sporadic-E season began during the afternoon of 12 May and ended 102 days later around 0800ut on 22 August, only one day later than the 1975 season. During this period, sporadic-E reflections influenced the normal paths of radio signals between 40 and 80MHz on 33 days, compared with 38 days in 1975, 37 days in 1974 and 71 days in 1973.

Although there were no major disturbances prior to the start of the 1976 season, there were, however, minor events which took place during the early mornings as follows:
January: 4, 26, 27, 30.
February: 4, 7, 11, 12, 14, 17, 18, 24, 27.
March: 2, 3, 4, 5, 6, 9, 10, 13, 17, 25.
April: 6, 9, 10, 13, 15, 21, 27.

Throughout each period prolonged bursts of signals were frequently heard simultaneously from a Polish broadcasting station in the 70MHz band, and the television sync-pulses from a Russian transmitter in the 50MHz band. Similar events occurred on 8, 18, 21, June; 3, 5, July; 8, 12, 16, August.

The author made observations daily at approximately 0800, 1230 and 1800ut, and the sporadic-E events recorded during these times are indicated by the dark squares in Fig 1 and identified as A, B and C respectively.

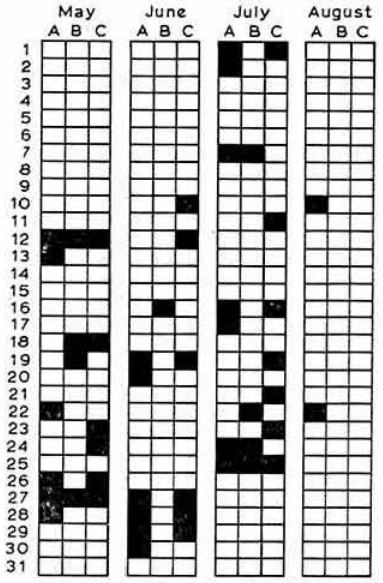


Fig 1. Monthly distribution of sporadic-E

Continental broadcasting stations

On 25 of the 33 days indicated in Fig 1 the influence of sporadic-E extended to 73MHz and the signals from many eastern European broadcasting stations were reflected toward the UK. Fig 2(a) shows the radio-frequency distribution, and the number of times that these signals were heard by sporadic-E. These fm signals were very strong in the UK when sporadic-E was present.

The 25 days when sporadic-E disturbed the frequency range of 65-73MHz are listed below, and the figures in parentheses are the comparable number of days for 1973, 1974 and 1975 respectively:

May: 12, 13, 18, 19, 22, 24, 26, 28.	(7, 2, 10).
June: 12, 19, 20, 28, 29.	(6, 13, 6).
July: 1, 7, 11, 16, 17, 19, 21, 23, 24, 25.	(2, 5, 6).
Aug: 13, 22.	(2, 9, 7).

As in previous years all of these broadcast signals were subject to deep and sharp fading shortly before the beginning and the end of each event.

Under normal ionospheric conditions the regular stations within the range of 40 to 80MHz are easily identifiable, and the inter-station frequencies are normally quiet. However, when sporadic-E is present a variety of radio signals, some of which have been reflected over more than 1,600km, can be heard in the UK throughout this frequency range. The practice of previous years was continued and the R1 television channel (49·75MHz) was monitored using a vertical dipole feeding a communication receiver to obtain an early warning of sporadic-E. A signal on this frequency is usually heard at the advent of sporadic-E, remaining consistently strong throughout the lifetime of the event, and then is the last to fade away at the end.

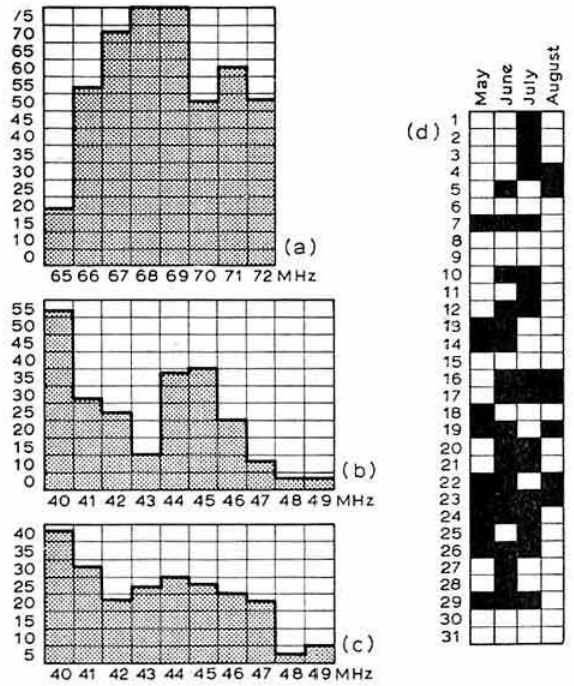


Fig 2. (a) E European fm stations heard in the UK during periods of sporadic-E. (b) European radiotelephone signals heard between May and August 1976. (c) Electronic devices heard during sporadic-E events. (d) Days on which the IBP station DL0IGI was heard

* Faraday, Greyfriars, Storrington, Sussex.

European radiotelephone stations
These two-way radiotelephone signals are obvious to the observer without knowledge of the language being used. Fig 2(b) shows the distribution of these signals heard by the author during the period. The total number of radiotelephone signals heard was 213 compared with 160 in 1975, and 178 in 1974. Again, the main activity was around 40MHz.

Electronic devices
This is a general term used to describe the host of tones, teleprinters and various beacons which appear between 40 and 50MHz when the E region is disturbed. Fig 2(c) illustrates the radio-frequency distribution of these signals heard during the 1976 season and shows once more that the main activity in this field is around 40MHz.

Major events
There were four major events during the 1976 sporadic-E season—18 May, 29 June, 23 and 25 July—the first three taking place during the early evening and the last at midday. Very strong signals from 26 eastern European broadcasting stations were received on 18 May, 39 on 29 June, 46 on 23 July and 30 on 25 July, all between 65 and 73MHz.

On 29 June a very strong signal was received from a Spanish station on E2 (53·75MHz). The author recorded this and it was used soon afterwards in the BBC World Service programme "World Radio Club". This prompted a listener in the Middle East to write to say that he had been receiving BBC stations in Band 2, at the same time. On each occasion, strong signals were also received from a host of radiotelephone stations (of European origin) and electronic devices, between 40 and 50MHz.

The author is again indebted to Igor Hajek of the Lancaster University language department for listening to tapes recorded during these sporadic-E disturbances and identifying signals from Poland, USSR, Czechoslovakia, Hungary and Romania.

28MHz band
Sporadic-E conditions affecting the 28MHz band were identified on the 54 days indicated in Fig 2(d), compared with 42 days in 1975, when a strong signal, sometimes for long periods, was heard from the International Beacon Project (IBP) station DL0IGI (28·195MHz) situated near Salzburg.

Solar activity
The sun was very "quiet" during the sporadic-E season, the author only recorded limited activity at 136MHz on 1 and 12 May, 16 June and 31 July. Although the sun was very "active" in August the sporadic-E events were only observed on two days.

The author has observed the sun and sporadic-E events for many years, and cannot show a connection between sunspot activity and sporadic-E disturbances. □

BOOK REVIEWS

ARRL Ham Radio Operating Guide. Editorial co-ordinator: Ellen White, W1YL. 128 pages copiously illustrated. Size 8¼ by 11in. Obtainable from RSGB Publications (Sales), 35 Doughty Street, London WC1N 2AE. Price £4.35 including postage and packing.

The reputation of a transmitting amateur is, or if he is a beginner, will be, almost entirely based on his quality as an operator, whether by code or voice. What is more, his enjoyment of operating will be equally dependent on his mastery of the art; he will gain enormously in self-confidence by a knowledge of his own ability. That is why this new ARRL book is of prime importance to all beginners, and will be a valuable and enjoyable source of information to the more experienced.

The purpose of the manual is "to introduce you as painlessly as possible, using an easy-to-read approach, to the many and varied operating practices that exist throughout amateur radio."

The style is pleasantly conversational and is sprinkled with examples from the experiences of the nine contributors, each a specialist in the field he describes. The consistency of style throughout must be credited to the editorial co-ordinator.

The chapters cover Getting Started, Contests, The Basic Intrigue of DX, Logging and QSLs, Repeaters, The Flea-power Challenge, Communicating Visually! (RTTY and SSTV), VHF/UHF and Oscar; and there is a section with information about amateur bands, DXCC country lists, deleted countries, WAS map, Q signals, International prefixes, 160m allocations map of the USA etc.

The treatment of dx hunting, satellite operation and QRP work, to mention only a few items, are written with an infectious enthusiasm which is irresistible, and the frequent inset panels with a brief history of the origin of many matters, add to the pleasure and knowledge of the reader.

This is a book which every operator should have within reach of his operating position.

T.P.A.

A further three volumes in the *Constructors' Guides* series are now available. These are *Project planning and building; Simple circuit building*, and *Practical electronic project building*. The initial volumes were described in *Radio Communication*, July 1976, page 511. The volumes are edited by M. A. Colwell and are published by Newnes Technical Books, Borough Green, Sevenoaks, Kent TN15 8PH. Each volume contains at least 102 pages, is 216 by 138mm, limp bound, and the cover price of each is £1.99.

The first of the new titles is intended to help the constructor to plan, design and lay out his electronic projects. The book explains the use of tools, pcb layout, the design of cases and chassis and assembly and wiring.

Simple circuit building provides an introduction to circuit building for the home constructor showing the conversion of theoretical circuits to practical layouts. The contents range from switching and logic circuits to power supplies and ac amplifiers.

Practical electronic project building describes the current popular construction methods and includes material on the use of tools, PCBs, wiring, chassis and cases. There is also a chapter on fault finding.

The books contain many photographs and diagrams and the presentation of these and the text is clear. They will be of value to constructors at all levels except the most experienced.

INTERFERENCE PROBLEMS

Members accused of causing interference or who suffer interference from external sources are invited to seek the assistance of the Interference Committee in solving their problems.

Enquiries should be addressed to: The Chairman, Interference Committee, RSGB, 35 Doughty Street, London WC1N 2AE.

the month on the air

John Allaway, G3FKM*

REFLECTION on the fact that this month sees the beginning of the writer's twelfth year in charge of *MOTA* caused him to look back at what was being said at the time he took over the task, since 11 years is reputed to be approximately one whole solar cycle. One thing which is immediately obvious is that although the position in the cycle was similar there was a great deal more dx activity. Another is that *MOTA* depends entirely on reader participation—there are many excellent regular reporters, but an increase in the amount of news received would be very much appreciated.

The beginning of a new year seems a good time to mention the **IARU Region 1 HF Band Plan.** This is a voluntary scheme, devised by member societies in the region, whereby amateurs follow generally agreed guidelines when choosing transmitting frequencies with the intention of reducing harmful interference between different modes.

Very best wishes to all readers for 1977—and may it see a real improvement in solar activity!

IARU REGION 1 HF BAND PLAN

Band		Type of emission
3·5–3·6MHz		cw [2]
3·6MHz	±20kHz	rtty [1]
3·6–3·8MHz		cw and phone [2, 3]
7–7·04MHz		cw
7·04MHz	±5kHz	rtty [1]
7·04–7·1MHz		cw and phone
14–14·1MHz		cw
14·09MHz	±10kHz	rtty [1]
14·1–14·35MHz		cw and phone
21–21·15MHz		cw
21·1MHz	±20kHz	rtty [1]
21·15–21·45MHz		cw and phone
28–28·2MHz		cw
28·1MHz	±50kHz	rtty [1]
28·2–29·7MHz		cw and phone

Notes
[1] For rtty, recommended section of operation shared with cw.
[2] 3,500 to 3,510 and 3,790 to 3,800kHz reserved for inter-continental working.
[3] 3,635 to 3,650kHz is used by USSR stations for inter-continental working.
[4] For sstv, recommended operating frequencies are: 3,735, 7,040, 14,230, 21,340, 28,670 —all ± 5kHz.
[5] For beacons, 28·2–28·250MHz is recommended.
[6] For the downlink of amateur satellites, 29·4–29·550MHz is recommended.

"MOTA" closing dates

Readers may care to note the following dates as the last days on which material for the following month can be accepted. Information available earlier should be submitted as soon as possible. Please note that your scribe will try to keep to this schedule but personal commitments may cause some alterations which will be notified as soon as they are known. The relevant dates are: February (8 January), March (5 February), April (12 March), May (9 April), June (7 May), July (11 June), August (9 July), September (6 August), October (10 September), November (8 October), December (5 November) and January 1978 (5 December).

10 Metre Activity Days

A full report on the 10 Metre Activity Day held on 3 October has been received from its organizer, David Whitaker. It seems that 41 reports were received and these indicated that over 300 UK callsigns were heard—about 100 less than during the spring event. There was a short opening into Scandinavia and the USSR during the morning with 27 SM, 11 OH and 7 U calls logged. Other areas noted included CT1, EA5, SP, YU, PY, W, ZE, ZS3, 5V4 and 9G. 9H1CH reported contacts with southern Africa and VP8PI. ZC4IO found the band very quiet and made only three contacts—with ZE, ZS and 9M8HG. A listener in Spain heard 4X4, ZS, G and 5T5ZR.

It is proposed to hold a series of activity days during 1977. These will take place on the first Sunday of each month, January to May inclusive. Unfortunately it was not possible to give this information in an earlier *MOTA* so that the first will have already passed by the time this is being read. However on **6 February, 6 March, 3 April** and **1 May** everybody is asked to try to be active on the band between 1200 and 1800, using particularly the areas 28,000 to 28,100kHz (cw) and 28,500–28,600kHz (ssb). No serial numbers need to be exchanged, but a contest style day is envisaged for May and details will be given later. As usual, reports on each of these activity days would be appreciated and should be sent to D. Whitaker, "Hillcourt", 57 Green Lane, Harrogate, N Yorks.

Propagation predictions

Reactions from readers concerning the accuracy and usefulness of the HF Propagation Study tables which have been appearing each month since April 1976 would be greatly appreciated by the Propagation Studies Committee. Please send your comments to R. J. Hughes, G3GVV, 10 Farm Lane, Tonbridge, Kent TN10 3DG.

It has been suggested that some newer readers may not fully understand some of the terms used in the Propagation Predictions section. One of these is the "dead zone". This refers to the area between where a signal can no longer be heard on direct ground-wave path, and the nearest point at which the signal being received via reflection from the ionosphere can be heard. Nothing will be audible between these two areas. The term "indirect path" refers to the situation when signals arrive from a direction 180° away from that indicated as the shortest by great circle map—for example when stations located in the western USA can be heard best when beams are directed towards the Indian Ocean area.

Top band news

Readers are reminded of the new **First Timers DX Periods,** full details of which were given last month. These replace the old transatlantic and transpacific tests.

It is now certain that ARRL is to award a special 160m DXCC certificate. The November issue of W1BB's *160 Meter DX Bulletin* lists four stations who are known to be eligible: W1BB, W1HGT, KV4FZ and W8LRL. It also contains a plea from W7FS who heard several European stations last

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year but was having a great deal of interference from east coast USA stations sharing his channel. He asks those who call "CQ W6/W7" not to answer any other callers. Another request in the *Bulletin* comes from W0IUB who asks dx-peditions to announce when they will be on 160m. It is also pointed out that any administration in Region 1 may allow operation on the band, and that others may try applying for permission to use the band for experimental work.

Signals from Japanese stations have been arriving in the UK and as only 1,908—1,912kHz may be used in Japan, European stations are asked to try to avoid this area as far as possible at times of likely openings (around 2100).

Welcome

The following overseas amateurs became members of RSGB during November: C5AE, EA3AHG, EI8Z, G4FIY/ZD8, HB9AKG, I2FUM, OH0NJ, ON1GW, ON6VV, SM4AWC, SV1HH, VE3DKN, VK3BHN, VK3JX and ZS6UP.

News from overseas

Andrew Pomfret, 9G1LZ, has written to say that he will be back in the UK for an indefinite period by the time this is read, and operational from G3LZZ. He is trying to QSL all stations worked and listener reports received but asks for patience. With Andrew's departure from Ghana, following closely that of 9G1GE (G4ABI), there are no longer any expatriate amateurs on the air from that country. Any British amateur who is likely to spend time in Ghana should contact the secretary of the Ghana Amateur Radio Society, K. A. Jackson, 9G1AJ, c/o PO Box 3773, Accra, who is in a position to assist in obtaining a Ghanaian licence.

Nasir Khan, 9K2AN, reports the receipt of QSLs for a station who has been using the callsign 9K3TC and giving his location as Jedda (Saudi Arabia) and name as Albert. No such call has been issued in Kuwait, and in fact only 9K2 calls have been issued to date.

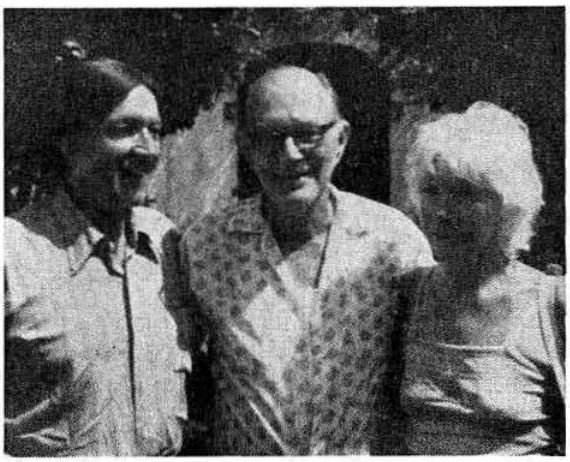
Roger Brown, G3LQP, has just returned from Seychelles from where he made 545 contacts covering 103 countries as VQ9RB between 12 and 30 November. He had the opportunity to investigate the QSL situation at VQ9R and found that the unopened mail took his wife and he six hours to open! This was the accumulation of several years direct mail. Roger brought all logs and blank cards back with him and is now able to offer confirmations for the period 11 June 1972 to 30 November 1976. He also has VQ9R/D logs from 29/10/1972—2/11/1972, and VQ9R/F from 21/10/1973—28/10/1973. (See "QTH Corner").

DX news

RNARS member ZC4IO is currently operating on 1·8 and 3·5MHz and is anxious to work UK members on those bands. He runs 75W to a trap dipole with the feeders strapped together for use on 3·5MHz. He is to be found on 3,501kHz from 1945 to 2000, and on 1,825kHz from 2000 to 2030. He has already contacted several UK stations.

John Farrer, G3XHZ, will be in Qatar for the next two years working on a water supply system for Doha. He hopes to have an A7 licence and to be active on 14, 21 and 28MHz, but at the time of writing the prospects did not look good.

LU2ZA and LU1ZA continue to be active from the S Orkneys, with the former having been noted regularly around 14,220kHz at 2300. The latest information gives LU2AFH as m/c and also as QSL manager—it is believed that the



Three operators from the YASME Foundation (l to r): Lloyd Colvin, W6KG; Dick Spenceley, AJ3A/KV4AA; and Iris Colvin, W6QL. Together they achieved almost 100,000 QSOs in 1976. QSLs go to YASME Foundation, PO Box 2025, Castro Valley, CA 94546, USA

LU2ZA QSL is large and that an envelope to accept a 5 by 8in card is required (with IRCs). VP8OT and VP8MS are fairly active from S Georgia on 14,200kHz around 2300.

PA0GMW maintains a schedule with VS6DO each Sunday, Tuesday and Thursday near 3,795kHz at 2230. Other stations in the western Pacific area which have been noted in Europe include WB4ZKG/KC6 who transmitted at 3,802kHz and listened on 3,798kHz around 2045, and K6QHC/KG6 who was using 3,793kHz at 2035.

Dxpeditions

Lloyd and Iris Colvin made 6,800 contacts during their stay in the US Virgin Is where they operated as W6KG/AJ3. They were there from 8 to 31 October and during this time worked 125 different countries. WAC on 7MHz was made in 3h 50min on 18 October, the stations taking part being 4X4GD, VK1RM, G3ZDW, W2PN, PY1NEW and CN8AD. On the 27th they made a 14MHz WAC with ZS1XR, OE1UZ, VK2QL, UI8IZ, W1BFT and PY1EUM in one hour. Since 1954 the YASME Foundation has sponsored no less than 63 dxpeditions and has been responsible for giving more rare dx contacts to amateurs than any other dx organization. Its officers are still as elected in 1954: president, W6AM; vice-president, Danny Weil; secretary/treasurer, W6RGG; directors, WA5LES, KV4AA, W0MLY, W6OAT, JA1KSO, OH2BH, W6KG, W6DOD and VK2EO. Frequencies used by the expeditions are usually 3,505, 7,005, 14,050, 21,050 and 28,050kHz (cw) and 3,795, 7,095, 14,195, 21,255 and 28,550kHz (ssb). W6AM asks that the following questions should be avoided when working Lloyd or Iris: (1) What is your call? (2) Where are you going next? (3) When will you switch from cw to ssb? (4) When are you going to operate from another band? and (5) Why don't you call by districts? He points out that information on these matters will be given at frequent intervals.

HB9AHL is reported to have been issued with a VR7 licence, and to be likely to use it during March. The VR7 area is the Central and Southern Line Is which are situated between VR3 and FO8.

QTH Corner

FH8GV	via F8FI, P. Floury, 3 R Cauvel-de-Beauville, 80 Montdidier, France.
FM0MM	via WA1JKJ, 147 Lincoln St, Franklin, Mass, 02038, USA.
FR7BE	BP 137 Tampon, Reunion Is.
FG0CJK/FS7	via W4BPD (see PJ8CM).
WB4ZKG/KC6	via WA7ZTL, 18431 35th Av SE, Bothell, Wash, 98011, USA.
PJ8CM, PJ8JM	via W4BPD, Drawer DX, Cordova, S.C., 29039, USA.
PJ9MM	via W1GNC, 1133 Fienemann Rd, Farmington, Ct, 06032, USA.
PY0ZAE	via PY1CK, R Cruz Lima 8-802, 20000 Rio de Janeiro, Brazil.
SV0WZ	via OE3NH, H. Plannhauser, J Reiterstr 3, 3430 Tulin, Austria.
VP1FOC	W4ZMQ, M. B. Carter, Box 845, Mims, Fla, 32754, USA.
VP2GMB	via W5MYA, 2 Country Place, Bedford, Texas, 76021, USA.
VP2KU	VE3EWY, 2821 Birchmount Rd 920, Agincourt, Ont, M1W 2C8, Canada.
VP2LDV	V. DuBois, 800 NW 62nd St, Ft Lauderdale, Fla, 33309, USA.
VP2VDJ	YASME Foundation, Box 2025, Castro Valley, Cal, 94546, USA.
VP5IZ	WA4SGF, 5052 Lexington Av, Jacksonville, Fla, 32210, USA.
VP5M	via WB4QKE, 111 Algonquin Terr, Indian Harbor Beach, Fla, 32935, USA.
5W1AZ	(CQ Contest QSOs) WA6AHF, 17494 Via Alamitos, San Lorenzo, Cal, 94580, USA.
WB4SJG/6Y5	via K4QMQ, 125 Bradham Drive, Watkinsville, Ga, 30677, USA.
8P0A	via WA4RRB, 18901 NE 1st Ct, Miami, Fla, 33162, USA.
9D5A	via WA6AHF, 17494 Via Alamitos, San Lorenzo, Cal, 94580, USA.
9G1LZ	A. M. Pomfret, G3LZZ, East Lodge, Baldersby Park, Topcliffe, Thirsk, N Yorks, YO8 3PE.
VQ9RB	R. Brown, 11 Fircroft Close, Tilehurst, Reading, Berks. RG3 6LJ.

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

There are rumours that there will be an expedition to Revilla Gigedo (XE4) early this year, probably in March.

