September 1976

radio communication

journal of the Radio Society of Great Britain

RSGB RADIO COMMUNICATION EXHIBITION

(Report on page 688)

Lord Wallace of Coslany opening the exhibition

The Mayor of Haringey, Councillor Vic Butler; Dr John Allaway, President of the RSGB, and Lord Wallace touring the exhibition

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radio communication

September 1976 Volume 52 No9

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	3·6	G2MI, Bromley, Kent (SE England)
1000	3·6	G8ML, Cheltenham (SW England)
	144·5	GM3UAG, Ellon, Aberdeenshire (NNW)
	144·5	G8GGK, Croydon, Surrey (NE)
1015	3·6	GI3GAL, Belfast (N Ireland)
	144·5	GI3TLT, Bangor, Co Down (N)
1030	3·6	G2CVV, Derby (N Midlands)
	144·5	G4DCH, Burnham-on-Sea (NW)
	144·5	GM3UAG, Ellon, Aberdeenshire (SW)
	144·5	G3PWJ, Brierley Hill (NW)
1045	144·5	G8CDP, Middlesbrough (NW)
	144·5	G8GGK, Croydon, Surrey (SW)
	144·5	G8BHQ, Stockport (NNW)
1100	3·6	G5VO, Bridlington (NE England)
	144·5	G3PWJ, Brierley Hill (SW)
1115	3·6	G3LEQ, Knutsford (NW England)
1130	3·6	GM3EHI, Bellshill, Lanarkshire (S Scotland)
1200	3·6	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.

CONTENTS

Radio Communication **is published by The Radio Society of Great Britain as its official journal on the first Tuesday of each month and is sent free and post paid to all members of the Society**

ABC
MEMBER OF THE AUDIT BUREAU OF CIRCULATIONS

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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).

MUSEN—THE REPUTATION IS UNPARALLELED!

FT-101E/EE/EX

● Solid State 160 thru 10 Metre Transceiver

The world's number one transceiver now offers even more value and performance in one, compact, thirty pound package. An effective RF Speech Processor is a built-in integral part of this exciting transceiver. Now you can realize that extra talk power to cut through the pile ups—without the addition of a linear amplifier. Except for the final and driver stages, the FT-101E/EE features the latest in solid state technology, incorporating time proven, plug-in 'computer type" modules for unparalleled reliability and serviceability. New lever type switches offer easier operation. Here is a complete radio station designed to go anywhere—ideal for today's active amateur. Just add an antenna and 12 volt DC or 100-234 volts AC for instant operation on 160 thru 10m. The FT-101E/EE is another step forward in amateur communications from the world's leader in communications equipment. YAESU—The Radio Company.

FT101 TRANSCEIVER

	FT-101E	FT-101EE	FT-101EX
160m Xtal	x	x	
10m Xtal A	x	x	
10m Xtal B	x	x	x
10m Xtal C	x	x	
10m Xtal D	x	x	
WWV Xtal	x	x	
RF Proc	x		
DC/DC conv.	x	x	
Fan	x	x	

x = FITTED

E MODEL WITH R.F. PROCESSOR
EE MODEL LESS R.F. PROCESSOR

Features

* Built-in AC and DC power supplies
* Built-in RF-speech Processor for increased talk power (E model only)
* 260 Watts PEP SSB, 180 Watts CW, and 850 Watts AM.
* Factory sealed, solid state VFO for optimum stability and accurate 1kHz readout.
* Effective Noise Blanker, threshold adjustable, for elimination of noise spikes
* Built-in, fully adjustable VOX
* Automatic break-in CW operation with sidetone
* Selectable 25kHz and 100kHz calibrator
* ±5kHz receiver clarifier w/separate ON/OFF switch
* Built-in WWY/JJY reception
* Heater switch to shut off final tubes for conservation of current drain
* Reliable easy to operate switch
* Adjustable carrier level for tune-up and novice operation
* Built-in speaker
* High-Q permeability tuned, FR stages to provide the performance required even in base station operation
* Includes dynamic, hand-held type microphone
* Indicator lights for interval VFO and clarifier operation
* Eight pole SSB filter for unparalleled selectivity on today's crowded bands
* All mode operation—SSB, CW and AM
* Built-in internal crystal control provision and Dual VFO adaptor
* Complete line of compatible accessories for flexible station design

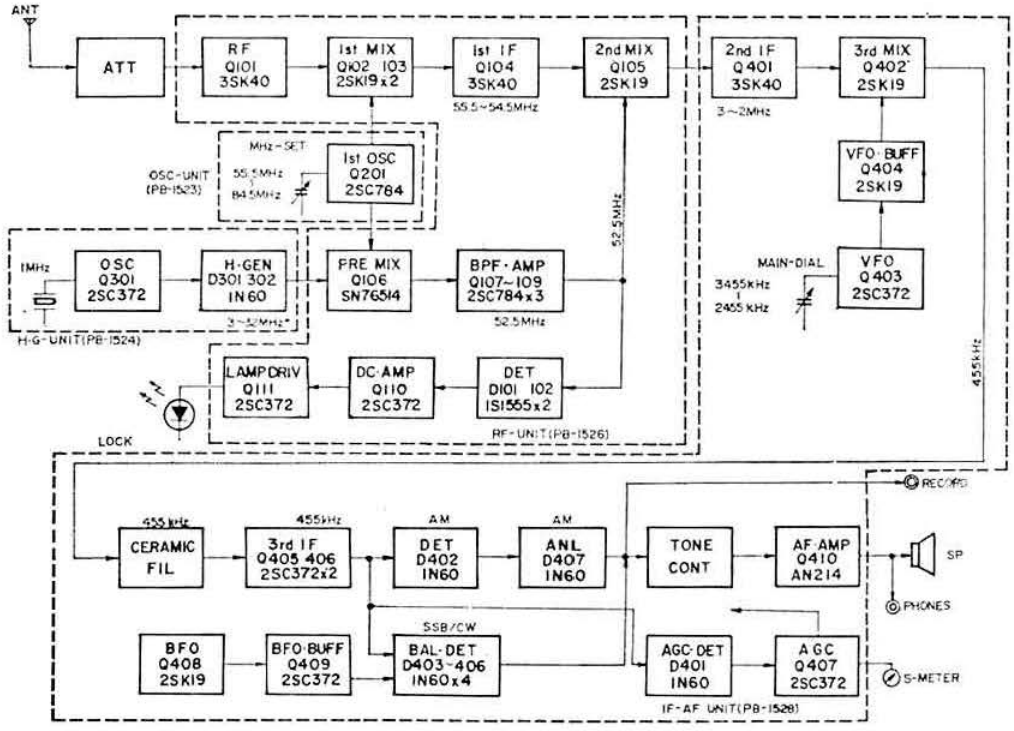
IN THE YAESU MUSEN SUCCESS STORY

READ ON FOR THE MAIN THEME ➧

THE LATEST QUALITY RECEIVERS FROM YAESU MUSEN

The FRG-7 is a precision built high performance communications receiver designed to cover the Band from 0·5 MHz—29·9 MHz. This little gem is ideal for the discriminating S.W.L. or as stand by receiver for the main station. Receiving modes of S.S.B. (USB LSB), C.W. and A.M. make it suitable for a wide variety of applications.

The Wadley Loop coupled with a triple conversion super heterodyne system guarantees an extremely high sensitivity and excellent stability in every way a worthy and thorough bred newcomer to the Yaesu collection.



BLOCK DIAGRAM FRG-7

FR-101 Receiver

Four models now available

FR101S	STANDARD
FR101D	DE LUXE
FR101SD	STANDARD WITH DIGITAL DISPLAY
FR101DD	DE LUXE WITH DIGITAL DISPLAY

● **Solid State Receiver with Total Spectrum Coverage 160 thru 2 Metre plus provision for Major Short Wave Broadcast Bands**

YAESU MUSEN

TEST EQUIPMENT

YP150

POWER METER/DUMMY LOAD

The YP150 is a fan cooled 50 ohm dummy load (using a large carbon resistor which maintains impedance (V.S.W.R. less than 1·2 : 1 at 145 MHz) by the use of a "Tapering Trough") and a power meter, for use between 1·8 to 200 MHz. Calibrated 6, 30 and 150W. FSD on a large 3½" × 2" meter with a maximum error of 10% FSD. Size 6" (7") × 4½" × 11" (12"). Weight 6 lbs.

YO100

MONITOR SCOPE

The YO100. The multi purpose monitor offers:—through line display, 1·8 to 60MHz of transmitted signals, of 10 to 500W, monitoring of the IF of a receiver (3·18 MHz standard 445 kHz and 9 MHz options), trapezoidal exhibition, audio and R.T.T.Y. portrayal. Built in 1·5 and 1·8 kHz oscillators permit the measurement of power, in accord with statutory two tone P.E.P. measurement requisites.