Contests

The 1977 French Contest

0000 29 January to 2400 30 January (cw).
0000 26 February to 2400 27 February (phone).
3·5 to 28MHz. Single- and multi-operator (single-operator may only operate for 36 hours). Exchanges consist of RST plus serial QSO number (from 001). Contacts count three points with France, DUF, and francophone countries (ON, HB, LX, VE2, OD, HH, 3B, 9U and 9X), with F8REF, F6REF or DA2REF 10 points. The multiplier is arrived at as follows: one for each French department, DUF country, or francophone country worked on 3·5, 7 or 14MHz, three on 21MHz, and 10 on 28MHz. Scores for each band are calculated and added together to reach the final total. Note that stations in the same continent may not contact each other on 3·5MHz during the first quarter of each hour, on 7MHz during the second quarter, on 14MHz during the third, and on 21 and 28MHz during the last quarter. Logs should be sent to REF Traffic Manager, Lucien Aubry, F8TM, 53 rue Marceau 53—Palaiseau France. In the 1976 French Contest, UK scores were as follows: (cw section) **G3ESF** (36,720 points), **GW4DOO** (22,563), G3HTA (21,158), GW3INW (18,865), G3JUL and G8DI (12,087), G2GJY (9,288), G4DBW (8,520), G8VF (6,660), G3LIK (4,896), G2AJB (3,330) and G2WQ (819); (phone section) **G6UW** (134,091), **GW3GHC** (80,520) and G4CLD (2,892).

The CQ WW DX 160 Contest

2200 29 January to 1600 30 January.
CW only. Exchanges consist of RST and serial QSO number (from 001). Contacts with own country count two points, with other countries five points, and with the USA and Canada 10 points. The multiplier is one for each US state, Canadian province and DXCC country worked (note that the USA and Canada do not count). Logs must be mailed before 28 February to: CQ 160 Contest, 14 Vanderventer Avenue, Port Washington, LI, NY, 11050, USA. G3FKM has a *small* supply of log and summary sheets.

The 3·5MHz YU-DX Contest 1977

2100 8 January to 2100 9 January.
3·5MHz cw only. Exchange RST plus serial QSO number (from 001). Contacts between stations in the same country count one point, on same continent two points, in different continents five points, and with YU stations 10 points. The multiplier is the total of DXCC countries and YU prefixes worked. Logs should show date, time, station worked, numbers given/received, country/YU prefix, if new multiplier, and points claimed. A summary sheet including a signed statement that all rules have been obeyed must be included with the entry. Logs should reach YU-DX Club SRJ, PO Box 48, 11000 Belgrade, Yugoslavia, before 14 March.

October *QST* carried results of the **1976 ARRL DX Contests** which showed the following UK scores:

PHONE SECTION

All band	Points	High band	Points	Low band	Points
G4ANT	302,778	**GW4BLE**	203,148	**G3TJW**	125,928
G4BTY	184,977	**G3SSO**	118,935		
G4DKT	18,327	G2FNK	31,920		
G2QT	16,644	G3TXF	11,832		
		GW4CYD	8,568		
		G3YBH	5,040		

CW SECTION

All band	Points	High band	Points	Low band	Points
G3FXB	1,082,730	**G3SXW**	126,084	**G2RO**	68,352
G4BUE	1,071,180	G3TXF	68,526	G3XVY	61,596
G3MXJ	976,533	G3YBH	62,952	G3ZQW	16,695
G2QT	350,052	**GM4ASY**	60,534	**GM6RV**	15,120
G3IAS	285,480	**GW4CXM**	16,038		
G3ESF	242.757	G6NK	8,100		
GI3JEX	155,325	G3AWR	2,640		
G3APN	57,720	G3DNF	1,326		
G3KSH	50,544				
GI3OLJ	42,630				
GW3INW	38,415				
G2AJB	7,980				

Congratulations to certificate winners (listed in bold type) and particularly to **G3FXB** for winning the Braaten Trophy, and to **GI3JEX** for winning the Milne Trophy (for the second year in succession).

The 1977 ARRL International DX Competition

0000 5 February to 2359 6 February and 0000 5 March to 2359 6 March (phone).
0000 19 February to 2359 20 February and 0000 19 March to 2359 20 March (cw).
Single-operator (1) all band, (2) high band—14, 21 and 28 MHz, and (3) low band—1·8, 3·5 and 7MHz classes. Multi-operator single-transmitter and multi-transmitter sections also. Send RS/T followed by figure indicating transmitter input power. W/VE stations will send RS/T and state or province. Work stations once on each band. Score is number of contacts multiplied by three multiplied by total of USA states and Canadian provinces worked on each band added together. Logs and summary sheets must reach ARRL, 225 Main St, Newington, Conn, 06111, USA, no later than 18 April. Log sheets (100 per sheet) and summary sheets are available from G3FKM (sae please).

QRP Winter Contest

1500 17 January-1500 18 January.
Single-operator cw only. Below 10W input but QRO stations may take part. Full rules from DJ7ST, H. Weber, D-3201 Holle, Kleine Ohe 5, W Germany.

Awards

Festac 77 Award

The second world black and African Festival of Art and Culture will take place in Nigeria between 15 January and 12 February 1977. A special station with the callsign 5N2WBF will be active. For the award QSL cards must be obtained from this special station and from the other four countries taking part and sent, with 10 IRCs or US $2 to: Award Manager, 2nd WBCAF, PO Box 448, Apapa, Lagos, Nigeria. Listeners may apply. 5N2WBF will issue serial QSO numbers and this should be quoted on each QSL.

"DXNS Prefix-Country-Zone list"

This very excellent and comprehensive list gives all amateur radio prefixes currently in use and others used in the past five years, including those now obsolete. It also gives ITU allocations, DXCC status, *CQ* zone, and ITU zone of every country, and is obtainable from Geoff Watts, 62 Belmore Rd, Norwich NR7 0PU, price 35p in UK, four IRCs overseas, or six IRCs by airmail. Space is available on the list for adding new prefixes and ITU allocations.

Band reports

Once again 1·8MHz has been outstandingly interesting, as has 3·5MHz. However, even 28MHz has carried signals and more activity is sought on this band.

Very many thanks to the following who provided the information for this section: Gs 2HKU, 2NK, 4RZ, 5JL, 3AAE, 3KSH and NKQ, BRSs 17567 and 35608, and As 8312 and 8961.

Stations listed in italics were using cw, the rest ssb.

1·8MHz. 0000 *C5AZ, CO2JA, EA8CR, HB0AZD, KP4AST, KZ5AA, PJ8CM, VE3BMV, W1, W2, ZD8AA, 9Y4A.* **0100** *K5LIW, W5USM.* **0500** *W2, 3, 4, 8, K9YWO.* **0700** *EL0N/MM, KP4AST,* LU1BAR/W3, *VP9DX, W1, 2, 3, 4,* W5SBX. **0800** KV4FZ. **1800** *ZC4IO.* **1900** *DL7ON/LX/P, EA8CR.* **2000** *I4AMO.* **2100** *JA3ONB.* **2200** *W1, 2, 9H1AV.* **2300** *IS0LYN, 4X4NJ.*

3·5MHz. 0000 A9XBD, FM7AG, TU2FN, W0GHY, 9J2IM. **0100** FP8DX (QSL to K9OTB), HZ1AB, *PJ9MM.* **0200** *K7VPF/VP2A, DJ0UP/VP2D, 9K2DR.* **0500** *HB0AZD, KP4AST, 9Y4A.* **0600** *DJ0UP/VP2S, ZLs.* **0700** *FP0BB, W7s KW, SGN, XE1FR.* **0800** JA8SCD, JA0RR, JR1CF, *PJ1AA, VP2M, VP2VDJ, 9Y4VT.* **1700** 7X2BD. **1800** JA6BSM. **1900** EA9FC, OD5LK, 7X2HM. **2000** A4XGR, JA, *ZC4IO.* **2100** 5B4BM, 6W8FP, 9X5SP. **2200** *JA6YG, JY9GR,* KA6YL, VS6DO, ZD7SD, 9G1JX. **2300** C5AZ, EL2AK, *FG7XA, PJ8CM,* PY0ZAE, *UI8LAG,* 8P7FU.

7MHz. 0000 *C6ABA, CE7AC, PY0ZAE, WA7VGT/TI7, DL0UP/VP2D, VP2VDJ, 9L1BH.* **0100** *C5AZ, FB8WW, VP1MPW, VU2GW.* **0300** *FR7AT, 9G1JN, 9Q5SW.* **0700** *JA4SP, VK, XE1YA, ZL.* **0800** *JA, JW2CF, OA8V, VP5T* (QSL to W4GDG). **0900** *JA.* **1500** *JA4FCS.* **1600** *ZL1AKV.* **1700** *JA3, 9, 5Z4WL.* **1900** *OX, VK3MR, 9K2EP.* **2000** *ZS1MZ.* **2300** *FG0CXV/FS7* (QSL to W4PRO), *YK1OE.*

14MHz. 0800 FK8JK. **0900** VK9JA, VP8HZ, VR4DX. **1000** *CR9AJ,* KG6RL. **1100** AP2SA. **1200** *P29JS.* **1500** C5AZ (QSL OH2NB), FB8ZI. **1600** *FB8XO,* VP2MT (QSL JA1KSO), W4YHK/VQ9, *ZD8DO,* 3D6BD. **1700** FL8KW, KH6BB, VQ9P, 7P6BC (QSL WA9SMM). **1800** FR8ZW. **2000** *JA8UI/PZ, 5V7AR* (QSL F6ACB). **2200** TD76GI.

21MHz. 0800 *WA8EGL/VQ9.* **0900** *UA0YT,* VK, *VS6HE.* **1200** *AP2TN, VE2ZN/SU* (QSL VE2YM). **1300** *PY0ZAE.* **1400** *FB8XO.*

28MHz. Occasional European signals.

Many thanks to all correspondents, and especially to the editors of the following for information supplied: *Long Skip* **(VE1AL/3)**, the *West Coast DX Bulletin* **(WA6AUD)**, *DX'press* **(PA0TO)**, *CQ Magazine* **(W1WY)**, the *Ex-G Radio Club* **(W3HQO)**, and the *29 DX Club Bulletin* **(VK6RV)**.

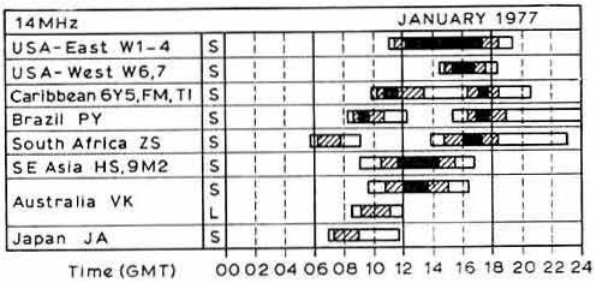
Please send all items for the **February** issue to reach G3FKM no later than **8 January**, and for **March** by **5 February**. □

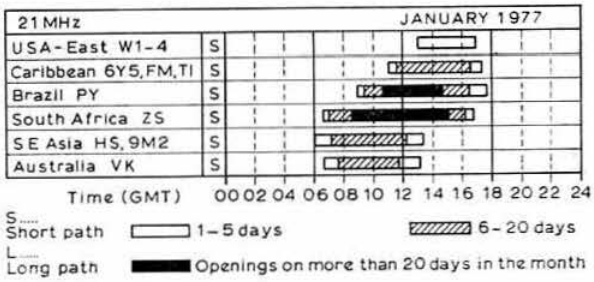
Propagation predictions

Conditions in January will differ little from those forecast for December, and will hold good for all bands mentioned. It is again pointed out that all times are given in gmt. This is done to facilitate conversion into local time of various dx countries such as east and west USA, Asia and Australia.

These propagation predictions have been published by the RSGB for the last 10 years and by the Polish Amateur Radio Society PZK since 1972.

The provisional sunspot number for November 1976 from the Swiss Federal Observatory was 5·5, with the first half of the month showing zero solar activity. Predicted smoothed numbers for March, April and May are 7, 8 and 9 respectively.





obituaries

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

Mr F. N. F. Bewley, G8HX

Frank Bewley, who died on 4 November, was a keen cw operator who operated mainly on 40 and 80m. He was secretary of Mansfield RS for many years.

Mr H. G. Davidson, G3FZP

Harry Davidson, who died recently, was a founder member of Barking R&ES and served as secretary and editor of the society's journal for many years.

Rev J. E. McGrane, VE6PP

Joseph McGrane died on 13 October aged 73. A well-known Canadian amateur, he was active on hf until recently.

Mr V. Stewart, EI7E

Vic Stewart died on 22 September. He will be remembered by many for his cheery QSOs on 40 and 80m.

Mr D. A. R. Tilcock, G8DWM

Dan Tilcock died on 9 November aged 53. First licensed as G3JYV in 1954, he later gave up the callsign but returned to amateur radio in 1970. He appeared as "Dan the tools" at many exhibitions and rallies, selling a wide range of hand tools.

The Society has also been informed of the deaths of:
Mr R. Butterworth, G8BI, and **Mr C. W. Clarabut, G2VS.**

The 1976 AGM

The 50th AGM of the RSGB took place at the Royal Society of Arts, London, on 3 December 1976. The meeting was opened at 6.30pm when more than 100 members were present. In the chair was the President, John Allaway, G3FKM, supported by the President-elect, Lord Wallace of Coslany, the hon treasurer John Brown, G3DVV, and the general manager, George Jessop, G6JP.

Formal agenda items

The minutes of the 49th AGM were approved unanimously and the meeting then considered the Society accounts for the year ended 30 June 1976. Among the comments from the hon treasurer were that the rise in subscription income should continue, with £105,000 as the budget figure for the current year. It was hoped that the deficiency for the same period would show a reduction to £9,000. No increase in the subscription was foreseen in the present circumstances. G3UUS questioned the large increase in the bad debts and G3DVV stated that this was almost solely due to the failure to pay of one large European advertiser and steps to recover the amount were in hand. G3RYF believed that the auditors' fees were high and G3SJE queried the effect of a cost accounting basis on the Society's finances. John Brown replied that in the nature of the Society's business, mostly comprizing cash transactions, there would be no noticeable change. The accounts were then adopted with two abstentions.

The third agenda item comprized the election results, and the approval of the election of GW8NP as a Council member which was necessary by the Companies Acts owing to his age. Council was authorized to fix the remuneration of the auditors for the ensuing year and the meeting moved on to the last item. A call for volunteers to act as scrutineers for the 1977 Council election was fulfilled.

A supplementary report of Council was read by Mr W. A. Scarr, G2WS.

The formal meeting ended at 1910 and, immediately following, the President-elect drew the names of the 20 members to whom redemption of Lambda debentures will be offered this year.

Informal discussion

In response to a request from the floor a show of hands was held to determine whether the awards and trophies should now be presented or whether the informal discussion should be the next item. The result was a tie and the President ruled that the discussion should now commence and end at 2015.

A telegram was read from SRJ, the Yugoslav national society, expressing good wishes and support for the work of the RSGB for amateur radio.

Before the discussion opened the President made a personal statement in which he mentioned the reference to the RSGB and amateur radio made by Lord Wallace in the House of Lords. (This is fully reported elsewhere in this issue). The purchase of a data processor had been fully justified and the success was largely due to the efforts of David Evans, G3OUF, who had also played a large part in the implementation of the repeater plans. G2BVN was thanked for his part in the issue of the new licence, which, while not perfect, was a step in the right direction.

Lord Wallace drawing the numbers of 20 Lambda debentures to be repaid last month, while John Brown, G3DVV, hon treasurer, right, announces the names of the holders. On left is George Jessop, G6JP, secretary; and John Allaway, G3FKM, presiding

G2UV made a plea for support of the Radio Amateur Old Timers' Association and mentioned the good work carried out at Christmas time by that organization.

G3RYF asked for an explanation of the late delivery of the November issue of *Radio Communication*. It was stated in reply that some 400 issues had gone astray and that the blame lay entirely with the Post Office.

G3UUS asked for changes in the modes of transmission of the RSGB news bulletin to include fm and ssb in addition to a.m. G3IDG thought that more news should come from HQ. G2UV asked if the slow morse transmissions could carry Society news. G2CVV appealed for the news bulletins to carry items of wider interest aimed at the general public and not only members. G3SJE was unhappy with the rejection by HQ of certain items of club news.

G6XN referred to the pulse transmissions emanating from the USSR and asked what action has been taken. In reply G5XB, the RSGB Intruder Watch organiser, mentioned the reports that had been sent by national administrations and the ITU in an effort to obtain the cessation of the interference. Reports had appeared in newspapers in the USA largely based on material from G3PSM but no worthwhile mention had been noted in any UK newspaper.

G3SJE noted the activity of certain manufacturers in the citizens band field and believed that commercial pressures were increasing towards an allocation for this type of activity. G2MI referred to the appalling behaviour of cb operators overseas, while G3AAJ believed that some amateur radio operators wished to have cb facilities.

Dr John Allaway making more presentations at the AGM, l to r: the ROTAB Trophy to P. A. Miles, G3KDB (RSGB trophies manager); the Wortle-Talbot Trophy to L. Moxon, G6XN; the Founders Trophy to I. Jackson, G3OHX

The Raynet Trophy to Mrs L. A. Crane, Raynet registrations secretary; the Houston-Fergus Trophy, awarded to C.Lindsay, G3KTZ, and K. Spicer, G3RPB, being received by G3KTZ

Photos: P. Jones, G3YLV

Several members commented on the Alexandra Palace exhibition and the general manager stated that the format of the RSGB stand in 1977 would show changes. Better signposting in the immediate vicinity of the park was requested.

G8CKZ voiced the opinion that the Council was self-perpetuating and it was difficult for members to obtain invitations to serve on committees. It was suggested that the AGM should be held in the provinces from time to time and perhaps at a weekend. It was pointed out that at one Saturday meeting there had not been a quorum of members present and the proceedings had to be terminated and resumed one week later.

G3SJE asked that there should be an open forum at the 1977 convention when members could question Council and committee members. G2MI deplored the lack of conventions but realized that a sales area was apparently necessary.

G3UUS asked for an assurance that the RSGB was making every effort to obtain permission for the proposed Bacton repeater. G2BVN and G6JP outlined the history of the repeater over which a disproportionate amount of time had been spent. The group were not prepared to accept a 432MHz repeater, originally proposed some two years ago.

In closing the meeting the President thanked members for their attendance and interest.

This brief report is primarily intended for those members unable to attend the AGM. It is an informal account in advance of the minutes of the meeting and in no way is a formal record of the occasion.

G2BVN

HF PROPAGATION STUDY

Predicted HPFs (MHz × 10) for January 1977

GMT	00	02	04	06	08	10	12	14	16	18	20	22	24
Aden	136	125	106	159	277	315	286	266	214	155	141	136	136
Ascension	153	144	133	111	210	288	295	281	271	223	171	155	153
Bahrain	130	131	105	158	270	293	276	243	188	147	129	129	130
Bangkok	105	120	91	144	251	265	218	187	144	112	103	106	105
Barbados	129	119	112	116	110	158	267	274	271	241	173	138	129
Bermuda	107	106	105	105	93	106	239	268	268	241	162	121	107
Bogota	120	119	111	116	105	130	253	268	267	241	174	134	120
Buenos Aires	145	136	129	121	129	216	263	274	271	238	172	148	145
Cape Town	153	140	126	119	261	298	301	281	263	187	166	155	153
Colombo	92	130	103	162	268	285	270	232	178	136	124	124	92
Cyprus	121	125	103	124	248	274	261	242	196	139	125	121	121
Dakar	153	144	133	110	210	288	295	281	271	223	171	155	153
Denver	106	100	93	87	87	82	93	178	242	200	134	107	106
Fairbanks	106	100	101	94	106	131	125	124	136	136	129	117	106
Falklands	147	138	130	121	154	213	257	277	271	232	171	148	147
Gibraltar	91	91	82	77	126	190	192	186	172	121	102	92	91
Hongkong	102	102	79	120	239	196	155	140	120	106	103	102	102
Honolulu	106	100	94	94	106	116	128	128	115	145	122	117	106
Iceland	77	77	69	59	59	144	182	181	155	102	77	77	77
Jamaica	107	106	103	106	94	129	220	267	268	237	162	121	107
Lagos	153	145	133	108	249	301	298	281	266	210	145	157	153
Las Palmas	130	124	115	107	147	255	262	255	247	192	149	133	130
Lima	133	125	116	119	110	116	271	275	270	239	174	140	136
Los Angeles	106	100	94	93	93	111	110	124	215	187	126	106	103
Malta	105	107	93	91	188	230	223	215	181	122	110	105	105
Mauritius	124	121	112	147	279	314	290	271	227	161	145	138	124
Mexico	106	100	92	93	81	134	147	228	256	215	140	108	106
Moscow	89	86	81	75	181	219	216	186	148	94	89	88	89
Nairobi	145	105	108	134	276	291	291	275	237	168	150	144	145
New Delhi	117	122	97	158	257	268	230	174	134	121	103	114	117
New York	106	106	105	93	81	82	195	248	260	216	145	108	106
Osaka	103	105	81	97	168	138	114	111	110	105	103	103	103
Perth	125	130	103	162	268	282	210	200	176	135	120	122	125
Rio de Janeiro	147	138	130	121	124	260	266	266	266	237	172	148	147
Salisbury	139	124	122	130	261	299	296	280	247	177	159	150	139
Seychelles	112	84	100	147	265	276	290	267	216	159	144	138	112
Singapore	117	128	97	158	257	268	257	215	159	121	103	91	117
Suva (S)	106	101	83	94	119	187	178	140	100	116	116	117	106
Suva (L)	153	147	136	117	227	209	196	158	139	171	173	159	153
Sydney (S)	102	102	79	120	239	210	199	186	121	106	103	102	102
Sydney (L)	135	128	117	119	116	208	164	157	131	157	171	143	135
Teheran	126	130	100	162	268	285	267	224	171	134	124	124	126
Vancouver	106	100	94	94	88	82	93	98	158	153	124	117	106
Wellington (S)	98	100	75	98	162	202	210	166	110	105	103	105	98
Wellington (L)	145	140	131	122	158	182	157	149	138	169	173	153	145

For information on the use of this table, see page 284, *Radio Communication* April 1976. Please send reports to Mr J. Spurling, G4AQI, 15 Tibbs Hill Road, Abbots Langley, Watford, Herts WD5 0EE.

MESSAGE RECEIVED

AMATEUR BANDS IN THE UK

The following schedule applies from 1 January 1977

Amateur Licence A and Amateur Licence B

Footnote No	Frequency bands (MHz) (See (A))	Classes of emission (See B)	Power	
			Maximum dc input power (See (C) and (D))	RF output p.e.p. for A3A and A3J emissions only (See (D))
1 and 5	1·8–2	A1, A2, A3, A3A, A3H, A3J, F1, F2 and F3	10W	26⅔W
2 and 10	3·5–3·8		150W	400W
10 and 12	7–7·10 14–14·35 21–21·45 28–29·7			
1 and 3	70·025–70·7		50W	133⅓W
4, 10 and 12	144–145		150W	400W
10 and 12	145–146			
1, 7 and 8	430–432	A1, A2, A3, F1, F2 and F3	—	—
1 and 11	432–440	A1, A2, A3, A3A, A3H, A3J, F1, F2, and F3	150W	400W
1	1,215–1,225			
1 and 11	1,225–1,290			
1	1,290–1,325			
1 and 11	2,300–2,450			
1	3,400–3,475			
1 and 11	5,650–5,850			
1 and 11	10,000–10,500			
9 and 11	24,000–24,050		—	—
1, 9 and 11	24,050–24,250			
1 and 6 1 and 6 1 and 6	2,350–2,400 5,700–5,800 10,050–10,450	P1D, P2D, P2E, P3D and P3E	25W mean power and 2·5kW peak power	—

Footnotes

1. This band is allocated to stations in the amateur service on a secondary basis on condition that they shall not cause interference to other services.

2. This band is shared with other services.

3. This band is available to amateurs until further notice provided that use by the licensee of any frequency in the band shall cease immediately on the demand of a Government official.

4. The following spot aeronautical frequencies must be avoided whenever this band is used: 144·0, 144·54MHz.

5. The type of transmission known as radio teleprinter (rtty) may not be used in this band.

6. Use by the licensee of any frequency in this band shall be only with the prior written consent of the Secretary of State.