YC355D

DIGITAL FREQUENCY METER

The YC355D counts from 5 Hz to 35 MHz. The D model's prescaler extends this range to over 200 MHz. The ingenious design offers: a dual range system (providing eight digit readout but using only five cold cathode tubes) and operation from mains, or 12v. DC, at the flick of a switch. The accuracy offered is time base (1 MHz crystal (±0·0005% at 25°C, ±0·0025%, 0 to 40°C)) + 1 count, Input impedance is switchable 1 Mohm or 50 ohm (B.N.C. socket), construction is on double sided epoxy board. Size 8½" × 3" × 11" (12½"), weight 7 lbs.

YC601

DIGITAL DISPLAY

The YC601 digital display unit (for 101 and 401 series (3·18 MHz IF)) indicates transmit and receive frequencies to 100Hz on six bright green, 9 segment gas discharge tubes. Built in mains P.S.U. (consumes only 10W), gate time of 100mS., size 3" × 8½" × 9" (10½") and weight 5½" lbs. Supplied complete with connecting cables, etc.

Yaesu Musen Authorised UK Distributors

Western Electronics (UK) ltd

AMATEUR ELECTRONICS UK

SOUTH MIDLANDS COMMUNICATIONS LTD.

South Midlands

ESTABLISHED 1958—OVER 18

FOR FURTHER INFORMATION & DEMONSTRATIONS CALL INTO TOTTON OR LEEDS, OR SEND A LARGE (10″×12″) S.A.E. (or 15p stamps) FOR YOUR FREE YAESU CATALOGUE, 22 PAGE STOCK/PRICE LIST, SECOND-HAND LIST ETC ETC. DEMONSTRATION FDK MULTI 2700 NOW AVAILABLE.

NEW FROM SMC—AMPERE SOLID STATE LINEARS FOR VHF & UHF

For 144 and 432MHz. RF sensing, excellent bias arrangements, 12V (13.8VDC), 10W drive, 13 × 5.8 ×20cms. CW, AM, SSB.

APB82A 145MHz, 80W output, 10A .. .. .. **£88.89 (+ VAT)**
APB57A 432MHz, 45W output, 6A .. .. .. **£88.89 (+ VAT)**

THE DIGITAL II (FM 14·4-10SXRII)

The de luxe 2 metre FM transceiver with a 5kHz stepped synthesiser and bright digital readout, 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 6¾″ × 2″ × 7½″. Easily underdash mounted with the supplied mounting bracket, or slipped in place of the broadcast wireless.

For strong signal handling and low noise the R.F. mixer, first IF (16·9MHz), second mixer (and LO) are all FET's. The front end is tuned by varicaps fed by the DC output of the P.L.L with superb selectivity provided by 15 pole(± 8kHz @ —6dB. ± 15kHz @ —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 serviceability and screening). Selective calling socket (mic/LS/PTT etc.) on rear panel.

INTRODUCTORY PRICE ONLY £225 + VAT

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

A unique combination of frequency control by either external VFO, 23 switchable or 4 instantly selectable auto scanning channels.

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 illustrated 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 bass 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)

INTRODUCTORY PRICE ONLY £200 + VAT

KP202

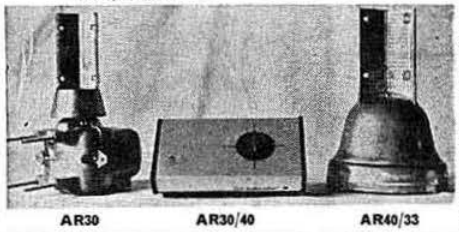
KCP2
EX-STOCK

The handheld KP202 with its 2W of RF and ½W of audio, immunity to image and IF breakthrough, offers performance to rival all walkietalkies 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 (£5.25), leather case (£4.40), base charger KCP2 (£10.50), set of 10 ni cads (£8.50), F to UHF adapters, F plugs, spare whips, spare hods etc.

SIX CHANNELS FITTED S20 and S22 and any 4 of :-S0, S21, S23, S24, R3, R5, R7, *only* **£99.50 (plus VAT) Ex Stock**

CD44/HAM II

AR33



AR30 AR30/40 AR40/33

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 contorl box and instr.

CDE ROTORS

AR30	Light VHF/UHF	£29.25
AR40	VHF & Light HF	£38.50
AR33	De luxe control AR40	£44.75
CD44	Medium duty	£75.85
Ham 11	Heavy duty	£115.00

STOLLE ROTORS

2010/220	Automatic	£40.00

BEARINGS

CD562	CDE	£4.25
RZ100	Stolle (ballrace)	£10.00

MOUNTING KIT

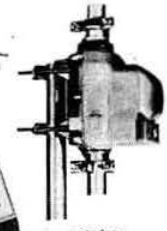
AK121	CDE to Versatower	£3.60

CABLE

5 core	AR30/40/33/2010	pr yd .20
8 core	CD44/Ham 11	pr yd .32

STOLLE

RZ100



2010/220

Control Box

CDE

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.