7. This band is not available for use within the area bounded by 53°N 02°E, 55°N 02°E, 55°N 03°W and 53°N 03°W.

8. In this band the power must not exceed 10W erp (effective radiated power).

9. Use by the licensee of any frequency in this band shall only be with prior written consent of the Secretary of State and such consent shall indicate the power which may be used, taking into consideration the characteristics of the licensee's station.

10. Slow scan television may be used in this band.

11. High definition television (A5, F5) may be used in this band.

12. Facsimile transmission (A4, F4) may be used in this band.

13. Data transmission may be used within the frequency bands 144–145MHz and above provided (a) the station callsign is announced in morse or telephony at least once every 15 minutes and (b) emission is contained within the bandwidth normally used for telephony.

(A) Artificial satellites may not be used by stations in the amateur service except in the bands 7–7·10MHz, 14–14·25MHz, 21–21·45MHz, 28–29·7MHz, 144–146MHz, 435–438MHz, 24,000–24,050MHz.

(B) The symbols used to designate the classes of emission have the meanings assigned to them in the Telecommunication Convention. They are:

Amplitude modulation

A1 Telegraphy by on-off keying, without the use of a modulating audio frequency.

A2 Telegraphy by on-off keying of an amplitude-modulating audio frequency or frequencies or by on-off keying of the modulated emission.

A3 Telephony, double sideband.

A3A Telephony, single sideband, reduced carrier.

A3H Telephony, single sideband, full carrier.

A3J Telephony, single sideband, suppressed carrier.

Frequency (or phase) modulation

F1 Telegraphy by frequency shift keying without the use of modulating audio frequency, one of the two frequencies being emitted at any instant.

F2 Telegraphy by on-off keying of a frequency modulating audio frequency or on-off keying of a frequency modulated emission.

F3 Telephony.

Pulse modulation

P1D Telegraphy by on-off keying of a pulsed carrier without the use of a modulating audio frequency.

P2D Telegraphy by on-off keying of a modulating audio frequency or frequencies or by on-off keying of a modulated pulsed carrier—the audio frequency or frequencies modulating the amplitude of the pulses.

P2E Telegraphy by on-off keying of a modulating audio frequency or frequencies or by on-off keying of a modulated pulsed carrier—the audio frequency or frequencies modulating the width (or duration) of the pulses.

P3D Telephony, amplitude modulated pulses.

P3E Telephony, width (or duration) modulated pulses.

(C) DC input power is the total direct current power input to (i) the anode circuit of the valve(s) or (ii) any other device energizing the aerial.

(D) As an alternative, for A3A and A3J single sideband types of emission, the power shall be determined by the peak envelope power (p.e.p.) under linear operation. The radio frequency output peak envelope power under linear operation shall be limited to 2·667 times the dc input power appropriate to the frequency band concerned. This column gives the maximum power determined by this method which may be used.

(E) Double sideband suppressed carrier emissions are permitted within the terms of this licence.

General rules for vhf/uhf/shf contests 1977

The rules governing all RSGB vhf/uhf/shf contests to be held in 1977 will be selected from the following general rules, which will be referred to by number. Supplementary rules will be added for the more complex events such as VHF NFD.

Please read these rules carefully.

Minor telephone queries can be answered outside working hours on Didcot 812584 or Wantage 3497. Cover and summary sheets and up to 10 log sheets can be obtained from the contest adjudicator. If you are entering a contest it is only necessary to tick the bottom of the cover sheet (Form 427) and enclose an sae. All stationery is A4 size (30 by 21cm); envelopes which will hold flat sheets will carry far more than those which require the sheets to be folded. Larger quantities of log sheets may be purchased from RSGB Publications (Sales).

1 Date and time. See individual contest details.

2 All entries must be sent to the adjudicator at the address given with the rules for the contest.

3 All operators must be members of the RSGB or have a membership application in progress.

4 Sections:

(a) There are two sections:
Section F —fixed stations;
Section P —portable and temporary stations.
If less than 10 entries are received for either section, Rule 4b will apply instead. /A stations will be listed with portable stations, but may not enter portable contests run under rule 4d.

(b) All classes of stations with no separate sections.

(c) Fixed stations only (excluding /A).

(d) Portable stations only (excluding /A).

All equipment, including antennas, for portable and temporary stations must be installed on the site during the 24 hours preceding the contest, or during the contest itself. This does not apply to storage of equipment, or to its prior installation more than 1km away from the contest operating position.

Portable stations may be required to provide proof of permission to use a site.

5 Location

(a) Entrants may not change the location of their stations during the contest.

(b) Entrants may change the location of their stations during the contest on one occasion provided that only the highest scoring contact with a given station is claimed in the event of a repeat contact. Repeat contacts must be clearly marked as such in the contest log.

6 Modes

(a) Contacts may be made on all permitted modes.

(b) Entrants may transmit only A1 (cw) or F1 (fsk) and contact only other stations transmitting these modes.

7 Scoring system

(a) Contacts made between the distances shown in the table will score as indicated. Contacts on borders between scoring rings score **low.**

Km	Points	Km	Points
0–50	1	250–300	11
50–100	3	300–350	13
100–150	5	350–400	15
150–200	7	400–450	17
200–250	9	and pro rata	

Note that, (i) all radial rings are 50km wide, (ii) all possible scores are **odd** numbers.

(b) Contacts will be scored at one point/kilometre.

8 Awards

In each section there will be an award to the highest scoring station. An award will also be made to the runner-up in each section in which there are 10 or more entries.

Additional awards will be made when appropriate.

9 Cross-band contacts

(a) Cross-band contacts do not count for points.

(b) Half points may be claimed by both stations for a cross-band contact if two-way communication cannot be established on the same band.

10 Repeat contacts

(a) Only one scoring contact may be made with a given station on each band covered by the contest (ie callsigns that are fixed, /A, /P or /M or the same set of equipment used under a different callsign all count as one station). If a station that has moved location is contacted a second time, only the higher scoring contact may be claimed. Serial numbers start at 001 and advance by one for each contact.

(b) One contact may be made with a given station (as defined in 10a) during each activity period. Only three out of seven activity periods will count towards the final score. However, all available logs should be sent to the adjudicator for the purposes of checking. To be eligible for an award, an entrant must take part in a minimum of three activity periods. Serial numbers start at 001 for each activity period and advance by one for each contact.

11 Contest exchange

The contest exchange shall consist of:

(a) Both callsigns;

(b) RS or RST report followed by serial number;

(c) Both QTH locator (the standard five-symbol location system) and QTH.

For stations operating within Great Britain the QTH must be given as a point identifiable on the Ordnance Survey Route Planning Map (Scale 1:625,000) or as a direction and distance up to 25km from such a point, to the nearest kilometre. For a station operating from outside Great Britain, the QTH must be readily identifiable.

No points will be lost if an entrant is unable to obtain a serial number or complete location information from a station not taking part in the contest. But the receiving operator must obtain enough information to be able to calculate the claimed distance score.

12 Log keeping

Entrants must keep their own log records in accordance with licence requirements.

The logs for contest entries must be made out on current RSGB contest log sheets, tabulated as follows:

(a) Date/time (gmt);
(b) Callsign of station worked;
(c) My report on his signals and serial number sent;
(d) His report on my signals and serial number received;
(e) QTH locator received;
(f) QTH received;
(g) Points claimed.

13 An entrant must operate within the terms of his/her licence.

14 An entrant may not engage in more than one contact concurrently.

15 Stations using telephony in the recognized cw sub-bands 70·05–70·15MHz, 144·0–144·15MHz, 432·0–432·15MHz and 1,296·0–1,296·15MHz, or transmitting on beacon frequencies, are liable to disqualification. Entrants should observe the provisions of the IARU/RSGB band plans.

16 Stations that persistently overmodulate, radiate poor quality signals, or otherwise contravene the code of practice for vhf/uhf contest operation (see p55), are liable to disqualification or loss of points.

17 Special event callsigns (eg GB) may not be used.

18 Contacts made via a repeater or man-made satellite will not count for points.

19 Proof of contact may be required.

20 Entries

(a) All entries must be accompanied by an RSGB vhf/uhf contest cover sheet (Form 427). The cover sheet must be correctly made out and the declaration signed.

(b) All entries must be postmarked not more than 15 days after the end of the contest.

(c) All entries become the property of the RSGB and will not be returned.

(d) Gross errors in logkeeping render the entrant liable to disqualification.

21 Failure to comply with any of the rules given for a particular contest may result in disqualification.

22 The ruling of the Council of the RSGB shall be final in all cases of dispute.

General rules for RSGB hf contests 1977

The general rules for all RSGB hf contests are given below. For each contest throughout the year a short supplementary set of rules will be published which must be read in conjunction with the general rules. *Note that Rules 8(a), 8(d) and 8(f), have been revised since last year.*

1. Entrants must operate in accordance with the terms of their licence.

2. Contacts with unlicensed stations will not count for points.

3. Only one contact on each band may be claimed with a specific station, whether fixed, portable, mobile or alternative address. Duplicate contacts must be logged and clearly marked as duplicates without claim for points. Cross-band contacts may not be claimed. Proof of contact may be required. Simultaneous operation on more than one band is not permitted.

4. (a) A fixed station must operate from the address shown on the licence.

(b) A portable station must operate from the same site for the duration of the contest and may not be located in a permanent building or use public mains. Power for all equipment may be derived only from a portable generator on the site, accumulators or batteries. No equipment or antennas may be installed or erected on the site prior to 24 hours before the start of the contest. This does not apply to the storage of equipment.

(c) A mobile station is a station installed in a motor vehicle, or vessel on an inland waterway, so equipped that the station may be operated in motion without alteration.

(d) An **alternative address station** is a station at a location not named on the licence, other than a portable or mobile station.

5. Unless otherwise stated, single-operator entries only will be accepted.

(a) A **single-operator station** is one manned by an individual operator who receives no assistance whatsoever in operating, log keeping or checking etc from other persons during the contest period.

(b) A **multi-operator station** is one which does not conform to the definition of a single-operator station given above. In those contests where multi-operator entries are allowed, such entries will only be accepted provided that:

(i) The declaration is signed by only one operator, who will be regarded as the entrant.

(ii) The callsign of the operator concerned is indicated for each contact.

(iii) The names and callsigns of all operators are listed on the cover sheet, and

(iv) For stations located in the British Isles, all operators must be fully-paid-up members of the RSGB.

6. Eligible entrants. Unless otherwise stated, only fully-paid-up members of the RSGB resident in G, GC (GU, GJ), GD, GI, GM and GW may enter. In those contests which are open to radio amateurs elsewhere, British Isles entrants (as defined above) must be members of the RSGB. Entries from GB stations, aeronautical mobile and maritime mobile stations will not be accepted.

7. A **contact** consists of an exchange and acknowledgement of an RS report on telephony, or an RST report on telegraphy, and a three-figure serial number starting with 001 and increasing by one for each successive contact throughout the contest, irrespective of the band or mode in use. Serial numbers, *when sent*, must be recorded from non-competing stations.

8. Form of entry.

(a) Entries must be clearly written or typed on one side only of RSGB contest log sheets or international A4 size paper using blue or black ink.

Columns must be headed as shown in the example below.

(b) *Separate log sheets must be used for each band.*

(c) Logs must be kept, and entries submitted, in gmt.

(d) Each entry must include a cover sheet in the form shown below incorporating a signed declaration.

HF Contest Entry Cover Sheet (Form HFC2)

Contest ..... Date ..... Score ....

Section (if any) ..... Callsign .....

Name .....

Home address .....

Name of club or group (if applicable) .....

Address of station, or portable location (if other than home address above) .....

National Grid six-figure reference, county code letters, or other co-ordinates (see contest details) .....

Transmitter ..... Input power ....

Receiver ..... Antenna(s) .....

Declaration. I declare that this station was operated strictly in accordance with the rules and the spirit of the contest, and I agree that the decision of the Council of the RSGB shall be final in all cases of dispute. I certify that the maximum input to the final stage of the transmitter was ..... watts.

Date ..... Signed .....

Failure to sign the declaration will involve disqualification of the entry.

Small quantities of RSGB contest log sheets and cover sheets may be obtained from HQ upon request. The request must be accompanied by a large sae. Larger quantities may be purchased.

(e) All entries become the property of the RSGB. In the event of any dispute the ruling of the Council of the RSGB shall be final.

(f) All entries must be postmarked not later than 15 days following the contest. If acknowledgement of receipt is required, British Isles entrants should include a stamped addressed postcard which will be returned to the sender. Overseas entries will not normally be acknowledged.

(g) Entries must be addressed to the adjudicator, whose address will appear in the supplementary rules for each contest, with the name of the contest marked in the top left-hand corner of the envelope.

9. For scoring purposes, aeronautical mobile and maritime mobile stations will count as mobile stations in the country of origin.

10. Awards

(a) Awards are made at the discretion of the Council of the RSGB and may consist of trophies, plaques or certificates. Awards are, where possible, presented at the RSGB AGM following the contest.

(b) The standard award format for contests is as follows: Some winners and section leaders will be the holders of particular trophies, and these will also receive a special certificate or plaque. Certificates of Merit will be awarded to the entrants placed first, second and third in each section of the contest, from (i) the British Isles and (ii) overseas.

11. Disqualification. Entrants may be disqualified on any one of the following counts:

(a) Failure to complete and sign the declaration.

(b) Frequent reports of poor-quality signals.

(c) Failure to record operators' callsigns against log entries (multi-operator entries only).

(d) Failure to use separate log sheets for each band.

(e) Failure to observe the terms of the entrant's licence.

Failure to observe and comply with other rules may also entail disqualification.

12. Errors in log. Points are deducted as follows:

(a) For errors in received information, on a proportional basis (eg one-third of points claimed for one error, two-thirds for two errors, all points lost for three or more errors);

(b) For errors in callsign, both sides lose *all* points for the contact;

(c) For unmarked duplicate contacts for which points have been claimed, additional penalty points may be deducted (eg five times the claimed score for that contact).

RSGB HF-VHF-UHF CONTEST LOG SHEET

Contest ..... Band.....MHz Sheet No.....of..... Callsign.....

Date and time (gmt)	Callsign	RS(T) and Serial No.		(5)	(6)	(7)	Points claimed
		SENT	RECEIVED				

General rules for RSGB hf receiving contests

1. All entrants operating from the British Isles must be fully-paid-up members of the RSGB.
2. Single-operator entries only will be accepted.
3. To claim for points, a station may be logged once only on each band, whether fixed address, portable, mobile or alternative address.
4. A receiving station log must show in columns: date/time, callsign of station heard, report and serial number sent by station heard, callsign of station worked, band in megahertz, bonus points, total points.
5. Where two or more bands are in use, separate log sheets must be submitted for each band.
6. In the column designated for "station worked", the same callsign shall not appear more than 20 times on each band throughout the contest.
7. A cover sheet shall be submitted with a contest log as under transmitting section General Rule 8(d) except that the last sentence of the declaration shall read: "I certify that I do not hold a transmitting licence."
8. The following rules from the transmitting section general rules also apply to receiving contests: 5(a), 8(e), 8(f), 8(g), 9, 10(a), 10(b), 11(a), 11(d), 12(a), 12(c).

General rules for listeners' vhf/uhf contests 1977

1. The following rules from the general rules for vhf/uhf/shf contests published in this issue shall apply: 1, 2, 4b, 5a, 7a, 10a, 18, 20, 21 and 22.
2. Listeners' contests are open to all non-licensed members of the RSGB. Only the entrant may operate the receiving station.
3. Logs must show in columns: (a) date/time (gmt), (b) callsign of station heard, (c) my report on his signals, (d) report and serial number sent by station heard, (e) callsign of station being worked (f) location given by station heard, (g) points claimed.

   On 144MHz the callsign in column (e) may occur only once in every 20 contacts logged. CQ and test calls do not count for points and should not be logged. If both sides of a QSO can be heard, both can be claimed for points.

The Hanson Trophy will be awarded to the entrant with the highest aggregate score in all the swl contests between 5 March and 4 September 1977.

Code of practice for vhf/uhf contest operation

1. Obtain permission from the landowner or agent before using the site, and check that this permission includes right of access. Portable stations should observe the Country Code.
2. Take all possible steps to ensure that a site is not going to be used by some other group or club. If it is, come to an amicable agreement *before* the event. Groups are advised to select possible alternative sites.
3. *All transmitters* generate unwanted signals; it is the level of these signals that matters. In operation from a good site, levels of spurious radiation which may be acceptable from the home station may well be found excessive by nearby stations (up to 25 miles or even further).
4. Similarly, *all receivers* are prone to have spurious responses or to generate spurious signals in the presence of one or more strong signals, even if the incoming signals are of good quality. Such spurious responses may mislead an operator into believing that the incoming signal is at fault, when in fact the fault lies in his own receiver.
5. If at all possible, critically test both receiver and transmitter for these undesirable characteristics, preferably by air test with a near neighbour before the contest. In the case of transmitters, aim to keep all in-amateur-band spurious radiations, including noise modulation, to a level of —90dB relative to the wanted signal. Similarly, every effort should be made to ensure that the receiver has an adequate dynamic range.
6. Above all, be gentlemanly at all times. Be helpful and *inform all stations* apparently radiating unwanted signals at troublesome levels—having first checked your own receiver! If asked to close down by a Government or Post Office official, do so at once without objectionable behaviour. If the site owner requests your station to close down, accede to his request without hostility.

Code letters for use in RSGB contests

County/Region	Letters	County/Region	Letters	County/Region	Letters	County/Region	Letters
Alderney	ALD	Durham	DHM	Isles of Scilly	IOS	Salop	SLP
Antrim	ATM	Dyfed	DFD	Isle of Wight	IOW	Sark	SRK
Armagh	ARM					Shetland	SLD
Avon	AVN	Essex	ESX	Jersey	JER	Somerset	SOM
				Kent	KNT	Staffordshire	SFD
		Fermanagh	FMH			Strathclyde	SCD
Bedfordshire	BFD	Fife	FFE			Suffolk	SFK
Berkshire	BRK			Lancashire	LNH	Surrey	SRY
Borders	BDS			Leicestershire	LEC	East Sussex	SXE
Buckinghamshire	BKS	Mid Glamorgan	GNM	Lincolnshire	LCN	West Sussex	SXW
		South Glamorgan	GNS	Greater London	LDN		
		West Glamorgan	GNW	Londonderry	LDR		
Cambridgeshire	CBE	Gloucestershire	GLR	Lothian	LTH		
Central	CTR	Grampian	GRN			Tayside	TYS
Cheshire	CHS	Guernsey	GUR	Greater Manchester	MCH	Tyne & Wear	TWR
Cleveland	CVE	Gwent	GWT	Merseyside	MSY	Tyrone	TYR
Clwyd	CWD	Gwynedd	GDD				
Cornwall	CNL			Norfolk	NOR		
Cumbria	CBA			Northamptonshire	NHM	Warwickshire	WKS
		Hampshire	HPH	Northumberland	NLD	Western Isles	WIL
		Hereford & Worcester	HWR	Nottinghamshire	NOT	West Midlands	WMD
Derbyshire	DYS	Hertfordshire	HFD			Wiltshire	WLT
Devon	DVN	Highlands	HLD	Orkney	OKE		
Dorset	DOR	Humberside	HBS	Oxfordshire	OFE	North Yorkshire	YSN
Down	DWN					South Yorkshire	YSS
Dumfries & Galloway	DGL	Isle of Man	IOM	Powys	PWS	West Yorkshire	YSW

contest news

144MHz Open and Listeners Contest results

By and large, a good contest, but a good time was not had by all; the usual crop of disasters, catastrophes and crises beset stations, but none that, in retrospect, will not take on a rosier hue.

Several stations submitted computer logs and these certainly make checking easier, not least because they print out the home station location at the head of each A4 page. The program in use, however, did not allow for extra summation of the IARU kilometric scores. One station claimed total accuracy because "computers don't go wrong wrong wrong wrong".

About one in four entries were scored for entry to the parallel IARU contest, and these have been sent on. In the past, IARU entries from the UK have been small and results have not been published; but when the results for this one are received they will be published even if they are not received before next Christmas.

Several stations suggested power limits, ranging from 10W to 150W dc in, and others did creditably with only 5 to 10W, and cw was a help. Some stations were notable by their absence, and this was probably due to the concurrent hf contest. *P.W.W.*

PORTABLE SECTION

Posn	Callsign	Points	QTH	Contacts	Best dx	Km
1	G3PMH/P	4,706	AN61	503	DJ7CL	730
2	GD3FLH/P	4,519	XO67	398	F6CUN/A	852
3	GW8IZS/P	4,433	YM44	483	F1KH/P	860
4	G4BPO/P	4,408	AM66	443	OZ1OZ	660
5	G8BQX/P	4,380	AK03	458	F1DEQ/P	843
6	G3PIA/P	4,123	ZL34	519	F5HV/P	790
7	G2FJA/P	3,799	AL43	436	HB9MM/P	712
8	GW3WRA/P	3,591	YL05	413	F5HV/P	885
9	GW3OXD/P	3,534	YM55	409	PA0MS/P	570
10	G3VCP/P	3,510	AK11	391	F1AUB/P	810
11	GM4DMZ/P	3,441	XO26	308	F1CRP/P	682
12	GM3OUR/P	3,249	YP25	295	F1KAR/P	695
13	G3TNO/P	3,204	ZK07	394	F1BYM/P	710
14	G4BEM/P	3,157	ZN61	525	F6CTT	565
15	G8GBY/P	3,128	ZN18	374	PA9SH	513
16	G4CCC/P	2,942	ZL54	415	F6BBK	700
17	G8GCP/P	2,838	ZK09	385	GM3OUR/P	550
18	G3XC/P	2,798	XK54	231	GM8KYL/P	606
19	G3OZE/P	2,781	ZN07	344	F1ANH/P	515
20	G8HDR/P	2,406	ZO71	302	F1BBD	595
21	G3VRE/P	2,290	ZL41	340	GM8FFX	620
22	G3PFM/P	2,151	YK09	333	DC8DK/P	658
23	G3HBR/P	2,145	ZK10	271	F5HV/P	665
24	G3OGY/P	2,143	ZL63	309	DJ5BV/P	595
25	G4DSC/P	2,060	ZO64	236	GC8CEY	556
26	GM4AVH/P	1,949	YP44	206	—	—
27	G3IZD/P	1,899	ZK07	286	F6BBK/P	635
28	G8GLS/P	1,850	YN18	234	F1BGR/P	517
29	G3WHL/P	1,842	ZN44	280	DK0ME/P	590
30	G4DZO/P	1,839	ZK10	270	F5HV/P	663
31	G3OHM/P	1,760	YM50	285	GM3JZK/P	510
32	GW8IVO/P	1,757	YL06	252	F1ANH/P	980
33	G3ZLQ/P	1,692	ZN52	259	ON4PB/A	505
34	G3WKS/P	1,611	AL61	308	GM3OUR/P	540
35	G4ATV/P	1,595	YM47	250	GM8FFX	525
36	G3PKF/P	1,594	AM62	225	GM8FFX	575
37	GW3ZTT/P	1,551	YM04	217	ON5UN/P	—
38	GW8CSA/P	1,496	YL15	207	PA0MS/P	590
39	G8JTP/P	1,469	ZN53	229	G3GZJ	445
40	G4BWP/P	1,402	ZM79	245	DJ9DX/LX/P	472
41	G4CDY/P	1,365	ZK34	200	DC8RCA	595
42	G4DHF/A	1,303	ZN53	207	ON5UN/P	430
43	G4BEW/P	1,263	AM06	146	G3XC/P	520
44	G3ZQU/P	1,130	AM66	141	DC8RLA	504
45	G8LED/A	1,125	ZM66	207	GM8FFX	525
46	GC3UGF/P	1,123	YJ48	116	G3DSC/P	525
47	G3YMD/P	940	AL76	139	GM4DMZ/P	560
48	G8KQW/P	885	ZM31	201	ON5NK/A	425
49	GM8DVD/P	823	YP66	89	G8BQX/P	512
50	G4DSP/P	790	ZM07	156	GM8FFX	473
51	G8HCI/P	665	YK30	90	GM3OUR/P	560
52	GM8KYL/P	645	YP14	85	G3XC/P	665
53	G8LVS/P	633	ZL19	159	GD3FLH/P	386
54	G4DLB/P	481	ZM73	98	GI3SXG/P	405
55	G8CMU/P	442	YM28	60	GM8FFX	485
56	G8KTK/P	378	ZL01	66	ON6IG	387
57	G8JXV/P	350	ZL60	114	GD3FLH/P	445
58	GI3YOR/P	309	WO62	36	GM8FFX	421
59	G8LM/P	257	ZM36	49	G3XC/P	360

FIXED SECTION

Posn	Callsign	Points	QTH	Contacts	Best dx	Km
1	G8BBC	2,005	ZL40	330	GM8FFX	630
2	G3OSS	1,943	ZL40	361	F1BGR/P	950
3	GD2HDZ	1,719	XO68	151	F1ANH/P	620
4	G8HQJ	1,553	ZL79	280	GM8FFX	
5	G3FGI	1,376	YN58	197		
6	G8AZA	1,092	ZO69	113	G3XC/P	542
7	G8FUL	1,068	ZL58	185	GM8FFX	635
8	G8GDK	1,044	ZL08	165	DL0EI/P	499
9	G3UHF	1,033	YN49	169	F1DPU	419
10	G3ERN	979	AL11	169	GM3XNE	535
11	G8ETB	916	ZL37	172	DK5PO/LX/P	525
12	G4FBK	850	ZL39	181	GM4DMZ/P	455
13	G8IZN	816	AL31	172	GM4DMZ/P	491
14	G8JGE	810	ZL39	217	GM3XNE	530
15	G8KME	800	YK07	114	GM8FFX	675
16	G3USF	778	YN79	125	ON5UN/A	463
17	G3FIJ	737	AL05	85	GM4DMZ/P	485
18	G8BKR	700	YL48	98	GM3OUR/P	465
19	GW8HVP	597	XL16	60	F1KAR/P	475
20	G4BYP	548	YN46	100	GM8FFX	415
21	G8IMF	535	ZL22	89	GM3OUR/P	454
22	G4FDF	530	ZM39	82	G3XC/P	413
	G3LCH	530	ZL50	107	GM4DMZ/P	470
24	G4FFJ	477	ZO02	65	G8BQX/P	481
25	G4AZA	476	ZL24	81	GM3OUR/P	457
26	G8LLG	475	YK38	65	DJ9DX/LX/P	580
27	GC3YIZ	461	YJ48	53	ON5UN/P	440
28	G8IBO	453	ZL67	116	GD3FLH/P	418
29	G3RYV	404	ZL37	86	GD3FLH/P	390
30	G8KAX	385	AL32	90	GD3FLH/P	439
31	G8LDY	369	ZL30	85	GD3FLH/P	400+
32	G8KSS	362	YL38	62	G4DSC/P	315
33	G2BLA	360	ZL20	80	EI9Q	460
34	G8GVA	312	ZM25	44	G3XC/P	375
35	G4CSB	291	ZL40	72	G4DSC/P	263
36	G3FPK	263	ZL60	27	GM3OUR/P	523
37	G3WDI	251	AM49	27	DK0ME/P	450+
38	G8ITS	242	ZL40	84	G8HDR	310
39	G3ILO	78	YL29	10	ON5UN/P	425
40	GM5BCI	62	XP19	20	GW3WRA/P	250+
41	G8JBH	38	ZL29	16	GW8IZS/P	200

Check logs received with thanks from: G4EAN, G3JFO/P, G4ASR/P, G8FSZ, G8AYN and G8HQR/P.

LISTENERS' SECTION

Posn	Station	Points	Posn	Station	Points
1	BRS35974	937	5	BRS36940	551
2	A8677	916	6	A8713	396
3	BRS36843	573	7	BRS15822	356
4	A9199	566			

SSB Field Day 1976 results

The Channel Contest Group is the winner of the 1976 SSB FD which was held during the first weekend in September in order to coincide with the DARC phone field day. Many groups commented upon the increased activity and interest in the contest from stations on the Continent, and as has been reported elsewhere it is hoped to organize a European SSB Field Day within the next few years once discussions on the formulating of common rules have reached a satisfactory conclusion.

The Channel Contest Group concentrated its activities on the 3·5 and 14MHz bands, making 396 QSOs and 32 multipliers on the former and 581 QSOs and 65 multipliers on the latter. An extensive station was set-up with an SB301/SB401/SB220 combination on one band and a FR400/FL400/FL2100 on the other plus two additional search receivers. A 2-el quad at 60ft was used on 14MHz, while on 3·5MHz there were four switchable sloping dipoles around an 80ft mast and an inverted-V with the apex at 60ft. The runner-up, the Northumbria Radio Club, made 757 contacts with the aid of a Trio TS520 plus an SB220 linear, an inverted-V dipole at 80ft for 3·5MHz and a TH3 beam and a quad at 50ft for 14MHz.

Conditions, while not excellent, were certainly good enough to enable strings of W/K stations to be worked on 14MHz, plus several contacts with VK/ZL on both 3·5 and 14MHz. The scoring system came in for some criticism in that it did not encourage groups to operate on all bands, and so it seems that perhaps further changes will be made for 1977. It also seems that several groups are not accustomed to working on the hf bands as several entrants were confused by the Russian club station prefixes, and one had obviously not met the USA Bicentennial special prefixes before as he claimed AC4 as Tibet. A few enterprising groups claimed W/K call areas as additional countries, and while other RSGB events may allow this, SSB FD was scored in accordance with the RSGB

Countries List (on sale from RSGB Publications price 24p). Several other groups were active during the contest but did not send in their logs, which is a pity because some of them would probably have done quite well in the final placings.

Thanks to all who sent in comments, these will be considered when the rules for 1977 are discussed.

Certificates of Merit will be sent to the three leading groups and to the leading overseas logs JA2HLX, VP8ON, YU1ELM/P—thanks to them and to OK2SPS, VP8HZ and VP8NX for their useful check logs.

Posn	Group	Callsign	3·5MHz	7MHz	14MHz	21MHz	28MHz	Total
1	Channel CG	G4DAA/P	60,064	—	184,925	—	—	244,989
2	Northumbria RC	G4AAX/P	21,600	—	196,460	—	—	218,060
3	Mansfield ARS	G3GQC/P	16,065	—	80,195	—	—	96,260
4	White Rose RS	G3XEP/P	29,400	60	59,395	200	—	89,960
5	BSC Port Talbot ARS	GW3EOP/P	16,425	4,350	58,350	35	—	79,160
6	Border ARS	G3YOG/P	10,660	—	66,240	—	—	76,900
7	Torbay ARS	G3NJA/P	16,380	3,640	48,300	35	—	68,355
8	Southgate RC	G3SFG/P	18,410	15,410	33,785	560	20	68,185
9	Bury RS	G3BRS/P	23,800	10,575	32,550	45	40	67,010
10	Addiscombe ARC	G4ALE/P	14,640	2,960	46,800	5	—	64,405
11	Crawley ARC	G3WSC/P	9,295	2,750	48,600	600		61,245
12	Lichfield ARS	G3WAS/P	—	—	60,648	—	—	60,648
13	G4FEV & G4CBZ CG	G4FEV/P	53,770	—	—	—	—	53,770
14	West Kent ARS	G4DIX/P	3,325	9,800	26,535	—	—	39,660
15	Shefford & DARS	G3FJE/P	14,840	—	21,000	810	20	36,670
16	Hull ARS	G3AMW/P	17,500	1,610	15,290	—	—	34,400
17	Cambridge & D RC	G4AKD/P	14,775	480	11,600	—	—	26,855
18	Greenock & D ARC	GM3ZRC/P	6,279	2,925	17,010	600	—	26,814
19	Cheltenham ARS	G5BK/P	4,268	3,550	13,920	380	225	22,343
20	Denby Dale & D ARS	G4CDD/P	12,900	375	8,550	30	—	21,855
21	Dartford Heath DFC	G4BDF/P	6,985	5,940	5,100	5	—	18,030
22	Sutton & Cheam RS	G4CWH/P	7,080	840	9,280	49	30	17,279
23	Reading ARC	G3ULT/P	4,770	800	9,900	240	10	15,720
24	Bromsgrove & D ARC	G3VGG/P	1,800	1,525	11,040	850	360	15,575
25	First CG	GW4FCG/P	6,075	115	9,215	30	20	15,455
26	Doncaster Coll of Tech	G3UER/P	9,170	210	3,080	10	—	12,470
27	Preston ARS	G3KUE/P	4,910	3,600	1,710	170	—	10,395
28	Clifton ARS	G3GHN/P	4,880	880	2,255	160	—	8,107

Countries worked by G4DAA/P

3·5MHz: G, GW, F, ON, DL, GM, GC, PA0, GI, EI, LX, OH, OK, OZ, SM, YU, SP, HB9, HA, UR2, LZ, I, CT1, UP2, YO, PY, YV, UB5, W, ZL, GD, VE.

14MHz: W, YB, LZ, VK, G, YO, VS6, VU, 9H, ZS, 9M2, AP, YU, 4X4, 5Z4, DL, EP, OK, A9, EA, IS, HA, SP, I, OH, VE, KP4, VP2K, LU, PJ, VP9, HI8, UL7, KZ5, YV, SM, YN, HR, UA, UA0, YK, UP2, JY, UG6, UF6, UB5, UR2, OA, EA8, IT, OE SV, F. UO5, 5B4, A4, OZ, UM8, JA, GM, LA, PA0, UA2, P29, HC.

First 1·8MHz Contest 1977 rules

1. The general rules for RSGB hf contests, published in this issue of *Radio Communication*, will apply.

2. When. 2100gmt Saturday 12 February to 0200gmt Sunday 13 February 1977.

3. Eligible entrants. All radio amateurs licensed to use 1·8MHz. Single-operator stations only may enter.

4. Sections.

(a) British Isles stations—RSGB members only.

(b) Overseas stations (including EI).

5. Contacts. CW (A1) only in the 1·8-2·0MHz band. County/region code letters, as published in this issue of *Radio Communication*, must be sent after the RST plus serial number group, eg for a contact from Surrey-599001 SRY.

6. Scoring.

(a) British Isles section. Three points for each contact, with a bonus of five points for the first contact with each new British Isles county/region, and for the first contact with each new country outside the British Isles.

(b) Overseas section. Three points for each contact with a station in the British Isles (not EI), with a bonus of five points for the first contact with each new county/region.

7. Logs. Column 5 to be headed "Code rcvd". Entries must be addressed to the RSGB HF Contests Committee, c/o R. L. Glaisher, 279 Addiscombe Road, East Croydon, Surrey.

8. Awards. The Somerset Trophy will be awarded to the winning station, and certificates of merit will be sent to the second- and third-placed entrants. The Maitland Trophy will be awarded to the Scottish entrant with the highest aggregate number of points in this contest combined with the Second 1·8MHz Contest 1976.

A certificate of merit will be awarded to the highest-placed entrant whose 18th birthday falls on or after 14 February 1977. Entrants wishing to compete for this award should state their date of birth on the cover sheet, and write clearly "Under 18" at the TOP of the cover sheet. Entries will only be eligible for this award where operation has taken place under the entrant's own callsign, and from the "main address" as stated on the station licence.

70MHz Fixed Station Contest results

Propagation conditions were poorer than the corresponding event in 1975 and this may have contributed to the reduced entry. The majority of the contestants enjoyed this event and found the timing to their liking although many people commented upon the lack of activity. An analysis of the percentage of contacts made on cw has been incorporated into the table at the request of a number of operators. No doubt these statistics could be interpreted in many ways, but they do show that G3JYP operating from a dx site in Cumbria managed to hoist his score into a respectable third place by resorting to cw for 50 per cent of his contacts.

Among the hardware it appears that the QQVO6-40A remains an almost universal choice as a pa, while the choice of the rx front-end appears to be more varied with 40673 and 40822 having the largest number of adherents. The choice of an antenna is interesting, with the leading four stations running much larger arrays than the normal 4-el Yagi. G3JYP wins the prize for the largest antenna with a 15-el colinear stack.

Posn	Callsign	Points	QSOs	%cw	QTH	Best dx	Km
1	G3OHH	389	59	7	YN79	GC3HFN	415
2	G4ASR	357	63	3	AL22	GD2HDZ	410
3	G3JYP	266	28	50	YO39	G3AUS	455
4	G3XBY	265	51	14	ZM52	GC3HFN	340
5	G3OHC	250	46	7	ZM31	GC3HFN	385
6	G3UKV	242	42	24	ZM28	G3DAH	290
7	G3WCS	240	38	11	YN47	G3TR	295
8	G3TR	234	53	21	ZL70	GD2HDZ	435
9	G3LVP	211	48	19	AL33	GD2HDZ	430
10	GD2HDZ	195	19	0	XO68	G3DAH	485
11	GC3HFN	193	19	5	YJ48	G3OHH	415
12	G4APL	190	51	14	ZL60	G3JYP	400
*	G3FJE/A	189	49	10	ZM78	GD2HDZ	355
13	G2DMR	178	52	25	ZL60	G3WCS	290
14	G5RP	166	36	33	ZL34	G3JYP	370
15	G4AEZ	165	39	0	ZL30	GD2HDZ	460
16	G3BZU	161	43	11	ZK05	G3OHH	200
17	G4BBA	159	31	34	ZM39	GD2HDZ	330
18	G3FIJ	151	29	17	AL05	GC3HFN	370
19	G4BVE	147	25	4	YN39	G3XCS	382
*	G3MGS/A	122	22	50	YL48	G3DAH	259
20	G4AGK	112	38	24	ZL08	G3WCS	200
21	G3ASF	93	25	0	ZM43	G3DAH	215
22	G3TAL	67	17	29	ZK14	G3OHH	260
23	G5UM	64	15	67	ZM35	G3JYP	253
24	G3BTO	62	20	100	ZL55	G3DAH	158
25	G3PGN	57	19	0	AL22	G3OHH	240
*	G8LM/P	55	17	24	ZM36	G4APL	149
26	G3SBV	27	19	0	ZL50	G3BZU	80
*	GM3YOR/A	6	6	0	YQ64	GM3BQA	36

* Disqualified, Rule 4c.
Check log received from G3YPS/M.

70MHz CW Contest rules

1000–1500gmt 23 January 1977

All entries and checklogs to: VHF Contests Committee, c/o Mr G. M. C. Stone, G3FZL, 11 Liphook Crescent, Forest Hill, London SE23 3BN.

The following general rules (published in this issue) will apply: 1, 2, 3, 4a, 5a, 6b, 7a, 8, 9a, 10a, 11–22.

144MHz Open and SWL Contest rules

1600–1600gmt 5–6 March 1977

All entries and checklogs to: VHF Contests Committee, c/o Mr I. White, G3SEK, 83 Portway, Didcot OX11 0BA.

The following general rules will apply: 1, 2, 3, 4b, 5a, 6a, 7a, 8, 9a, 10a, 11–22. Listeners rules 1, 2 and 3 will apply.

BARTG Spring RTTY Contest rules

0200gmt 26 March to 0200gmt 28 March

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 18h non-operating period can be taken at any time during the contest, but off periods may not be less than 3h at a time. Times on and off the air must be summarized on the log and score sheets. There will be separate categories for multi-operator stations and SWLs.

Bands: 3·5, 7, 14, 21 and 28MHz.

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 & VE/VO counted once only for QCA).

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.

(d) *Note:* The proof of contact may be required in cases where the station worked does not appear on any other contest logs received.

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 final score.

Sample score.

Exchange points (302 × countries (10)	= 3,020
Country points (10) × bonus points (200) × continents (3)	= 6,000
(a) and (b) added together to give a score of	9,020

Logs and score sheets. Use one log for each band and indicate any rest periods. Logs to contain: Date, time gmt, callsign of station worked, RST report and message number as sent, RST report and message number as received and exchange points claimed. *All logs must be received by 31 May 1977 to qualify.*

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.

Send contest logs to:

Ted Double (G8CDW), 89 Linden Gardens, Enfield, Middlesex EN1 4DX.

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 8IRCs 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 new 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.

Contests calendar

9 January	Affiliated Societies (Rules in December issue)
23 January	70MHz CW (Rules in this issue)
28-30 January	CQ WW DX 160
29-30 January	REF CW
5-6 February	ARRL DX Phone
12-13 February	1st 1·8MHz (Rules in January issue)
19-20 February	ARRL DX CW
26-27 February	REF Phone
5-6 March	144MHz Open (Rules in January issue)
5-6 March	ARRL DX Phone
12-13 March	Commonwealth (Rules in December issue)
19-20 March	ARRL DX CW
20 March	432MHz Open
26-27 March	CQ WW WPX SSB
2-3 April	70MHz Open
17 April	Low Power
24 April	144MHz CW
1 May	Queen's Jubilee CW
14 May	1·3GHz Open
15 May	432MHz Open
22 May	Queen's Jubilee Phone
28-29 May	144MHz Portable
11-12 June	HF NFD
18-19 June	Microwave
25-26 June	Summer 1·8MHz
2-3 July	VHF NFD
17 July	3·5MHz FD
31 July	144MHz QRP
13-14 August	70MHz Open
3-4 September	SSB FD
3-4 September	144MHz Open
1-2 October	UHF Contest
8-9 October	21/28MHz
15-16 October	7MHz Phone*
23 October	70MHz Fixed
October-November	432MHz Cumulative
5-6 November	7MHz CW*
12-13 November	144MHz CW
12-13 November	2nd 1·8MHz
4 December	144MHz Fixed

* *Mode amended*

8th BARTG VHF RTTY Contest results

Generally the standard of logging was high and only a very small number of adjustments had to be made to the claimed scores. The number of entries from Sweden was higher than last year but there were less entries from Germany although activity appeared to be high. There was considerable activity, both in this country and on the Continent during the contest, despite the small number of entries from Germany, and we are pleased to welcome an entry from Norway.

Posn	Callsign	144MHz	432MHz	Total points	Contacts	Best dx (km)
1	DK1AQ	228	10	238	34	498
2	G3PLX	92	—	92	19	280
3	DC3OZ	86	5	91	23	427
4	G3VPC	90	—	90	18	255
5	G8LT	69	—	69	17	170
6	SM6FYU	52	13	65	10	275
7	SM6ASD	57	6	63	13	301
8	G3OZF	62	—	62	18	282
9	G8JMC	52	—	52	14	212
10	G4ATG	50	—	50	16	185
11	G4AFQ	45	—	45	19	124
12	G8BIS	42	1	43	17	175
13	G8LFZ	40	—	40	18	168
14	G8JUG	37	—	37	17	136
15	G8IZU	36	—	36	10	170
16	G3EFP	33	—	33	17	144
17	G8ISI	32	—	32	12	137
18	PA0YZ	27	—	27	5	281
19	LA7AJ	23	—	23	3	275
20	GW8BXQ	22	—	22	2	300
21	G4EGH	18	1	19	7	190
21	G3IIR	19	—	19	11	108
23	G8FSL	12	—	12	10	60
24	SM6ANW	8	—	8	4	86
25	SM6EBM	7	—	7	5	75
26	G8LZA	6	—	6	4	38
26	G8KAV	6	—	6	6	35
26	SM6CAL	6	—	6	4	53
29	OE1VKW	5	—	5	1	107
29	DJ2YE	5	—	5	1	140
29	G3RDG	5	—	5	3	54
32	SM6GDL	1	—	1	1	25

Additionally G3WWV scored 69 points but was unable to submit an entry by the closing date due to the pressure of other business.

A check log was submitted by G8CDW.

"This never used to happen on 160!"

club news

RSGB affiliated societies and clubs, and RSGB groups, are invited to submit items for inclusion in "Club News" to their regional representatives (not direct to the editor).

Items of news and dates of forthcoming events should reach RRs by 22 January for the March issue.

REGION 1—RR position vacant. Queries to B. O'Brien, G2AMV, Tanglewood, 8 Anthony's Way, Heswall, Wirral, Merseyside L60 0PB.

Ainsdale (AARC)—13, 27 Jan, 10, 24 Feb, 10 Mar. 8.15pm. Ainsdale Scout Headquarters. Further details from G2CUZ.

Blackburn (East Lancs ARC)—First Thursday in each month, 7.30pm. YMCA, Blackburn. Visitors always welcome. Sec G4CGT.

Blackpool (B&DARS)—Mondays, 8pm. Pontins Holiday Camp, Squires Gate. Morse tuition, 7.30pm.

Bolton (B&DARS)—First and third Wednesdays in each month, 8pm. Bolton Recreation Club, Kensington Place. Sec G8LXD.

Bury (BRS)—Main meeting on the second Tuesday in each month. RAE classes and morse instruction every Tuesday as well as an informal meeting of club members. Mosses Community Centre, Cecil Street, Bury. Sec John Clifford, G4BVE, 10 Arley Avenue, Bury, tel 061-764 3466.

Carlisle (C&DARS)—Mondays, 7.30pm. Currock House, Lediard Avenue, Currock, Carlisle. A very full programme of lectures and demonstrations have been arranged for the coming months. Full details from G8DVD.

Chester (C&DARS)—Tuesdays, 8pm, except for first Tuesday in the month. YMCA Chester. Further details from the ASR, G3PYU.

Douglas IoM (IoM ARS)—Mondays fortnightly, Highlander Inn, Crosby. Visitors welcome. Sec GD2HDZ, tel Laxey 465.

Eccles (E&DARC)—Tuesdays, 8.30pm. White Swan, Worsley Road, Swinton. Sec G4AEQ.

Lancaster University (UoLARS)—Wednesdays, 8pm. Furness College. Visitors are welcome, as are skeds on hf and 2m—club callsigns are G8DOU and G3ZBY. There are RAE and morse test classes. Enquiries to John Morris, G4ANB, Dept of Physics.

Leyland (LHARG)—Second Monday in each month, 7.30pm. "Rose & Crown", Ulnes Walton, Leyland. Details from G3XII.

Liverpool (L&DARS)—Tuesdays, 8pm. Conservative Association Rooms, Church Road, Wavertree. Sec G4EST.

Liverpool (North Liverpool RC)—Tuesdays, 8.30pm. Informal meetings. "Nags Head", Thornton, Crosby, Liverpool 23. Visitors welcome. Sec R. Porter, 11 Cranmore Avenue, Crosby, Liverpool L23 0QD.

Liverpool University (UoLARS)—Meeting at lunchtime and on Mondays, 5pm. Club shack, Reilly Building. The club is active on all bands 80-2m, with callsigns G3OUL/G8JUL. Constructional facilities and test equipment are available for members. Students from the polytechnic and other colleges in the city are welcome. Officers for 1976/77 are: chairman G4FKA; treasurer G8IDX; sec GW4FJK. Details from sec c/o the Students' Union or c/o GW4FJK.

Manchester (M&DARS)—Wednesdays, 7.30pm. 203 Droylesden Road, Newton Heath, Manchester 10. Sec G8IYX.

Manchester (South Manchester RC)—7 Jan ("Recent developments at vhf" by Peter Torry, G3SMT), 14 Jan ("Aerials" by M. Barnsley, G3HZM), 21 Jan ("Aerial support systems" by R. Parkinson, G3FNM), 28 Jan ("Logic circuits" by I. Parkinson, G3YRQ), 4 Feb (Mini-lecture competition), 11 Feb ("Reminiscences" by D. Barber, G2AKR), 18 Feb ("The modern oscilloscope", speaker to be announced), 25 Feb ("Surplus equipment sale). 8pm. Sale Moor Community Centre, Norris Road, Sale. Informal meetings on Mondays at "Greeba", Shady Lane, Baguley, Manchester 23. Details from sec G3VIW.

Manchester University (MUARS—G3VUM). Interested parties should contact G4AOS, QTHR.

University of Manchester (UoM—IoS&TARS)—G3CXX is active on all hf bands and G8FOT on 2m and perhaps 23cm. Items for club/magazine/newsletter, or letters from intending members gratefully received by sec, c/o UMIST.

North Western Repeater Group—Third Thursday of each month, 8pm. "Grey Mare", Blackburn. Meetings open to all interested. Full details from G8HQW.

Basil O'Brien, left, former Region 1 representative and now RSGB Council member for Zone A, presenting the Home Brew Contest Senior Award to Peter Torry, G3SMT, at the South Manchester RC annual dinner. Looking on is club chairman Jeff McBurney, G4AUR *Photo: G3VIW*

Preston (PARS)—13, 27 Jan, 10, 24 Feb, 10 Mar. Morse practice 7.30pm. Meeting 8pm. "Windsor Castle" (private room), St Paul's Square, Preston. Sec G8KTM.

Salford (Dial House RS)—Wednesdays, 5.30-9.30pm. Dial House, W45, 55 Portland Street, Manchester M60 1BA. Net channel 145·25MHz a.m.—most members are now mobile on this channel, and the club station G3WDH now monitors this frequency every club night for calls from any other station. Sec G8JCN.

Stockport (SRS)—Second and fourth Wednesdays in each month, 8pm. Blossoms Hotel, Buxton Road, Stockport. Sec G3FYE.

Thornton Cleveleys (TCARS)—First and third Wednesdays in each month, 8pm, morse practice from 7.30pm. St John Ambulance Hall, Fleetwood Road North (next to "Gardener's Arms"), Thornton. Details from sec G8OY.

UK FM Group (Western)—20 Jan (Informal meeting). 8pm. Legh Arms, Chelford Road, Knutsford.

Warrington (W&DARS)—Tuesdays, 7.45pm. Grappenhall Community Centre, Bellhouse Lane, Grappenhall. Sec J. Weaver, c/o Grappenhall Community Centre.

Wigan (W&DARS)—First and third Wednesdays of each month. Poolstock Cricket Club, Keats Avenue, Poolstock. Sec A. Cunliffe, G4EII, 50 Langholm Road, Garswood, Wigan.

Winsford (Mid-Cheshire ARC)—Wednesdays. Technical Activities Centre, rear of Verdin Buildings, Verdin Comprehensive School, Grange Lane, Winsford. RAE class 7pm to 8pm. Morse class every third Wednesday. Net nights 160m Mondays, 8pm, 2m (fm) Tuesdays, 8pm. Sec G8HAV.

Wirral (WARS)—First and third Wednesdays in each month, 7.45pm. Sports and Recreation Centre, Grange Road West, Claughton, Birkenhead. Sec G3DLF.

Liverpool Luncheon Club—members wishing to attend should contact G3VQT or G2AMV.

The 1977 North West Amateur Radio Convention will be held on 17-18 September 1977. Its format will be similar to that used with great success for the first two conventions. Further details will become available early this year. Enquiries to J. R. Morris, Dept of Physics, University of Lancaster.

Belle Vue Convention, Manchester, 1977—the date has been fixed for 24 April.

Region 1 trophies 1976. HF NFD-RR's cup to Stockport RS, 80m Trophy to Bury RS, G3LWQ Rosebowl to Wirral ARS. Region 1 VHF contest—G2CIP Shield and 4m and 70cm certificates to North Liverpool RC, certificates for 2m top score to Isle of Man ARS; single operator section—G3SMM Shield and 2m certificate to G4CZP, 4m certificate to GD2HDZ, 70cm certificate to G8BCG. Best result outside the region—certificate to G4ESK. Congratulations to all concerned.

Basil O'Brien, G2AMV, would like to thank all members for the support and encouragement received over a very long period. For this, and particularly for the help and co-operation always willingly given by all the staff at HQ, he is most grateful. Best wishes to the next Region 1 RR.

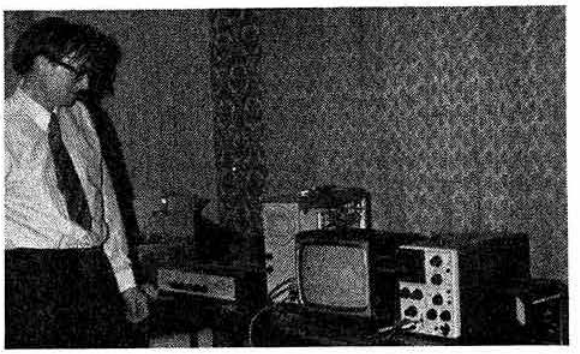
REGION 2—RR R. C. Andreang, G4CMT, 6 Beech Avenue, Bilton, Hull, Humberside.

Barnsley (B&DARS)—Fourth Friday in each month, 7.30pm. King George Hotel, Peel Street, Barnsley. Hon sec G3LRP.

Denby Dale (DD&DARS)—Wednesdays, 7.30pm. Pie Hall, Denby Dale. Visitors always welcome. For New Year dates contact hon sec G3FQH.

Goole (G&DARS)—Fridays, 7.30pm (during school term only). Goole Grammar School. Full details from chairman G3VBI.

Halifax (Northern Heights ARS)—7.45pm. Peat Pitts Inn, Ogden, Halifax (four miles north of Halifax town hall). Hon sec G3MDW.



On 24 November, David Raven, G3TKR, was guest speaker at the Northern Heights ARS when his subject was conversion from slow-scan television to fast scan using his version of the WB9LVI circuit. After outlining conventional sstv and describing the way conversion took place, he demonstrated the equipment shown here (l to r): tape recorder, WB9LVI converter, sstv monitor, fast-scan monitor 'scope, and sstv monitor. It was believed to be the first working demonstration of the system in the north of England. *Photo: G3TQA*

Hornsea (HARS)—Wednesdays, 8pm. Rear of Victoria Hotel, Hornsea (facing Hornsea Mere). Club callsign G4EKT. Visitors welcome. Hon sec G4CHH.

Hull (H&DARS)—Fridays, 7.30pm. Dorchester Hotel, Beverley Road, Hull. Hon sec G8IED.

Leeds (White Rose RS)—Late Jan (AGM), 3 Apr (White Rose Rally, venue as usual). Wednesdays, 7.30pm (lectures start 8pm). Hon sec G4DZI.

Leeds (LUUARS)—Tuesdays, 8pm. Union Annexe (second floor), Woodhouse Lane. All new students welcome. Hon sec G4CNG, QTHR or at "E" block, Lupton Flats, Alma Road, Leeds 6 during term.

Otley (Radio & Electronics Society)—Tuesdays, 8pm. 14 Back of Court House Street, Otley. Hon sec J. H. Marchbank, 116 Brooklands Lane, Menston, Ilkley, W Yorks LS29 6PJ.

Scarborough (SARS)—Fridays, 7.30pm. Scarborough Technical College, Corby Road, Scarborough. Visitors always welcome. Hon sec G3RTN, PRO Charles Whitaker, 1 Ryefield Close, Eastfield, Scarborough YO11 3DN.

Sheffield (SU&PRS)—Thursdays during term, 5.30pm. "The Phoenix", Charles Street. Details from A. Marvin, G8CZO, 74 Kirkstone Road, Sheffield S6 2PP.

Sheffield (Association of Sheffield Amateur Radio Clubs (ASARCs))—Officers elected at the AGM: chairman P. Bradbury, G4EXK; sec B. Flounders; treasurer Barry Chambers, G8AGN; newsletter joint editors J. Hall, G4DUP, E. Chambers, G4CUW. Subscriptions to the association became due at the AGM.

York (YARS)—28 Jan (AGM). A visit to Hull Technical College is planned for early 1977. Fridays, 7.30pm (except for the third Friday in the month). United Services, 61 Micklegate, York. The club was pleased to have a visit from G4CMT and to hear of his QSO from the top of the Humber Bridge Towers. Another visitor was HCIRT/W0ZMU. Hon sec G3WVO.

The Region 2 RR would like to wish everyone a happy New Year, and especially to thank his ARs J. W. Thompson, G3WQM, and Connie Wade, G4CUY.

REGION 3—RR H. S. Pinchin, G3VPE, 61 Cole Bank Road, Hall Green, Birmingham B28 8EZ.

Birmingham (Midland ARS)—11 Jan, 1 Feb, 1 Mar (Construction and club station). 7pm. Brasshouse Centre, off Broad Street, Birmingham. 18 Jan, 15 Feb (lectures). 8pm. Room 110, University of Aston, Gosta Green, Birmingham. G3ZKQ.

Birmingham (Slade RS)—7 Jan (Golden Jubilee discussion evening), 21 Jan (Trends and changes in 50 years), 4, 18 Feb, 4 Mar. 8pm. The Committee Room, Church House, Erdington, Birmingham. G4FGF.

Birmingham (South Birmingham RS)—12 Jan, 2 Feb, 2 Mar. 8pm. Hampstead House, Fairfax Road, West Heath, Birmingham B31 3QY. G8KPA.

Birmingham (Birmingham University RS)—Every Tuesday during term, 7pm. Students' Union. G3IUB. Sec G4CKK.

Bromsgrove (B&DARC)—Second Friday in each month, 8pm. Avoncroft Art Centre, Bromsgrove. G8JTK.

Coventry (CARS)—7 Jan (" Early telephone systems" by G4CFG), 14, 21, 28 Jan, 4, 11, 18, 25 Feb, 4 Mar. 8pm. Baden Powell House, 121 St Nicholas Street, Radford, Coventry. G8DMI.

Coventry Technical College (CTCARS)—Mondays, 7pm. Morse classes and rtty included in club activities. Winfray Annexe of the College. G8ISJ.

Hereford (HARS)—7 Jan ("The satellite tracking station at Madley" by G3NPA), 21 Jan, 4, 18 Feb, 4 Mar. Civil Defence HQ, Gaol Street, Hereford. G4CNY.

Lichfield (LARS)—First Monday and third Tuesday in each month, 8pm. Swan Hotel. Tuesday meetings are natter-nites. Sunday net noon, 21·150MHz. G3RTY.

Lichfield (Chad RC)—Alternate Wednesdays, commencing 5 Jan. 8pm. The Naval Club, Burton Old Road, Lichfield. G4ESK.

Mid-Warwickshire (MWARS)—First and third Mondays in each month, 8pm. 61 Emscote Road, Warwick. G8CXL.

Redditch (RRC)—Second and fourth Thursdays in each month, 8pm. The Old People's Centre, Park Road, Redditch. G3EVT.

Solihull (SARS)—18 Jan (Surplus sale), 15 Feb, 4 Mar (Social outing). 7.30pm. The Manor House, High Street, Solihull. G4EQF.

Stoke-on-Trent (S-on-TARS)—Thursdays, 7.30pm. 2A Racecourse Road, Oakhill, Stoke-on-Trent. G4CWN.

Stoke-on-Trent (North Staffs ARS)—First and third Mondays in each month—lectures etc. Second, fourth and fifth Mondays in each month—natter nites, Raynet and club station G4BEM. Newcomers welcome. 7.30pm. Harold Clowes Community Centre, off Dawlish Drive, Bentilee, Stoke-on-Trent. G3YBY.

Stourbridge (S&DARS)—Informals on the first Tuesday in each month, 9pm. "Shrubbery Cottage" public house, Heath Lane, Oldswinford, Stourbridge. 17 Jan (Annual constructors' contest), 21 Feb. 7.45pm. Longlands School, Brook Street, Stourbridge. G4CLX.

Sutton Coldfield (SCRS)—Second and fourth Mondays in each month, 7.30pm. Central Youth HQ, Clifton Road, Sutton Coldfield. Sec Miss E. Lamb, 190 Birmingham Road, Sutton Coldfield B72 1BX.

Telford (T&DARS)—Wednesdays, 7.30pm. Phoenix Centre, Webb Crescent, Dawley. G4AXZ.

Willenhall (W&DARS)—Alternate Wednesdays. Morse classes available at the end of each meeting. "The Three Crowns", Stafford Street, Willenhall. G3YHN, XYL.

Wolverhampton (WARS)—10 Jan (Natter-nite), 17 Jan (10GHz evening), 31 Jan (Natter-nite), 7 Feb ("DX on 60m" by Bill Millerchip), 14 Feb (Natter-nite), 21 Feb (Film show), 7 Mar ("Amateur tv" by G5KS). 8pm. Neachells Cottage, Danescourt Road, Stockwell End, Tettenhall, Wolverhampton WV9 9PH. G8EDG.

Worcester (W&DARC)—15 Jan (Natter-nite), 29 Jan (Annual dinner at Lenchford Hotel), 7 Feb ("Which semiconductor device?" by G3WGY), 19 Feb (Natter-nite), 7 Mar. 8pm. The Old Pheasant, New Street, Worcester. G4DXE.

REGION 4—RR T. Darn, G3FGY, Sandham Lane, Ripley, Derbys.

Derby (D&DARS)—5 Jan (Surplus sale), 12 Jan (To be announced), 19 Jan (Film or video), 20 Jan (Technical topics), 2 Feb (Surplus sale), 9 Feb (To be announced), 16 Feb (Video films), 19 Feb (Annual dinner-dance, Derbyshire Yeoman, Kingsway, Derby, tickets and information from G2CVV), 23 Feb (Open forum). 7.30pm. The Clubroom, 119 Green Lane, Derby. Morse classes on Tuesdays, 7pm. G2CVV.

Derby (NHCAARG)—Fridays, 7.30pm. Nunsfield House, Boulton Lane, Alvaston, Derby.

Leicester (LRS)—10 Jan (AGM). 8pm. Club meetings on Mondays, 7.30pm. Club House, Gilrose Estate Cottage, Leicester. Once again the club did a wonderful job at the Leicester exhibition, looking after

the talk-in station and the eyeball corner. The Leicester Raynet and repeater groups both staged very commendable exhibits. G3ZJS.
Mansfield (MARS)—First Friday in each month, 7.30pm. "The New Inn", Westgate, Mansfield. G3XWZ.
Melton Mowbray (MMARS)—21 Jan, 18 Feb. 7.30pm. St John Ambulance Hall, Asfordby Hill, Melton Mowbray. G3NVK.
Nottingham (ARCoN)—6 Jan (Forum), 13 Jan ("Semiconductors" by G8FWH), 20 Jan (Activity night), 27 Jan ("Amateur radio in the USA" by G3LOV), 3 Feb (Forum), 10 Feb (Activity night), 17 Feb (Debate on citizens' band), 24 Feb ("Fax"). 7.30pm. Sherwood Community Centre, Mansfield Road, Sherwood. G4EKW.
Spalding (S&DARS—northern)—20 Jan (Amateur television demonstration and lecture covering both closed circuit and uhf transmission—all interested persons invited). 7.30pm. William Lovell School, Stickney (on A16 between Boston and Spilsby). G8LGF.
East Midlands Amateur Radio Group—23 Mar ("Radio spectrum utilization—co-ordination or chaos ?", group lecture by J. A. Saxton, DSc, PhD, CEng, FIEE, FInstP, director of the Appleton Laboratory). 7.30pm. St Helen's House, King Street, Derby. Admission by (free) ticket. See your local club sec or contact G3FGY.

REGION 5—RR P. F. Chilcott, G4BBA, 258 Coneygree Road, Peterborough PE2 8LR.

Bedford (B&DARC)—6 Jan (Club on the air vhf/hf 1977). Thursdays, 8pm. United Services Club, Broadway. Chairman is now David Boyde, G4FNS, and sec is David Whitty, G4FEV.
Cambridge (C&DARC)—Fridays, 7.30pm. Corporation Yard, Victoria Road. Sec is now John Worsnop, G4BAO.
Cambridge University (CUWS)—Tuesdays during term. Sec G4EAG, St Catherine's College.
Corby (CTCARG)—Mondays, 7.30pm. Corby Technical College. Clubhouse and GB3CI in college grounds.
Dunstable (DDRC)—Fridays, 8pm. Chews House, 77 High Street South. Sec G3WXS.
March (M&DRAS)—Tuesdays, 7.30pm. 2 Grays Lane. Sec G8GNE.
Northampton (NRC)—13 Jan (Visit of Garex Electronics), 27 Jan ("Multi-channel logic switching" by Andy Sibley, G8JFF), 10 Feb (Slide evening), 17 Feb (Constitution EGM), 24 Feb ("70cm fm" by the repeater team). Thursdays, 8pm. Spencer Dallington Community Centre, Tintern Avenue, off Gladstone Road. Sec G8GHZ.
Peterborough (GPARC)—27 Jan (AGM), 24 Feb (Tape/slide lecture). 7.30pm. Southfields Infants School, Stanground. Details from G4BBA, tel 65213.
Peterborough (PR&ES)—Third Friday in each month, 7.30pm. Scout Hut, Occupation Road. Sec G3EEL.
Shefford (S&DARS)—Thursdays, 8pm. Church Hall. Sec G3TAZ.

REGION 6—RR D. C. Andrews, G4CWB, 63 Bulmershe Road, Reading, Berks.

Banbury (BARS)—Fridays, 7.30pm. 43 North Bar, Banbury. New members and visitors welcome. Details from sec G3LTN, tel Banbury 710623.
Bracknell (BARC)—17 Jan (AGM). First and third Mondays in each month, 8pm. Alternate Mondays morse. Visitors welcome. Sec G3YMC.
Burnham Beeches (BBRC)—7 Feb (Junk sale), 7 Mar ("Picture show" by G8BPN). 8pm. Hedgerley Scout HQ. Sec Peter Fynn, tel Farnham Common 2609.
Maidenhead (M&DARC)—First Thursday and third Tuesday in each month, 7.30pm. British Red Cross Hall, The Crescent, Maidenhead. Sec G4ALG.
Milton Keynes (MK&DRS)—10 Jan ("Communications and the Civil Aviation Authority" by G3IAB), 14 Feb (Ladies' evening, "Ben Nevis in winter" by G8LFB), 14 Mar ("Microwaves" by G3WKL). 8pm. Lovat Hall, Newport Pagnell. Sec G3THC, tel 0908 316730.
Newbury (N&DARS)—First Monday in each month, 7.30pm. Newbury College of Further Education, Oxford Road, Newbury. Everyone most welcome. Sec G4EFE, tel 0635 45747.
Oxford (O&DARS)—Second and fourth Wednesdays in each month, 7.30pm. Civil Service Sports Club, Marston Road, Oxford. Visitors welcome. Sec G4BHR.
Oxford (Oxford University RS)—Wednesdays. 62 Banbury Road, Oxford. Sec G4CNV, Keble College, Oxford.
Reading (RARC)—First and third Tuesdays in each month, 8pm. "White Horse", Emmer Green, Caversham, Reading. Details from sec G4CCC.

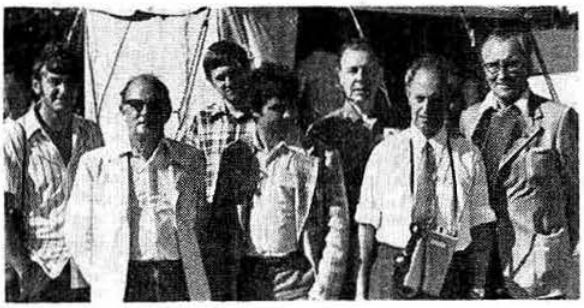
A very happy New Year to all members and their families in Region 6.

REGION 7—RR N. A. Smith, 7 The Byeways, Surbiton, Surrey KT5 8HT.

Addiscombe (AARC)—Tuesdays, 9pm. "Spread Eagle", Portland Road, South Norwood. Sec G4CZB.
Ashford, Middlesex (Echelford ARS)—10, 27 Jan, 14, 24 Feb (Programmes to be arranged). 7.30 for 8pm. St Martin's Court, Kingston Crescent, Ashford. Sec G3TDR, tel Staines 56513.
Bexley Heath (North Kent RS)—Second and fourth Thursdays in each month, 8pm. St Mary's Institute, 2 North Cray Road, Bexley. Sec G4ARQ.
Coulsdon (CATS)—First Thursday in each month, 8pm. 10th Purley Scout HQ, Chipstead Valley Road, Coulsdon. Third Monday in each month, 8pm. 1st Purley Scout HQ, Purley Park Road, Purley. A new treasurer, G4DRO, and committee members were elected at the AGM. Hon sec G4DLD, tel 25 59956.
Cray Valley (CVRS)—6 Jan (To be arranged), 20 Jan (Natter-nite), 3 Feb ("Citizens' band radio" by J. Bryant, G4CLF), 17 Feb (Natter-nite), 3 Mar (To be arranged). 8pm. Eltham United Reformed Church Hall, 1 Court Road, London SE9. Sec G3YWO.
Croydon (Surrey Radio Contact Club)—First and third Wednesdays in each month, 7.30 for 8pm. TS "Terra Nova", 34 The Waldrons, Croydon (new meeting place). Intensive morse course starts early January. Details from sec G3FWR, tel 01-657 3258.
Crystal Palace (CP&DRC)—15 Jan (Thick film technology), 19 Feb (AGM). 8pm. Emmanuel Church Hall, Barry Road, London SE22. Sec G4AVV, tel 01-653 4340.
Guildford (G&DRS)—Second and fourth Fridays in each month. Model Engineers HQ, Stoke Park, Guildford. Sec G4BHQ, tel Guildford 76375.
Kingston (K&DARS)—12 Jan ("Oscar" by G8CSI), 9 Feb (To be arranged). 8.15pm. Berrylands Scouts and Guides HQ, Stirling Walk, Raeburn Avenue, Surbiton. PRO G8HUW.
New Cross (Clifton ARS)—Fridays, 8pm. 225 New Cross Road, London SE14. Details from R. A. Hinton, 58 Camilla Road, Bermondsey, London SE16.
Reigate (RATS)—18 Jan ("Introduction to logic" by D. Pedder, G3LFX), 15 Feb ("Propagation" part 2 by D. Thom, G3NKS). 8pm. Constitutional Centre, Warwick Road, Redhill. 4 Jan, 1 Feb (Natter-nites). 8.30pm. "Marquis of Granby", Hooley Lane, Redhill. Sec G3XSZ, tel Reigate 43130.
Sutton & Cheam (SCRS)—Third Thursday in each month, 7.30pm. Sutton College of Liberal Arts, Cheam Road, Sutton. Sec G4BOX.
Thames Ditton (Thames Valley ARTS)—4 Jan (AGM), 1 Feb ("The art and science of direction finding" by J. Sonley, G3XSV). 8pm. The Conference Room, Giggs Hill Green Library, Giggs Hill Road, Thames Ditton. Sec G3ZNW.
Wimbledon (W&DRS)—Second and last Fridays in each month, 8pm. St John Ambulance HQ, 124 Kingston Road, Wimbledon SW19. Sec G3XTC, tel 01-644 3698.

REGION 8—RR D. N. T. Williams, G3MDO, "Seletar", New House Lane, Thanington, Canterbury, Kent.

Burgess Hill (Mid-Sussex ARS)—7.45pm. Marle Place, Burgess Hill. Details from G3PEQ.
Canterbury (East Kent RS)—6 Jan (Grand junk sale), 3 Feb ("ATV" by G6ALR/T and G6AOG/T). Details of future events from G8GHH.
Chichester (C&DARC)—First Tuesday and third Thursday in each month. Lancastrian Boys School. Details from G4ETU, tel 0243 88069.
Crawley (CARC)—United Reform Church Hall, Ifield, Crawley. Details of future events from G3MGL.
Dartford (DHDFC)—Second Friday in each month, 8pm. The Scout House, Broomfield Road, Dartford.
Dover (South East Kent YMCAARC)—5 Jan ("The aurora borealis" by G4EQJ), 12 Jan ("Aerials and propagation" by G3LCK), 19 Jan ("Visit to Hi-Fix" by G4DCV, followed by hf evening), 26 Jan (Debate on citizens' band in the UK), 2 Feb ("Satellites and the amateur" by G3XVY), 9 Feb ("Visit to G8KNY factory"), 16 Feb (Film night), 23 Feb (Project night, G8KEN). Details from G8KSD.
Eastbourne (Southdown ARS)—22 Jan (Annual dinner at Esmaralda restaurant). PRO G3LFZ.
Gravesend (GRSGBG)—Mondays, 7.30pm. The Windmill Tavern, Shrubbery Road, Gravesend.
Hastings (HERC)—Details of club events from G8DNO.
Hastings (ITT(H)S&AC)—Details of club activities from G8DNO.
Horsham (HARC)—First Wednesday in each month. Civil Defence HQ, Moons Lane, Brighton Road, Horsham. Details of future events from G3NPF.
Kent Repeater Group—Details from G3XDV, 5 Lambs Walk, Whitstable.



The Southdown ARS is "twinned" with the Radio Club de Normandie and exchange visits between the clubs took place in July and September 1976. In July the Southdown ARS were the hosts and entertained their visitors at the Polegate Steam Engine Rally where this photograph was taken. In September a return visit was made to the RC de Normandie at Rouen by the Southdown ARS. Both occasions were an outstanding success and plans are already in hand for this year. L to r: G3TOE, G8KXJ, F6DEX, F6DZQ, F9CB (vice-president, RC de Normandie), G3LFZ (chairman, SARS), F1XI. *Photo RC de N*

University of Kent (UKC)—Wednesdays, 3.30pm (during term). Further information from Jon Hudson, G4ABQ, Rutherford College, University of Kent, Canterbury.
Maidstone (MYMCAARS)—First and third Fridays devoted to the beginner, RAE and morse tuition, 7.30pm. Melrose Close, Loose, Maidstone. Alternate Fridays, a wide variety of lectures and use of the club shack. Details from Harry Poppy, G8KMX, tel Maidstone 61792.
Medway (MARTS)—Fridays, 7.30pm. Aurora Hotel, Gillingham. Details from G8APB.
Ramsgate (Kent Coast ARC)—Details of future events from hon sec G4DTA.
North Sussex Repeater Group—Details from C. M. Goadby, G8HVV, "Twin Firs", Hophurst Lane, Crawley Down, West Sussex RH10 4LJ.
Tunbridge Wells (West Kent ARS)—Details of future events from G8LMV.
Worthing (W&DARC)—Tuesdays 8pm. Adult Education Centre, Union Place, Worthing. Details from G6KFH.

REGION 9—RR H. W. Leonard, G4UZ, 4 Start Bay Park, Strete, Dartmouth TQ6 0RY.

Camborne (Cornish RAC)—6 Jan ("Visiting the USA" by G3UCQ), 3 Feb ("Measuring instruments" by G3VWK), 3 Mar ("Electrical safety in the home" by G3XFL). 7.30pm. SWEB Clubroom, Pool, Camborne. Cornish net every Sunday at 11am on 3·685MHz. Visitors always welcome. Full details from G3NKE, tel Camborne 2419.
Exeter (EARS)—Second Monday in each month, 7.30pm. Community Centre, Exeter (new venue). Full details from J. Bawden, 232 Exwick Road, Exeter EX4 2BA.
Newquay (N&DARS)—Alternate Wednesdays, 7.45pm. Treviglas School, Newquay. Details from G8GOR, tel Newquay 4168.
North Devon (NDRC)—Second Wednesday in each month at QTH of G4CG, fourth Wednesday at QTH of G2FKO. Details from G4CG.
Plymouth (PRC)—First and third Tuesdays in each month, 7.30pm. Virginia House, Bretonside, Plymouth. Visitors most welcome. G4ELQ.
Saltash (S&DARC)—First and third Fridays in each month, 7.30pm. Burraton Toc-H Hall, Saltash. Sec J. Reynolds, G8LLR, 47 Lulworth Drive, Roborough, Plymouth PL6 7DT.
Torbay (TARS)—29 Jan ("Beermaking at home" by G4UZ; constructors' contest), 26 Feb ("Visiting New York" by G3UIQ), 11 Mar (Annual dinner-dance, tickets from G3UIQ). Fridays, with special meeting on the last Saturday of each month, 7.30pm. Rear of 94 Belgrave Road, Torquay. Torbay net every weekday at 10.30am on 3·758MHz. Visitors most welcome. G3UIQ.

G4UZ wishes all in Region 9 a happy New Year. He is hoping to arrange an ORM in February or April at Newton Abbot—details later.

REGION 10—RR R. G. Barrett, GW8HEZ, 23 Carshalton Road, Beddau, Pontypridd, Glam.

Barry (BCoERS)—Thursdays, 8pm. Barry Rugby Football Club Reservoir Road, Barry. Details from sec GW3VBP.
Blackwood (BARS)—Fridays, 7pm. Oakdale Community Centre, Oakdale, Nr Blackwood. Details from sec GW3KYA.
Bridgend (Glamorgan VHF/UHF Group)—Second Wednesday in each month, 7.30pm. NCB Social Club, Tondu, nr Bridgend. Details from sec GW8HEZ.
Cardiff (CRSGBG)—Second Monday in each month, 7.30pm. The Pantmawr Inn, Pantmawr Estate, Cardiff. Details from sec GW3VOW.
Merthyr (Hoover ARS)—Mondays, 7.30pm. Hoover Social Club, Pentrebach, Merthyr. Details from sec GW8HHY, QTHR.
Newport (NARC)—Mondays, 7pm. Adult Education Settlement, Brynglas Road, Newport. Details from sec GW8MER.
Pembroke (PRSGBG)—Last Friday in each month, 7.30pm. Defensible Barracks, Pembroke Dock, Dyfed. Details from sec GW3XJQ.
Pontypool (PRSGBG)—Tuesdays, 7pm. Educational Settlement, Park Hill Road, Pontypool. Details from GW3JBH.
Port Talbot (British Steel Corporation ARS)—Thursdays, 7.30pm. BSC Sports and Social Club, Margam. Details from GW4ESV.
Rhondda (RARS)—Every other Thursday, 7.20pm. Transport Employees' Club, Porth. Details from GW3PHH.
Sully (S&DSWC)—Mondays fortnightly, 7pm. Sully Bowls and Social Club, 58 South Road, Sully. Details from sec GW8JHF.
Swansea (SARC)—Tuesdays fortnightly, 7.30pm. The Commercial Inn, Killay. Details from sec GW4AYJ.

REGION 11—RR P. H. Hudson, GW3IEQ, "Silhill", Dinas Dinlle, Caernarvon LL54 5TW.

Bangor (UCNWARS)—Thursdays, 7.30pm. Small lecture theatre, School of Engineering Science.
Conway Valley (CVARC)—13 Jan (Hot pot supper at the "Dulas Arms"), 10 Feb ("Radar in the war" by GW3ELM). The Quaries, Llandulas, Colwyn Bay.
Rhyl (R&DARC)—Second Tuesday in each month. Lecture room, Ambulance Station, Coast Road, Rhyl. Newcomers and visitors welcome.

REGION 12—RR Frank Hall, GM8BZX, 45 Priory Cottages, Lunanhead, Forfar, Angus DD8 3NR.

Aberdeen (ARS)—Friday evenings. Clubrooms, rear of 91 Crown Street, Aberdeen. Sec GM4BKV.
Dundee (Kingsway Technical College ARC)—Wednesdays, 6.30pm. Kingsway Technical College. Visitors welcome. QSL manager for club station GM4AAF is GM4FLP. Sec Robert Officer, 17 Broomhill Gardens, Monikie, Broughty Ferry, Dundee DD5 3QP.
Lerwick (LRC)—Wednesday evenings. Annsbrae House, Lerwick. Sec GM3HTH.
Moray Firth (MFARS)—Wednesdays, 7.30pm. Elgin Technical College. Winter programme—talks on all modes 2m transceivers, propagation, tvi, afi, transistor theory, rtty, dxing and sstv. Sec GM8LVG.

The area representative for the Scottish Islands region is now Sven Weber, GM8ACC, QTHR.

REGION 13—RR Rev S. J. Smith, GM4DNM, St Ninian's, 6 Derran Drive, Cardenden, Fife KY5 0JG.

Berwick (BARS)—Last Sunday in each month, 7pm. Tweed View Hotel. Further details from GM8IIO.
Dunfermline (DARS)—Second Wednesday in each month, 7pm. CCTV Studios, Pittencrieff School, Maitland Street, Dunfermline. Further details from GM8HEY.
Edinburgh (Lothians RS)—13 Jan ("Citizens' band"), 27 Jan (Junk sale), 10 Feb ("School projects" by GM4FDU), 24 Feb (Demonstration of commercial equipment by GM8DOX). 7.30pm. Adult Education Centre, Riddles Court, High Street.
Edinburgh (Pioneer Club)—Tuesdays, 7.30pm. Church Hall, Ravenscroft Place, Gilmerton. Details from sec GM4DTJ.
Glenrothes (G&DARC)—First Sunday in each month and Wednesdays, 7.30pm. Old Nursery Buildings, Leslie, Fife. Sec GM3YOR.

Since submitting this contribution, GM4DNM has resigned as RR on health grounds—Ed

REGION 14—RR A. J. Mitchell, GM3UDL, 7 Limetree Crescent, Newton Mearns, Glasgow G77 5BJ.

Ardeer (ARCARS)—Thursdays, 7.30pm. Ardeer Recreation Club, Stevenston, Ayrshire. Details from GM8BOM.

Ayr (AARS)—23 Jan (Air TC). Every second Sunday evening. Community Leisure Centre, 24 Wellington Square, Ayr. Details from GM3THI.

Falkirk (F&DARC)—Temperance Cafe, Lint Riggs, Falkirk. Details from GM3OQI.

Glasgow (West of Scotland ARS)—Fridays, 7.30pm. 22 Robertson Street, Glasgow. Programme and other details from G. Milne, GM4BLO.

Greenock (G&DARC)—Tuesdays and Fridays, 7.30pm. 22 Inverkip Street, Greenock. Details from GM3LYI.

Motherwell (Mid-Lanark ARS)—Fridays, with alternate meetings informal. Morse classes every other Friday. Wrangholm Hall Community Centre, Jerviston Street, Motherwell. Details from GM8HBY.

REGION 15—RR H. J. Campbell, GI8FOK, 26 Kilcoole Park, Belfast BT14 8LB.

Ballymena (BRC)—Tuesdays, 8pm. 86 Old Cullybackey Road, Ballymena. RAE and morse classes. Fridays, club night; Sundays, special projects, 3pm.

Bangor (B&DARS)—First Friday in each month, 8pm. Redcliff Hotel, Seacliff Road, Bangor. Hon sec D. Steele, GI4EMS, 59 Donaghadee Road, Millisle, Co Down.

Belfast (QUoBRC)—Tuesdays, 8pm. Queen's University Radio Club, 37 Fitzwilliam Street, Belfast. All welcome.

Belfast (CoBYMCARC)—The club is active on the air from 7.30pm on Tuesdays and 2.30pm on Saturdays. Meetings at same times. 7 Brunswick Street, Belfast. Hon sec D. Kane.

Belfast (BRSGBG)—Third Wednesday in each month, 8pm. 90 Belmont Road, Belfast. Interesting winter programme arranged. Visitors most welcome. Further details from GI8FOK.

Carrickfergus (CYMCARC)—Last Monday in each month, 8pm. Carrickfergus YMCA. New members very welcome to this newly formed club. Hon sec GI8KZU, c/o Carlton House, Lancastrian Street, Carrickfergus, Co Antrim.

Mid-Ulster RSGB Group—First Sunday in each month, 3pm. At QTH of GI4BAC. Hon sec M. Anderson, GI3WWY, 32 Knockview Drive, Tandragee, Craigavon, Co Armagh.

North Ulster (NURSGBG)—For particulars of change of venue and other details contact GI8AYZ.

REGION 16—RR R. E. G. Kendall, G8BNE, "Wesley", Ranworth Road, Hemblington Corner, Blofield, Norwich NR13 4PJ.

Chelmsford (CARS)—First Tuesday in each month, 7.30pm. Marconi College, Arbour Lane, Chelmsford. Details from R. Brocks, 30 Rowan Drive, Heybridge, Maldon.

Colchester (CRA)—Wednesdays, 7.30pm. Stanway School, Colchester. Sec T. A. Mills, G3YAI, 75 Lymington Avenue, Clacton-on-Sea.

Great Yarmouth (GYRS)—Last Thursday in each month. 67 Southdown Road, Great Yarmouth. Details from G3NHU.

Harlow (H&DRS)—Tuesdays, 8pm. Mark Hall Barn, First Avenue, Harlow, Essex. Details from G3WUX.

Ipswich (IRC)—Details from J. Gee, G4BAV, 35 Neath Drive, Stoke Park, Ipswich.

Loughton (L&DRS)—Second and fourth Fridays in each month, 8pm. Loughton Hall, near Debden Station. Sec G4CMD.

Lowestoft (L&DARC)—Fridays, 7.30pm. Morse class every Tuesday. YMCA, Park Road, Lowestoft.

Martlesham (MRS)—Details from G. Murchie, G8AXU, Post Office Research Centre, Martlesham.

Norwich (Norfolk ARC)—Wednesdays, 7.45pm. Crome Community Centre, Telegraph Lane East, Norwich. Details from G4EOL.

Norwich (U of East Anglia R&EC)—Details from P. Gowen, G3IOR.

Stowmarket (S&DARS)—Details from K. J. Bertrard, 35 Curwen Road, Stowmarket.

Vange (VARS)—Thursdays, 8pm. Youth Hall, Barstable Tenants Community Association, Long Riding, Basildon. Details from Mrs D. Thompson, 10 Feering Row, Basildon SS14 1TE.

Nominations for area representatives in the Norfolk and Suffolk areas would be appreciated. Names to G8BNE or to RSGB HQ.

REGION 17—RR L. Hawkyard, G5HD, 100 Shirley High Street, Southampton, Hants.

Basingstoke (BARC)—First Saturday and third Wednesday in each month, 7.30pm. Chineham House, Popley, Basingstoke. Sec G3CBU.

Basingstoke (UKFM Group, Southern)—5 Jan, 2 Feb. Chineham House, Basingstoke. Details from PRO G8ECO.

Bournemouth (Wessex ARG)—First Friday in each month. 7.30pm. Dolphin Hotel, Holdenhurst Road, Bournemouth. Sec G4EMN, tel Bournemouth 20027.

Chippenham (C&DARC)—Tuesdays, 7.30pm. Sheldon School, Hardenhuish Lane, Chippenham. Sec G8BXG.

Fareham (F&DARC)—Wednesdays, 7.30pm. Porchester Community Centre, Room 9. Sec D. Thompson, tel Fareham 2799.

Farnborough (F&DRS)—Second and fourth Wednesdays in each month, 7.30pm. Railway Enthusiasts' Club, Access Road, off Hawley Lane, Farnborough. Sec G4FEA.

Guernsey (GRES)—Tuesdays and Fridays, 8pm. Details from sec GC8ITE, PO Box 100, Guernsey.

Horndean (H&DARC)—Second Thursday in each month, 7.30pm. Merchiston Hall, Horndean. Net Sundays 6.30pm. 21·40MHz. Sec G4CHO.

Jersey (JARS)—Sundays, 10.30am, and Fridays, 8pm. Le Hocq Tower, St Clement, Jersey. Sec Mary McTaggart, 19 Parade Road, St Helier.

Poole (PRAS)—First Friday in each month, 7.30pm. Poole Technical College. Sec Graham Tizzard, tel Poole 4641 ext 34.

Portsmouth (P&DRC)—Wednesdays, 7.30pm. Portsmouth Community Centre, Malins Road, Buckland, Portsmouth. G3CNO.

Salisbury (SR&ES)—Tuesdays, 7.30pm. Salisbury Activity Centre, Wilton Road. Sec G2FIX.

Southampton University (SUARC)—Tuesday evenings, also informal meetings every lunchtime in the clubroom, Old Union Building. Sec T. Williams, G3YOZ.

Southampton (SRSGBG)—Second Saturday in each month, Lanchester Building, Southampton University; Wednesdays, the clubroom, Kent Road; both at 7.30pm. AR G4COM.

South Dorset (SDRS)—1 Feb ("Microprocessors in amateur radio" by G3VPF). 7.30pm. Lecture Hall, South Dorset Technical College, Newstead Road, Weymouth. Details from G3YWG.

Swindon (SD&ARC)—Alternate Wednesdays, 7.45pm. Clubroom above Coldharbour Public House, Blunsdon, just north of Swindon. Sec G8KWC.

Winchester (WARC)—First and third Fridays in each month, 7.30pm. Antrim House, St Cross Road, Winchester. G4BKE.

REGION 18—RR P. J. Fay, G3AKG, 5 Harland Way, The Glebe, Washington, Tyne & Wear NE38 7RB.

Easington (AR&EC)—Tuesdays and Thursdays, 7.30pm. Easington Village Workmen's Club (three minutes from A19). CW practice, 80 and 160m operation. ATV can be received on 625 lines. RAE instruction if required. Sec G3VSS.

Hartlepool (HRC)—Mondays, 7.30pm. Methodist Church Hall, Grange Road. Sec G3NWU, 73 Eamont Gardens, Hartlepool.

Middlesbrough (PORC)—Sec G8CDP, 200 Marton Road, Middlesbrough.

Morpeth (Northumbria RC)—The club now meets on Thursday evenings in the British Legion premises, Gambois, nr Blyth. Sec G4AVO.

Newcastle (Tyne & Wear Repeater Group)—First and third Wednesdays in each month. Arts Common Room, University of Newcastle. Membership is open to all amateurs. Contact G3URE for details. The repeater was due to commence tests on 28 November and reports giving location, power and antenna used are urgently required and should be sent to sec G3URE. The beacon is now under the control of this group, and has been in operation since 11 November, using the callsign GB3NEE on 144·935MHz. At present it is on low power but will run 30W erp when a fault on o/p stage is rectified. The group hopes to get a representative on to the RSGB Repeater Working Group soon.

South Shields (SSD&RS)—Fridays, 7.30pm. Trinity House. Old and new members welcome. Sec G8BQF, 67 Lauderdale Avenue, Kings Estate, Wallsend.

Sunderland (SARS)—This club is at present without a headquarters. Contact sec G8BQF.

Tyneside (TRC)—Mondays, 8pm-9.30pm. The Community Centre, Vine Street, Wallsend. Sec F. Addison, 3 Wilton Close, Whitley Bay, Tyne & Wear.

Middlesbrough PORC is considering the formation of a repeater group. Contact G8EIA for details.

REGION 19—RR D. S. Smith, G4DAX, 151 Hamper Mill Lane, Oxhey, Watford, Herts.

Acton, Brentford & Chiswick (ABCRC)—18 Jan (AGM), 15 Feb ("Introduction to vhf and uhf" by G4FBK). 7.30pm. Chiswick Trade and Social Club, 66 High Road, Chiswick.

Barking (BR&ES)—Mondays (Constructional), Wednesdays (CCTV techniques), Thursdays (Informal). Morse classes Tuesdays. 7.30pm. Westbury Recreation Centre, Westbury School, Ripple Road, Barking, Essex. Sec G8JEG, tel 01-599 1103.

Cheshunt (CDRC)—Wednesdays, 7pm. Rosedale Sports Centre, Andrews Lane, Cheshunt.

Chingford (Silverthorn RC)—Fridays, 7.30pm. Friday Hill House, Simmonds Lane, Chingford E4. Visitors very welcome. Sec G4AJA, tel 01-529 2282.

Ealing (EDARS)—Tuesdays, 8pm. Northfields Community Centre, Northcroft Road, London W13. Sec R. Blackwell, 4 Colnbrooke Avenue, West Ealing, London W13 8JY.

East London RSGB Group (Wanstead)—16 Jan ("VHF preamps and receiver problems" by G3FEW), 20 Feb ("Digital techniques" by G4ALN). 3pm. Wanstead House, The Green, Wanstead, London E11. Sec G4CJQ, tel 01-524 3169.

Harrow (RSH)—Fridays, 8pm. Roxeth Community Centre, Harrow (new venue).

Havering (H&DARC)—Wednesdays, 8pm. British Legion Club, Western Road, Romford.

Holloway (Grafton RS)—7 Jan (Open night), 14 Jan (Junk sale), 21 Jan (AGM), 28 Jan ("Photographic techniques" by Ivan Norton and Don Gookie), 4 Feb ("Industrial rf" by G8EEI), 11 Feb ("Antennas" by G3ZKE), 18 Feb (Ceefax/Oracle), 25 Feb (Tom's Tools). 7.30pm. Holloway Institute, Archway Annex, Highgate Hill, London N19. Sec G3ZKE.

Ilford RSGB Group—Thursdays, 8pm. 50 Mortlake Road, Ilford. Details from D. T. Sapworth, G3YMW.

Northolt (British Airways European Division ARS)—First Monday in each month. Trident Club, Western Avenue, Northolt, Middlesex. This club is open to non-BA employees by invitation. Contact G3OUF, tel Amersham 21573 for details. Civil Aviation Sunday net at 1100-1200gmt on 3·68MHz, listen for G3NAF or G3BEA.

South Kensington (Baden Powell House Scout ARG)—Third Tuesday in each month, 8pm. Baden Powell House, Queensgate, South Kensington.

Southgate (SRC)—Second Thursday in each month, 8pm. The Green, Winchmore Hill, London N21. Sec G4AEZ, tel 01-366 7166.

St Albans (Verulam ARC)—27 Jan ("Electronic keyer" by G3GJX) 24 Feb ("RSGB and regional representation", "GB3HR repeater" by G4DAX and G3WCB). 7.30pm. Market Hall, St Albans. Informal meetings on second Thursday in each month at RAF Association HQ, Victoria Street, St Albans. Sec G4DUS.

Stevenage (S&DARS)—First and third Thursdays in each month, 8pm. Hawker Siddeley Dynamics Ltd, Gunnels Wood Road. Sec Paul Tewkesbury, 267 York Road.

UK FM Group (London)—Second Tuesday in each month, 7.30 for 8pm. Grove Park Hotel, Junction Bolton/Spencer Roads, Grove Park, Chiswick.

REGION 20—RR G. Mather, G3GKA, 8 Hills Close, Keynsham, Bristol

Bath (B&DRG)—Tuesdays, 8.30pm. The Crypt, Ascension Church, 35a Claude Avenue, Oldfield Park, Bath. Hon sec N. Gridland, Flat 3, The Paragon, Bath.

Bristol (BRSGBG)—31 Jan (AGM). 7pm. Becket Hall, St Thomas Street, Bristol 1. Hon sec G3ULJ.

Bristol (BARC)—Tuesdays 7.30pm. The University Settlement, Barton Hill, Bristol 5. Sec G8HAZ.

Bristol (Shirehampton ARC)—Fridays, 7.30pm. Twyford House, Shirehampton. New members most welcome. G4BWB.

Cheltenham (CRSGBG)—First Thursday in each month, 8pm. The Old Bakery, Chester Walk, Cheltenham. Sec G3KII.

Gloucester (GARS)—First Thursday in each month, 8pm. Oddfellows Club, Barton St, Gloucester. Remaining Thursdays informal club night. G4AYM, The Chequers Bridge Centre, Painswick Road, Gloucester 8. Sec G3MA.

Taunton (T&DARS)—Fridays, 7.30pm. Jelalabad Barracks, The Mount, Taunton. Sec G. Swetman, "Little Copse", Monkton Heathfield, Taunton. Tel West Monkton 298.

Weston-super-Mare (WsMRS)—Second Friday in each month, 7.30pm. Room Lewis M2, Worle School, New Bristol Road, Worle. G3PQE.

Yeovil (YARS)—13 Jan ("QSL card design" by G3MYM), 20 Jan ("2m transverter and linear" by G3XFW), 27 Jan ("Using fets" by G3MYM), 3 Feb ("Breaking down rf amplifier circuits" by G3XFW), 10 Feb ("Setting up a receiving station" by BRS37195), 24 Feb ("Designing and building a short wave receiver" by BRS37195). 7.30pm. Due to possible change of venue contact sec G3NOF.

your opinion

The Editor
Radio Communication

Sir—In your August issue, Mr Bryant mentions, "... considerable pressure ... to establish a citizens' band in the UK". I wonder if he, or any other of the vociferous proponents of cb have ever commissioned a proper, NOP-type survey to ascertain if the *general public* wants it?

I very much agree with Mr Reynolds's views in your September issue but wonder if he is right about the British manufacturers? One of the pet themes of cb proponents is that it would give a much needed boost to Britain's electronics industry. Well, it has not done very brilliantly in the domestic tv, radio, hi-fi and amateur radio market, has it? So why should we expect it to be different with cb?

The cost of administration, monitoring, tracing illegal operators and dealing with the inevitable complaints of deliberate and unintentional interference would require a big increase in the civil service at a time when sensible folk are looking for cuts.

Mr Bryant advises his CBA members to write to ministers, MPs, and magazine and local newspaper editors, presumably to create his "considerable pressure". May I suggest that every opponent of cb does the same by reasoned argument so that if and when Parliament discusses the subject, it will have a balanced view?

Norman Fitch, G3FPK

The Editor
Radio Communication

Sir—With regard to J. G. Johnston's letter concerning one-day vhf/uhf portable contests; on behalf of a small but keen group may we support his idea. All too often the non-availability of one or more of our numbers for both days has led to an inability to take part. A one-day event would not only make support more likely, but would be far more popular with those with domestic responsibilities.

May we also take this opportunity to raise the question of power, particularly at vhf. There seems to be a belief, by what we suspect is a few, that QRO is a necessity and, although we respect their views, we believe the enjoyment of operating would be greatly enhanced by a return to a power limit.

The QRP contest has shown the popularity of a one-day event and proven the effectiveness of very low power even under adverse conditions.

G3GGL, G3JVJ, G3UDR,
Contest Committee, ATV ARS

The Editor
Radio Communication

Sir—Whilst not wishing to indulge in the ssb versus a.m. argument, remarks I have heard at local clubs and over the air induce me to make this plea for a.m.

Firstly, many newly-licensed amateurs cannot afford ssb transmitters but can acquire or make a.m. jobs. Secondly, thousands of SWLs got their first introduction to our hobby by listening on a.m. receivers—sometimes bc sets. Again many of these cannot yet afford ssb receivers. Thirdly, I know that many amateurs hanker after the better speech quality and more leisurely contacts that one associates with a.m.

When I listen on 10m, for example, I find a cluster of ssb signals all wedged in between 28·5 and 28·6MHz, with the rest of this nice wide band quite unoccupied. So I suggest that we use the top half of this band for local chats, and to this end I propose transmitting around 29·0MHz, particularly on Sunday mornings, using a.m. and I hope that I shall get some contacts on this mode.

H. S. Woodhouse, G2AHY

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 alternate issues 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 50p (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 1st 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. Traders who are members must enclose a signed declaration that the items for sale or wanted are part of, or intended for, their own personal amateur station.

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.

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

FOR SALE

Hamgear PM111 1·8MHz converter, £8. Reslo ribbon mic, 30Ω, £5. EMI Angel transcription arm, £3. G8HBW, QTHR. Tel Aldridge 54166.

Heath HR10B amateur bands rx, 80–10m, £50. Buyer collects London or Salford. G8JDN, House 25, Room 28, Castle Irwell Student Village, Cromwell Road, Salford, Lancs.

KW2000 with ac power supply, £110. Eddystone 888A rx, £55, or offers for either. Buyer collects. G3JXG, QTHR. Tel 0482 797889.

Pye Westminster W15, a.m./fm, tunes 144–146, transmits 144·825, 145·00, 145·5, a.m., mic, spkr, manuals for W15AM and W15FM, will exchange for full cov hf rx, cash adjustment either way. G3VCJ, QTHR. Tel 042 434726 evenings.

Stolle 2010 rotator, as new, £30. Stolle K22, bearing new, £10. Pye Tulip mic. GM3GJB, QTHR. Tel Falkirk 23608.

Joystick vfa. Joymatch 3A atu. RSGB Great Circle dx map in tube. *Practical Wireless* 1957–62, nearly comp, offers. G4BZL, QTHR. Tel 0532 582958.

Barlow Wadley XCR30 Mk2 portable rx, ·5–30MHz, exchange for commercial 2m fm mobile rig with toneburst, TR7200, IC22, why? Will travel reasonable distance Ealing/Wembley. Hackett, G8JPH, 9a Crawford Avenue. Wembley, Middlesex. Tel 01-579 0511 ext 35 work, 01-902 6904 home.

770R Eddystone vhf rx, exc cond, £120 ono. Rigonda mint 6in tv, portable, mains, car battery, £40. Wien digital a.m./fm clock radio, vgc. L. D. Ireland, Carnhell Green, Camborne, Cornwall TR14 0NA. Tel Praze 236.

G3ZVC board, wkg, 1246AX filter, accessories, £60 ono. Ultra Cub, not wkg, R3, R6 xtals, £15 ono. Pocketphone tx and rx boards, good cond, £20 ono. G4FAW. Tel Ipswich 58815.

Trio 9R-59DS with spkr, £40. CBM SR-36 scientific calculator, £20. A. V. Staniforth, 7 Horsley Road, Rochester, Kent.

Lattice tower, 30ft in two 15ft by 15in triangular sections, £30. HRO 100kHz-30MHz plus 2m valve converter, £15. Labgear wideband multiplier, £3. Various transformers, sae list. Carr by arrangement. G3CBU, QTHR. Tel 0256 58921.

Trio JR500 rx with top band conversion, £40. Liner 2 with preamp, vgc, £110. Codar AT5 and mains psu, £20. All ono. G4ATZ, QTHR. Tel 0423 879328.

Cossor 1039M oscilloscope, spare tube, £10. Set new valves KW2000A, £10. Heathkit vswr meter, £3. Transistorized Heathkit gdo, £3. Antennascope, £2. G3WGF, 18 Wychurst Gardens, Bexhill, Sussex.

Trio 9R59DS rx, mint cond, only £30. G8JHK. Tel 01-874 0272 daytime only.

Panda Cub tx, works cw three bands, £10. Wavemeters, Class D, £4. BC221, £18. RAE course, 31 lessons, £18. G4CZD, QTHR. Tel Gravesend 61252.

HF mobile, or base station, FT75 with dc psu, vfo, G-whip, five band, 80–10, 15 xtals, had QSO with USA while mobile, £170. G4DSO, QTHR. Tel 07357 2119.

Two lattice towers, approx height 35–40ft, sides 15in, to be lowered and removed from site of deceased amateur, price negotiable. Contact through G4CJY. Tel 0494 30018.

FT101, little used, £220. FT2F fm tx/rx, fitted S0, S20, S22, R5, R7, £80. Eddystone EC10 rx, £35. B221, comp, £18. G3JTQ, QTHR. Tel 01-894 7249.

Beulah cctv, operating at present on 405 lines, £75 or will swop for gen cov rx, 240/12V. KW Vanguard on 2m, no xtals, £20. Microwave Modules 5W a.m. tx, no mic, £30. Phil. Tel Hastings 421936.

Good cond high band Pye Ranger, less mic, xtals, handbook. Stainless steel 2m mobile antenna, as new. Highest offers by 30th of month secure. Buyers collect. Martin Barson, 31 Aldbourne Road, Burnham, Bucks. Tel Burnham 3756.

FT101B, good wkg order, £300. G3LSQ, QTHR. Tel 01-435 8331.

Codar AT5 tx, with ac psu and mobile psu, Tavasu mobile whip with 160 and 80m coils, £30. 160m rx, varicap tuned, £10. Unfinished kit DC6HL 2m tx/rx, all modules partly built, plus XF-9B filter, £40. G3YAS, QTHR.

HW101, perf cond with HW cw filter, h/b psu and spare valves, £160 cash for quick sale. Datong speech clipper in h/b diecast box, £18. G3YNV, QTHR. Tel Maldon 55641.

Multi 2000, vgc, fitted cmos toneburst, SSM preamp with original packing, manuals etc, £250. *Wanted:* 144MHz Monitor rx, scanning type preferred. U450L manual. PFIT mic insert. PFIR gain pot. PFI rx board. G8GHZ, QTHR. Tel Northampton 61794.

Colour monitor, Pye 19in, handbooks, exc cond, offers or exchange for JR599CS or similar rx etc. Various 1GHz power transistors offered in exchange for transistors suitable for 70MHz linear. Marconi 1·6–24MHz ssb exciter, £25. G3PGN, QTHR. Tel 0277 822891.

FT101/277 Mk2, fb cond, £300 ono. TR2200GX, four months old, R5, R6, S0, S20, S21, S22, S23, nicads etc, £140 ono. FRDX400S, all filters etc, fb cond, £180 ono. All collect or carr extra. G4BZE, QTHR. Tel Exeter 51646.

TH3 tri-band beam, £60. KW500 linear, £55. KW Viceroy, £70. Superb Hammarlund HQ170 rx, £80. G3NUG, QTHR. Tel Radlett 4435.

KP202, 6ch, nicads, helicap whip etc, £80. 6ch U10B, wkg, 433·2 and 433·5, circuit, cables etc, preamp fitted to rx, £40. G8EPQ, QTHR. Tel Kings Lynn 61554 after 6pm.

Westminster FM, scruffy, £40. UHF Vanguard, 30W, wkg 433·2, £60. UHF Starphone, wkg 433·2, £50. Tradipper gdo, £8. PFI tx strip, wkg, £5. RCA R44M10 uhf pa, £5. Omega noise bridge, 150MHz, £10. Giles. Tel 094 582401.

Xtal ladder filter experiments, see *TT* Sept and Nov 1976. HC18U xtals, 8·95MHz, £1 each. HC6U, 5MHz, £1 each. SAE with remittance and order. R. Bowell, 16 Margarite Way, Wickford, Essex.

Liner 2, mic, manual, mobile mount, exc, £120. Psu, 0–20V 7·5A, regulated, stabilized, ex-computer, superb cond, needs case, £20. G8LPE, QTHR. Tel 051-334 1819.

Trio 7200G, channels S20, 21, 22, R6, R7, mic, mobile brackets and connecting lead, PS5 mains psu with digital clock, manuals, as new, £150. cash. Buyer collects. GW3TFQ, QTHR. Tel Port Talbot 87860.

Trio tx/rx TS510 and PS510, wkg, £120. 14AVQ antenna, £10. Trio rx 9R59D, wkg, £25. All bargains, therefore no offers, buyer collects. G2KA, QTHR. Tel Gunnislake 832777.

Drake tx/rx TR-4C, AC-4, MS-4, psu, spkr unit, as new cond, £400. G3XNP, 251 Appleby Street, Cheshunt, Herts. Tel 97 32434.

Jaybeam 8XY/2m, £8. 6Y/2m, £3. HM/2m, £1. 70cm Parabeam PBM18/70, £10. Telequipment D51 dual beam scope ÷ 10 probe, £90. STC relays 2p 2W 5,800Ω, operate minimum 20V, plus bases 1in wide, 1¼in high, ¾in deep, 20p each. Buyer collects or pays postage. G8FFI, QTHR.

2m 10-el Parabeam, one month use, £10. Rx BC-453, 200–550kHz, £8. Teletype tuning fork, 87·6vps, £3. Eimac 4–65A tetrodes, £2.50 each. G8LT, QTHR. Tel 032 732321.

Large stocks of used tv/radio valves, many obsolete types, must clear, very reasonable prices, all electronically tested, many barely used, mail order only. Send sae. T. Jones, 150 Holmwood Road, Enfield, Middlesex. Tel Lea Valley 717612 after 4.30pm.

Swan 700CX, psu, spkr, TA32 and AR40 rotator with control and 100ft cable, both new and still boxed, £420 ono, carr paid. Would exchange for KW separates. GM4BHH, QTHR. Tel Alness 882483.

Trio 2m transverter TV502, poor location only reason for selling, £115. GW3MWH, QTHR.

Collins KWM1 dxdaptor, 230 psu, extra xtals, £200. Rarely used mint FT101 to Mk2, fan, cw filter, ext/vfo mobile mount, £335. Two Pentax cameras with many extras, £300. Buyers inspect and collect Cam area. Tel 0954 60584 after 7pm.

Heath SB303 rx with spkr, SB401 tx, SB620 spectrum analyser, with all connecting cables and manuals, exc cond, £350. Prefer buyer collects. G8AWV, 37 Denison Road, Lower Feltham, Middlesex. Tel 01-751 2262.

FL2000B linear, mint cond, inspection invited, £200 ono. C. J. Coward, 11b Hillcrest Close, Scaynes Hill, Sussex. Tel 044 486 431.

2m base tx 640PA, six xtals, a.m./fm/cw, £6. Teisco DM-304 Dynamic mic, 50K/600Ω and desk stand, £3. QQVO6-40R, new, £5. Pye/Ekco colour tv, handbook, 691–697 chassis, £1.50. Polaroid Swinger 2 camera, new, £3. Large items carr extra. G4AED, QTHR. Tel 0953 882187.

American GEC heavy duty step-down transformer, 230/115V 200VA, weighs 23lb, £5. Could deliver reasonable distance. G3FQX, QTHR. Tel Winchester 63906.

Codar CR70A gen cov rx, good cond, £45 ono. C. Wilcox, 10 Perrin Avenue, Kidderminster, Worcs. Tel Kidd 5146 evenings.

EMI oscilloscope WM3, bandwidth 150kHz-4·2MHz, has photocopy of manual, £27.50. Buyer must collect. Salisbury, GW8KSF, QTHR.

SB104 Heath all solid-state digital tx/rx, £395. SB644 rvfo, £49. HP1144 psu, £59. SB230 linear, £195. SB614 Monitorscope, £79. All constructed to prof standards. Delivery arrangeable. G2KF, QTHR. Tel Par 2337.

Pair of MBM88 70cm beam antennas, few hours use, £40 ono. Bryan Hartley, 23 Hastings Road, Thornton-le-Fylde, Lancs. Tel Cleveleys 74417.

FRDX400, mint cond, with manual, £125. Swan 350 tx/rx, exc cond, with manual, £175. Can deliver within area. Briggs, 8 The Grove, Whalley, Blackburn BB6 9RN. Tel 025482 3366.

Eddystone 680X gen cov rx, vgc, with manual and four spare valves, £70. Buyer collects. L. J. Pink, "Gilbert's Cottage", Church Street, Farringdon, Nr Alton, Hants. Tel Tisted 477 after 6pm.

KEN KP202, nicads, charger unit, leather case, toneburst, helical, telescopic whips, f to uhf, adapter etc, comp portable system, £120 ono. Will consider exchange for KW2000A, KW2000, with psu, why? Replies answered. G4ANW, 16 Chestnut Drive, Broadstairs, Kent.

FT221, with all fm simplex channels, xtals, good cond, £330 ono. *Wanted:* Stolle type rotator, prefer manual and cheap. G8JHL, QTHR.

KW204 tx and KW202 rx, exc cond, £320 ono. Mini-products C4 coaxial vertical, brand new, £32. PTC2012 a.m. Handi-ranger and xtals 70·26, £18. Emsac 4m converter, 4·1–4·7MHz i.f., £5. G3TQY, QTHR. Tel Loxwood 752933.

Creed 7B, old standards tv, 2½ psus, £20. Fidelity mains 3-speed 4-track mono tape recorder, £15 or offer. Japanese telescope 15–50 ×, inc floor tripod, £8. G8BMI, QTHR. Tel 0535 62859.

Liner 2 with preamp, as new, £115. G3USP, QTHR.

Storno Viscount, 4ch, S20, S21, S22, R0, Modular Electronics preamp, two sets control gear for use as base station and mobile, exc cond, £45. Pye base station tx, 25W on 2m, £10. Buyers collect. G3UJK. Tel 0494 25491.

Heathkit SB101 cw filter, HP23A psu, SB600 spkr, £190. Monitorscope SB610, £45. Manuals. G5DS, QTHR. Tel 01-390 1566.

AR88D rx, manual, £35. Buyer must collect. *Wanted:* FR50B or similar. K. Vickers, 28 Ilmington Close, Matchborough West, Redditch. Tel Redditch 23466.

Xtals—HC6U, 5·5, 7·5, 18, 25, 30, 32, 32·5, 33, 33·5, 40 and 96MHz, £1.25 each. HC18U 73 and 80MHz, £1 each. QQVO3-20A (2), £2.50 each. QQVO2-6, £1. MC1495D (2), £2.50 each. SL640C, £2.50. 2N3623 (3), £1.50 each. 40673 (3), 45p each. BAY96, £4.50. G4AJC, 21 Northcroft Road, Ewell, Surrey. Tel 01-393 1876 evenings.

Collins 75 S-1, good, no mods, £175. FT101 Mk2, cw filter, fan, as new, £290. Both original owner. Prefer buyers collect. G3BIQ, QTHR. Tel Blandford (Dorset) 2923.

Pye Westminster W15U, as new, £55. Vanguard AM25B, £10 ono. Class D wavemeter, mains operated, £6. BC221, mains operated, £15. CSE Swanco 160m separates, transistorized, £25 pair. GW3WMY, QTHR. Tel 0222 751522.

Advance Volstat constant voltage transformer, type CVN250A, i/p 190-260V 50Hz, o/p 240V 250W, ideal for colour printing etc, £35. Buyer collects. Patterson, 16 Norton Road, Stourbridge, West Midlands. Tel Stourbridge 2689.

TA33Jr 45ft coaxial, as seen but fb when last used 10m, buyer dismantles and collects, £17.50. Cyril Brown, GW3OIM, 125 London Road, Holyhead. Tel 2304 office hours.

TR2200, wkg but no xtals, £50. Tel 0323 762252.

Shack clearance. Akai X100 tape deck, offers. Codar AT5, T28, £15 each. 70MHz B44, £10. 1475 rx, £10. LG300, £15. STC aircraft hf rx, 2–18. £10. R209, £18. Command rx, £17. Pye Vanguard, £5. Buyer collects. G3EIW, QTHR.

Honda small petrol generator, model E40, 250/110V, 40W only. Eddystone 898 dial. Offers. G8KLO, QTHR.

FT/FP200 10–80m black model, three months old, £250. Collins 51J2 gen cov rx, immac, £200. Futaba 6 radio control system, M series, six servos, as new, £160. *Wanted:* Collins 75A-4 rx. McAllister, 218 Eckington Road, Coal Aston, Nr Sheffield. Tel Dronfield 413413.

2m linear, 1–4W i/p, 15–25W o/p, for IC202, £20. Varactor, 2m i/p, 70cm o/p, 30W, £8. G8ATK 2m tx, 10W, £4. HW17A tx pcb with valves, £2.50. 240–12V 1·5A VST transformer QQVO2–6, 2 off, £1.50. S. M. Sherratt, 32 Springfield Way, Cranfield, Beds MK43 0JN.

FT200, FP200, £180 ono. Katsumi speech comp, £6. Mains voltage regulator, 25A, £10. 0·6A variacs, £3. 4A variac, new, £6. 70cm varactor tripler, £8. 4CX250B, £2. 3–20, £1. FT243 2m 8MHz xtals, £1 each. G8CXT, 46 St James Close, Hanslope, Bucks.

9R59DE rx, voltage stabilizer, SP5 matching spkr, handbook etc, £40. G3OGP. Tel 01-398 3953.

AR88, needs attn, to swop for E-zee match or any atu, h/b or otherwise. G3ZDF, QTHR. Tel 07914 5112.

Liner 2, with mains psu, mobile mount, manual, £95. Garex 144-28MHz converter in diecast box, £6. Tektronix 543A cro with type H plug-in, offers or exchange for Creed 7B and converter CV89A/URA 8A. GW8HDH, QTHR. Tel 0792 22287 after 6pm.

Liner 2, PA3 preamp and Pye insert fitted, plus Belcom power supply, still under guarantee, £150 the lot, ono. Sentinel converter, 28-30MHz i.f., £10. Buyer collects or pays carr. G8LIH, 52 Lingfoot Crescent, Jordanthorpe, Sheffield, S Yorks S8 8DB.

FTDX401, with set spare new valves, £285. Prefer buyer inspects, collects. Burgis, 11 Morningside Avenue, Portchester, Fareham, Hants. Tel Portsmouth 812611 ext 102 day.

TS520 tx/rx, vfo 520 external vfo, TV502 2m transverter, all absolutely mint, with manuals, cables etc, October price £675. Prefer not to split. All sensible offers considered. G8WS, QTHR. Tel Maidenhead 23239.

Microwave Modules MMV432 high power tripler, BNC connectors, almost new, £17. PR40 preselector, £4. 4m h/b fet converter 28–30MHz i.f., £4.50. Lye Communications fm discriminator 455kHz i.f., £2.75. 35·000MHz xtal, 75p. G8LHC, QTHR. Tel 021 476 1161.

Swan 270 Cygnet 80–10m ssb tx/rx, 260W pip, integral ac/dc psu, comp with dynamic mic, £150. Lafayette HE-40 gen cov rx, £15. Class D wavemeter, £6. Heath scope OS1, £20. G3UJI, QTHR. Phone 0782 614570.

FL2500 Yaesu Musen linear amp, £125. G4GI, QTHR. Tel 0522 720366.

20-2m quality h/b transverter, built in psu, 50W o/p mosfet, rx converter, £50. R216 rx, 19–150MHz, cw/a.m./fm, matching mains psu, £55. Buyer to collect or can deliver 50 miles. G3MWV, QTHR. Tel Cromer 2872 evenings.

Stornophone 500 vhf hand portable tx/rx, tx mid band, with spare nicad, no details, £15. Pye Westminster tx, built in diecast box, 5ch fm on 2m, 12W o/p, automatic toneburst, £35. Storno fm h/b QQVO3–10 tx board, £6. All carr extra. G8ENI, QTHR. Tel Cheslyn Hay 415374.

Drake 2C Q-multiplier, calibrator, noise blanker, spkr, £90 ono. GW3UJB, 6 Matthew Road, Rhoose nr Barry, Glamorgan. Tel Rhoose 710079 anytime.

Microwave Modules 144/52/LO converter, BNC sockets, as new, suit Yaesu FT620, £14. *Wanted:* Pair of 6 or 10ch oscillator boards for Pye uhf Westminster W15U. G8AYY, QTHR.

Hammarlund HQ170A rx, £110. HX50 tx, top band to 10, £80. KW swr bridge and power meter, £10. KW dummy load 75S2, £10. AVO Mk4 valve tester, £40. All ono. G3TPI, 29 York Road, Loughborough, Leics. Tel Loughborough 61032.

Shack clearance. HW7 QRP rig. G3LLL Holdings. FT101 speech clipper. Heathkit G-125 Q-multiplier with manual. Yaesu FV101 Mk2. 30ft Telomast with guys etc. Metrosound ST20 stereo amp. Offers. G4BUE, QTHR. Tel Newick 2394.

Collins TCS12 rx, 1·5–12MHz a.m./ssb, mint cond, inc psu and comprehensive manual for all TCS 7/12 equipment, £27.50 ono. Lees, 450 Castle Lane West, Bournemouth. Tel 517200.

Collins TCS rx, 1·5–12MHz, wkg fb, £10. Heathkit RA1 amateur rx, as new cond, 100kHz calibrator, £40. HRO-MX with five coils, suitable for spares, £5. Hill, 114 Green Lane, Castle Bromwich, Birmingham B36 0BX. Tel 021 747 4570 after 5pm.

FR101D 160–2m. Datong FL1 audio agile filter. Both mint cond. Offers. Lewis, 73 Lomond Road, Spring Bank West, Hull, North Humberside.

Eddystone 840C rx, vgc, £45. PR30 rf preselector, 1·5–30MHz, mains powered, £5. Codar AT5 tx, mint cond, with mic, £30. TW 2m converter, 28–30MHz i.f., mains powered, good wkg cond but needs alignment, £5. Wien auto cassette recorder, £5. G3ZOH, QTHR. Tel Biggin Hill 71342.

Jaybeam 2m 5 over 5 slot, £8. Joystick deluxe copper elements with mobile roof mountings, £8. Joystick tapped with atu, Joymatch coil, comp, £8. QM70 high power transverter, 28/144, unused, maker's carton, £85 ono. G3JNY, 2 St Mary's Close, Garforth LS25 1HL. Tel Garforth 3058.

Liner 2 preamp and accessories, £120. 8X Yagi, £10. KW Vespa Mk2 with KW201, £180. *Wanted:* HF tx/rx, FT200, FT201 or similar. A. Brown, "Branting", Shoppenhangers Road, Maidenhead. Tel 30185.

TW phase 2 10–2m transverter and mains psu, exc cond, £60. G3PSH, QTHR. Tel Thatcham 62289.

Trio TS510 ssb tx/rx, with PS510 80–10m, vgc, offers around £180. KW E-zee match. G3SNA, 24 Oak View Road, Greenfield, Oldham, Lancs. Tel 045 77 2790.

HW7, handbook, info on mods, leads, dummy load, £30. Marconi Atlanta rx, handbook, several radio textbooks, RAE revision manuals, exam papers and manual of marine radio, £10 lot or split. Keeling, G4EUW. Tel Brightlingsea 3071.

ML generator, 12V in 500V out, £3. Hand driven HT gene, 600V, £2.50. Three linear amplifiers, sae or tel for details. UHF frequency meter with HRO type dial, £5. G2MF, QTHR. Tel Sheffield 360210.

Datong rf clipper, module in attractive case, vgc, £24 plus postage. G8JKA, QTHR.

Telford TC10 Mk2 multimode 2m tx, fully tunable fm/ssb, as new, £130. Telford TC7 2m tunable i.f. with G8AEV converter and band-searcher, vgc, £40. G4FAI, QTHR. Tel 01-807 3537.

SSB tx/rx, 160-10m, ¾ comp, comprises G3ZVC 9MHz exciter, dual-gate mosfet preselector, vfo plus switched xtal oscillator giving 500kHz segments at signal frequency plus 9MHz, all individually boxed, only requires pa stage, £85. G3WUN. Tel Rochdale 57353.

9MHz ssb i.f. strip, two KVG XF9A filters with carrier xtals, £35. Microwave Modules 2m converter, 2–4MHz, £10. G8KDR, QTHR. Tel 061 224 7880 evenings.

Eddystone 898 tuning dials, brand new, £11.80. Eddystone ceramic plug-in coil formers with base, £2.80, post extra. GW3SFC, QTHR. Tel 068 588 4880 after 5pm.

"Bulletin", "RadCom" and "SWM" 1950–75, offers. Venner Electronics frequency and time measuring inst, dc to 15kHz, £28 ono. Kokusai mechanical filter, 455kHz with matching xtals, £10. Clevite ceramic filter, 465kHz, £4. New valves 5B254M, £3. Pair matched 5B252M, £5. 5B257M, £2. *Wanted:* Codar AT5 in good cond. G3HBZ, QTHR. Tel Sunbury-on-Thames 82262.

Storno Viscount, comp control box, cables, 145·5MHz, a G8AKA conversion in fb cond, will exchange for similar low band Storno or sell, £30. *Wanted:* Low band Cambridge, dash mounted. G3HAS, QTHR.

RTTY Creed 7E/RP teleprinter, with silence cover and base, exc, £35. Creed 6S6M auto tx, £10. Power Equipment paper winder with baling ball, suitable for all Creed 7s, £15. All items carr or delivery extra by arrangement. G3RDG, QTHR. Tel 01-455 8831.

Welwyn 50Ω dummy load, 12 by ¾in, new, £2. Marconi 600kHz B7G xtal, £1. Cradle for Pye Ranger, £1. Geloso vfo calibrated dial, 80–10m, new, £2. Pye Reporter service manual, £2. Carpenter 4H4(Z) polarized relay, £1. Denco CT7/B valve coil turret, 1·5–30MHz, circuit, £3. Denco CP3/F valve coilpack, lw/mw, 1·85–18·75MHz, circuit, £2. Minimitter 160m control unit, vfo tune, standby, send, metered, 12V relay, £2. Morse key, plated, £3. Gardners transformer, 3 phase, 6·3V outputs, plus 22V. £3. Compact modulator, pair 6L6s, 20W, requires p/p, £3. Valves, used, several 6AW8A (Mosley rx), 6L6M, several 6L6G, 5R4GY, 1625, 25p each. 4X150D, £2. G3MBL, QTHR. Tel 01–445 4321.

Pye 2m base station tx with vxo, £15. Redifon R50M gen cov rx and psu, £22. 2m converter, £4. Swan 350 tx/rx, £210. Hallicrafter SX36A vhf rx, 28–135MHz, fair, £15. Other items, sae list. Callers Saturdays only. G3VOJ, QTHR. Tel Maldon 52757.

SEI 5·2MHz ssb xtal filter QC1246AX, with carrier xtals, £16. *Wanted:* Trio T599 or similar tx. G3SVL, QTHR. Tel Camberley 64330.

Emsac 2m a.m./fm tx, fitted 6ch plus mic and psu. £15. Heath GR64 gen cov rx plus Q-multiplier, £22. Assorted microwave components, offers. G5YC, QTHR.

Eddystone 740 gen cov rx, BFO S-meter, circuit diagram, wkg order, good cond, offers over £30. Bodigian, 37 Sandy Lodge Way, Northwood, Middlesex. Tel 25074 evening, Chesham 2462 day.

Trio 2200G, five xtal channels, nicads, leather case etc, good cond, one year old, £85 ono. Telford TC10 10w 2m tx, fm/ssb/cw, 18 months old, good cond, £80 ono. G8JRI, QTHR. Tel 0323 31518.

Tx, a.m., 35W dc, 6146 pa, plus modulator, four xtals, £8. 70cm trip/amp, 2X 3/20As, £10. Converter 2m, h/b, 4·5–6·5MHz i.f., £4. Aluminium mast tubing, 9ft by 1⅛in, 99p each. New meters, 1⅛ by 1⅛, 50mA plus 1mA, £1.80 each. Cambridge i.f. board, 10·7–465kHz, 75p. New 741 op-amps, 20p. Xtals, 40MHz and 46·5MHz, for 2m converter, £1.80 each. Carr extra. G8CJO, QTHR. Tel Bristol 772435.

FT2 Autoscan tx/rx, 12/240V preamp, five simplex channels, pi/bc, lo/mh, po/na toneburst, diode switched to repeater channels, mobile mounting bracket, manual, £145. Pocketphones PF1, good order, fitted 70cm xtals for RB4. G3FWA, QTHR. Tel Bedford 854687.

Trio TS500, with spare 6146Bs, £135. Advance DMM3 digital multimeter, needs attn, £12. Three 20ft lengths hollow fibreglass poles, 3in diameter, £5 each. 13ft Island Plastics fibreglass fishing dinghy with trailer, £220. G3AZI, QTHR. Tel 0772 37815.

Pye uhf channelized Vanguard CR150, RA17 tuning heart, 6146s, xtals, sig gen, high voltage variables, many other items of vhf/uhf interest, listed. G2CPM, QTHR.

Liner 2, inc mic, mobile mount, handbook, £110 ono. Pye Cambridge fm boot mounting xtals R5, no toneburst but with all cables, control box, l/s and mic, £30 ono. URM203, 75Ω, 8p metre. G3LFM. Tel Reading 64712.

Codar dc power supply, £10. Codar control unit, £3. Topmobile rx, £7. LG300 power pack, £10. Buyer collects. HW23A power supply, £30. HW12 for spares, £10. BC453, £5. G3RB, QTHR. Tel Whitley Bay 530504.

Telequipment D31-R db scope, dc 6MHz, £25. Bush CTV-25, needs new eht multiplier, £45. Sundry colour and mono tv bits inc good 19in tube, sae for list. G8ATC, 123 Merritts Hill, Northfield, Birmingham. Tel 021 475 7638.

70cm transverter, h/b but good, 28MHz i/p, dual conversion tx, 28MHz, 129MHz, 432MHz at 8W p.e.p. o/p, £70. Strumech 60ft Versatower, vgc, £200. Delivery easily arranged. T. Forrester, 68 Park Road, St Annes, Lancs. Tel St Annes 727825.

QTH Bucks, semi-detached bungalow, two bedrooms, living room, large kitchen, garage, very good uhf site, GB3SC 25dB over noise, neighbours happy, £15,350. G8AUG, QTHR. Tel Chesham 71909.

Yaesu comp beginner's station, all as new. FR50B rx plus calibrator, xtal, £55. SP50B, spkr, £3. FL50B tx, 50W plus vox, £60. FV50B vfo, £25. YD846 mic, £5. KW107 Supermatch, £65. TE701 bridge, £15. Medco filter, £5 ono. Buyer collects or carr extra. GM4BVU, QTHR. Tel Hamilton 23121.

KW204 tx, vgc, £180. Brenell 610 tape deck with three heads and some electronics, £110. G4CRY, QTHR. Tel 0642 243241 office hours.

Digital clock ics, AY-5-1224 (basic clock), MK50253N (clock/alarm/snooze etc), sub-min 32·768kHz xtal, CD4011, CD4025A, CD4020A, 7 off MAN 7 0·3in seven segment leds, quad seven-segment dil display, all new and unused, £18 ono the lot. G8DEV, 15 Chapel Fields, Swinford, Lutterworth, Leics LE17 6BS.

Redifon GR286/STR28 marine vhf, comp with remote control unit RC91, handbook, £55. Valves, maker's original cartons, Brimar 6146, £2.25. Eimac 4CX250B, £5.25. RCA1625, £1.25. G3JMJ, QTHR. Tel 073 271 3467.

Hy-gain 14AVQ trap vertical, with LC-80Q loading coil covers, all bands 80–10m, good used cond, full maker's instructions, £27. G3UYG, 11 South Park Road, Gatley, Cheadle, Greater Manchester. Tel 061 491 0688.

WANTED

External vfo SE600 GTB. Can't get it up, exchange HQ1 beam for 18AVT or why? G3KMH, QTHR.

FT101, FT101B mobile linear. Heavy duty rotator, YO100 or similar. Small oscilloscope. R216 or similar vhf rx. VHF handbook. Multimeter. G3NZT, QTHR. Tel 044 83550.

Good clean Oskerblok or Heath power meter. G8KAT, QTHR. Tel Wantage 4943.

Information, circuits, manual for Redifon R50M, buy or loan. Circuit for KW Vanguard. S. Webber, 115 Armstrong Street, Grimsby, South Humberside DN31 2QQ.

Schoolboy requires gen cov rx, ssb/cw/a.m., must be in full wkg order, eg AR88, CR100, HRO, Eddystone, 840C or similar. Can arrange carr. Tel Grange-over-Sands 3240 after 6pm.

Manual or circuit diagram for Panda Explorer tx, purchase or loan. G3REB, QTHR. Tel Churchdown 714321.

Pye Cambridge or Storno for 4m, must be in fb cond, inc all control cables etc, either Dashmount or Bootmount a.m./fm, good price paid. A. J. Lees, 450 Castle Lane West, Bournemouth. Tel 517200.

Beg, borrow or buy handbook for Cossor scope 1049 Mk3. G3HHR, QTHR.

Heathkit HW12 (80m) tx/rx and HP23 ac psu. G3JBU, QTHR.

Accommodation for electronic engineer in central Scotland, must be near GB3CS. GM4DDO, QTHR. Tel 0224 34165.

Marconi Marine morse key, original manual, for Eddystone rx model 840C. *For sale:* Heathkit rx HR10B, HRA10–1 xtal calibrator, £80. Tx DX40U and vfo model VFIV, £20. Buyer collects. Robert Williamson, 13 Antrim Road, Ballymena, Co Antrim, N Ireland.

Drake MN2000, state cond and price. G4CHP, QTHR. Tel Swainsthorpe 365.
Maintenance service to my AR88. G6BJ, QTHR.
Wanted urgently, hf ssb/cw tx/rx. Electronic key "paddle", valves type EF95/6AK5. HF quad antenna. F. J. Crisp, Rame Barton, Rame, Penryn, Cornwall TR10 9DY.
Lowe 2m Monitor rx 1460, less xtals. HC25U, 12·0417MHz. G3IFV, QTHR.
Hy-gain vertical antenna 12AVQ, and Mosley trap dipole TD-3Jr. Absorption wavemeter or grid dip meter for hf bands. F. W. White, G4FLW, Medina, Seaway Lane, Torquay. Tel 67353.
Trio TX599, 50Ω lpf swr bridge, and dummy load. 75Ω dummy load and 2m Yagi, will consider alternative tx. Fb cond all items and no mods. All letters answered. G3WXT, QTHR.
Yaesu vfo type FV50C, your price paid. GW3GAH, Gerafon, Benllech, Gwynedd.
Electrolytic capacitors, 8MFD 600V wkg, 16+16MFD 500V wkg. Redman, Scolt, Ploughman's Piece, Thornham, Norfolk.
Morse key type D, ref 10F/7373, for W1RW. Reply to G2BVN, QTHR.
KW E-zee match atu. Xtal calibrator for National NCX5 Class D wavemeter. Millar, 16 Kilnburn, Newport on Tay, Fife. Tel 3069.
KVG XF-9B with both xtals. 2 6146B. All items mint or vgc. G3XVP, QTHR. Tel Leeds 812064 after 7pm.

Mobile rallies calendar

3 April	White Rose Rally, Lawnswood School, Leeds.
17 April	North Midlands Mobile Rally, Drayton Manor Park.
22 May	Northern Mobile Rally, Victoria Park Hall, Keighley.
5 June	Maidstone Mobile Rally, "Y" Sportscentre. Details from G3WXL, QTHR, or Maidstone (0622) 890031.
12 June	Longleat Mobile Rally. Details nearer the date.
12 June	Elvaston Castle Rally, near Derby. Further details from P. Neal, G3WFU.
19 June	Royal Naval ARS Mobile Rally, HMS *Mercury*. Organizer: M. Puttick, G3LIK, 21 Sandyfield Crescent, Cowplain, Portsmouth, Hants PO8 8SQ.
17 July	Cornish RAC Mobile Rally, Truro Rugby Club Ground. Details from G3NKE, QTHR.
14 August	Derby Mobile Rally, Lower Bemrose School (Rykneld School). Details from G3FGY, QTHR.

Looking ahead

22 January—RSGB Presidential Installation, House of Commons, London SW1.
24 April—NRSA Convention, Belle Vue, Manchester.
6-8 May—RSGB International Radio Communication Exhibition and Convention, Alexandra Palace, London.
17-18 September—NW Amateur Radio Convention, University of Lancaster.
27-29 October—ARRA Exhibition, Granby Halls, Leicester.

East Midlands Amateur Radio Group Lecture

7.30pm, 23 March 1977

Radio Spectrum Utilization
(Co-ordination or chaos)

by

Dr J. A. Saxton, CBE, DSc, PhD, CEng, FIEE, FInstP
Director of the Appleton Laboratory

at

St Helen's House, King Street, Derby.

Admission by ticket. Seating limited

Details from Tom Darn, G3FGY, QTHR, or Ripley 2972, or from local club secretaries

BC221, with power supply, mod, charts, circuit. Any information on xtal calibrator no 10, will return or buy. GM4AWH, QTHR.
Heathkit SB610 Monitorscope. HM102 wattmeter/swr. G4EGR, QTHR. Tel Bristol 772804.
FR101D, FR400SDX or JR599, no mods, all letters answered. G2BCA, QTHR.
10,000Ω wire-wound anti log potentiometer, not more than 1¼in diameter, must be good electrical cond, please have look in your junk boxes, cash by return post, antilog only usable. Mitchell, 38 Portway Crescent, Ewell, Epsom, Surrey KT17 1SX.
Cash waiting for portable 2m fm tx/rx. Foster, 14 Audley Close, Lytham St Annes FY8 4RT.
Keen collector wants good xtal set. Early components. Eddystone base board ceramic valve holders. Pair Lissen or Colvern dual range coils. Varley "Niclet" If transistors. Igranic honeycomb coils, holders, hf chokes, grid leaks, early battery valves, anything interesting. Richardson, 2 Edna Road, Maidstone, Kent.
Easington ARC G4APN, wishes to purchase modern tx/rx. All replies answered. Details to sec G4COI, QTHR.
UHF equipment for portable forays in local mountains. High gain 70cm antennas. Transverter 12V operation. Quantity BFR90, BFR91 low noise uhf transistors. Valve or transistor linears. Des Walsh, EI5CD, Ballylynch, Carrick-on-Suir, Co Tipperary, Ireland.
KW2000 B or E with ac psu, above average price offered for equipment in first-class cond, will collect 50 miles radius. G3PZF, QTHR. Tel St Albans 57665.
Manual, circuit or any information Marconi hf rx HHOO-2301-01. Franklin, Royal Jordanian Air Academy, Amman, PO Box 6191, Jordan.
One or two 572B triodes. GW3KYT, 23 Lon Pendyffryn, Llanddulas, Clwyd. Tel Llanddulas 737.
Two brand new boxed 3·500Z valves. Copies *Ham Radio* October 1971, November 1972, July 1974, February, June, September 1975. G3DAM, QTHR.
Top band tx, ssb/a.m./cw. G3JWC, QTHR.
Short wave rxs, for young but eager members of school radio club. GW4CJC, QTHR.
KW2000B, with ac psu, mint cond, would travel reasonable distance to inspect. G5VT, QTHR. Tel 0279 53172.
S32A Telequipment oscilloscope operating manual, or copy. Burns TC101 absorption wavemeter. J. W. Henderson, 53 Dumyat Drive, Falkirk. Tel Falkirk 25559 after 6pm.
Tx/rx in really good cond, Heathkit, Trio, Yaesu etc, would collect reasonable distance. G3WY, QTHR. Tel Evesham 45497.
T599 Trio tx, silver front panel version preferred, buyer will collect. G3SVL, QTHR. Tel Camberley 64330.
TR7010. VFO 30. Datong FL1 filter. QM70 144 PA50 linear. HC25U xtals 8·0–8·5MHz. 12V coaxial relays. Swan 500 or 700. G3AZI, QTHR.
Rotator, Stolle 2010 or CDE AR40 or similar, wkg or not, state price and cond. G8KLV, 9 Downham Mead, Chippenham, Wilts. Tel 0249 713682 after 5pm.

INTRODUCING . . .

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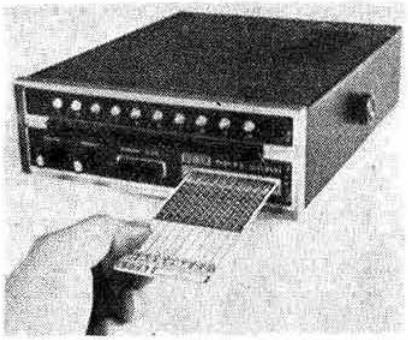
1. **THE OPTI-SCAN (illustrated right)**

A completely new approach. This monitor RX digitally derives 16,000 different frequencies, BUT NEEDS NO CRYSTAL . Channel selection involves inserting a card into a panel slot, where its programme is "read" by optical means and the frequency digitally synthesized. Frequency spacing 5kHz, or 12½kHz to order.

The cards (five supplied) are programmed initially by reference to the code lists supplied and up to ten frequencies can be programmed on each card. Cards have spaces for frequency identification.

Amateur Model Ranges: 28–54MHz., 56–82MHz., 138–164MHz., & 430–439MHz. Please note that frequencies from any of these ranges can be mixed on ONE card if required. Commercial/aircraft band models available, also A.M. model. All models supplied with built-in speaker, 12V DC 230V AC power leads and TWO plug-in aerials. Cabinet and panel finished in soft-black, bezel in satin chrome. Size: 66·7mmH × 200mmW × 254mmD.

PRICE: **£229.00** *excluding VAT*, but including carriage. At the time of going to press changes in VAT rates seemed likely. Our prices will in future include VAT, when the rate is known.



PRICE **£106.25** *excluding VAT*, but including carriage and crystals.
OR **£86.75** *Excluding VAT & Crystals*, but including carriage.

2. **THE SENTINEL (illustrated left)**

Similar in appearance to the Opti-Scan, but smaller. (57mmH × 152mmW × 191mmD.) This Monitor Receiver will scan any 8 Channels in the range 144–171MHz. Priority channel feature provides instant shift when a signal appears on that channel. Scanning can be automatic or manual, and lockout enables any single or combination of channels to be monitored.

Sentinel 2 operates from 12V DC or 230V AC, two leads being supplied. It comes complete with built-in speaker and mobile mount. No aerial is supplied. The receiver is crystal controlled, and is available with or without crystals. If crystals are required, please give your choice of eight—any standard simplex or repeater output frequency, or mixture.

3. **POCKET SENTINEL (illustrated right)**

VHF & UHF models available. Both models identical size 165mmH × 70mmW × 35mmD. Each will scan 4 channels. Both models have volume and squelch controls, switch for channel lockout and a switch which allows user to manually scan all channels.

Provision for earphone (supplied). Operates from four AA size dry cells or Nicads. Charger inlet is provided for use with nicads. Weight 12½ oz., with batteries, and consumes 50mA when fully squelched.

Telescopic whip supplied. Helical aerials extra. **£4.75** *including VAT*.

PRICES: VHF Model (2 Metres) **£65.50** *Excluding VAT*, but including crystals and carriage. (Please state choice of 4 frequencies)

VHF Model (2 Metres) **£54.95** *Excluding VAT & Crystals*, but including carriage.

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UHF Model (70cms.) **£61.25** *Excluding VAT & Crystal*, but including carriage.

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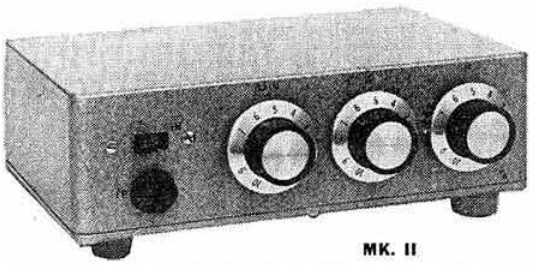
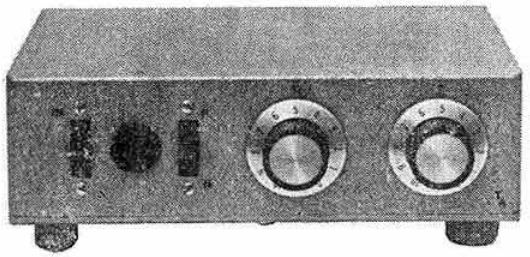


MK. II

AUDIO COMPRESSOR ★ Suitable for SSB/AM/FM ★ pure compression, no clipping! ★ 24 to 26dBs of compression, with less than 1% distortion ★ fast attack time in the order of 200 microseconds ★ variable decay time, on front panel ★ variable noise gate on front panel prevents ambient noise level tripping vox or being tx in pauses in speech ★ all functions routed to output in "off" position ★ goes between mic and tx no mods involved ★ these compressors have been tested alongside commercial rf clippers, the only difference at the receiving end was superior audio quality, **£21.00** + VAT (12½%) + 50p P. & P.

PRINTED CIRCUIT MODULE A.C.1. Assembled and tested including all pots **£11.50** + 12½% VAT.



RX PEAK AND NOTCH FILTER ★ no gimmicks ★ all integrated circuits ★ will clear QRM in seconds ★ 1 watt o/p stage ★ headphone socket ★ goes between RX and loudspeaker ★ by-pass switch ★ notch-width control for optimum width of notch ★ tune control allows you to put the notch or peak where you want it ★ runs from internal PP9 battery or any supply from 9V to 15V ★ will also peak up CW signals, **£23.00** + VAT (12½%) + 50p P. & P.

PRINTED CIRCUIT MODULE P.N.I. Assembled and tested including all pots **£12.50** + 12½% VAT.

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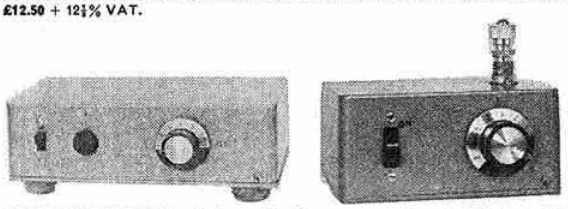
PRINTED CIRCUIT MODULE B.P.I. Assembled and tested in 8 way rotary Switch, **£12.50** + 12½% VAT.



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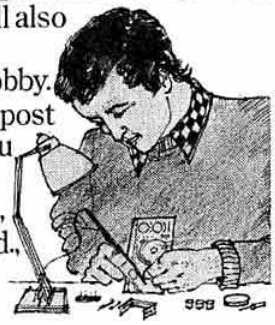

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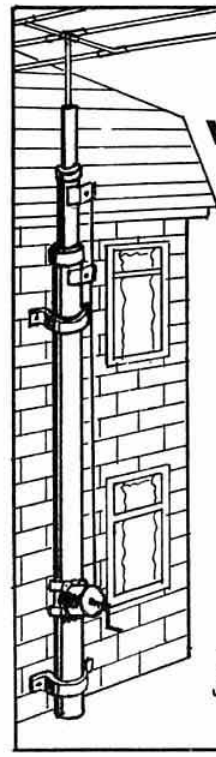

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