Access

BARCLAYCARD

Communications Ltd

YEARS OF PROFESSIONAL EXPERIENCE

YAESU

YAESU MUSEN

2-YEAR GUARANTEE
24-HOUR SECURICOR SERVICE

NEW FROM YAESU—THE FT301D

The FT301D is an all solid state, 10–160 metre, precision built (plug in boards), 12V, digital readout (to 100Hz) transceiver, measuring only 11" × 5" × 13½", weighing 22lbs and is equally at home in the car or with the matching external AC PSU/speaker (and V.F.O.) in the shack. Towards the end of the year, a new mains PSU with built-in 6 digit 12 or 24 hour electronic clock will be ready as will be the programmable automatic CW identifier.

The sensitive fet packed receiver has rejection tuning (IF pass band tuning), noise blanker, 3 position AGC, and provision for 600Hz, 2·4 and 6KHz crystal filters.

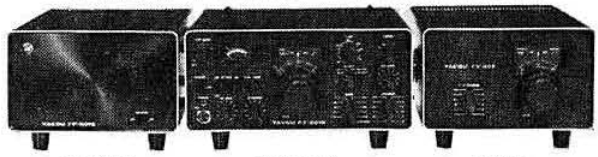
The transmitter employs RF derived ALC, and a wide band amplifier combined with a pre-set pass band system for 200W PIP of CW or RF-processed SSB or 50W of AM or FSK.

The FT301D is now in concentrated production. The first units will, we hope, leave the factory end of September thus allowing us a demonstration model for the Leicester Exhibition. Price around £550.

The FT301S—Ex-stock

The FT301S is a new solid state 12V transceiver of plug in construction, which with all options installed offers:
Top band to 10 metres (inc. 5MHz MSF) in 500kHz segments, 10W output, built-in RF speech processor, selectable 2·4 or 600Hz crystal filters, front panel controlled VOX (with MOX) and PPT, semi break-in keying (with side tone), clarifier with a separate or off switch, 25kHz crystal calibrator, 1kHz readout from the dual speed VFO (100 and 16kHz per turn), single knob resonance, internal VFO or 11 crystal per segment (or external VFO with same crystal facility), 3W audio to the internal or external AC. P.S.U.'s loudspeaker.

The transceiver employs a pre mix VFO and single conversion signal frequency I.F. (9MHz) uses MOSFETS in the RF and mixer stages followed directly by a roofing filter for sensitivity coupled with dynamic range.



FP301S FT301(S) FV301

FT101E

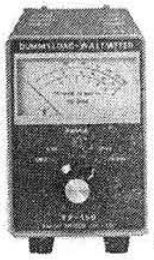
The FT101E, complete HF station, FT101E (EE-EX) EX-STOCK

The FT101E a complete mains or 12V DC station contained in a compact 30lb package. 260W P.I.P. of SSB (with in-built R.F. speech processor), 180W, CW and 80W of A.M., 10 to 160m. (inc. 10MHz RX). The sensitive and selective (permeability tuned R.F. stages and 8 pole crystal filter) receiver offers: threshold adjustable noise blanker, switchable 25 and 100kHz calibrator, ±5K clarifier (with separate on/off switch), etc., etc. The VFO is stable and linear (readout to 1kHz), external VFO or crystal control can be selected, with LED indicators illuminated accordingly. Carrier level is adjustable for; tune up, A.M., for CW operation, whose performance with the semi break in keying, with side tone, and the optional 600Hz filter installed is of a high order. Linear and transverter provisions are made with sockets for: relay contacts, ALC output, all internal HT supplies, low level RF heater links and switches, etc., etc.

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 AM, 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.



YP150

POWER METER/Dummy Load YP150

The YP150 is a fan cooled 50 ohm dummy load, using a large carbon resistor which maintains impedance (VSWR less than 1·2:1 at 145MHz) by the use of a "Tapering Trough" and a power meter for use between 1·8 and 200MHz calibrated 6, 30 and 150W FSD on a large 3½" × 2" meter with a maximum error of 10% (FSD) size 6(7") × 4½" × 11(12") weight 6lbs.

DIGITAL DISPLAY YC601

The YC601 digital display unit (for 101 and 401 series (3·18MHz IF) indicate transmit and received frequencies to 100Hz on six bright green, 9 segment gas discharge tubes. Built-in mains P.S.U. (consumes only 10W), gate time of 100mS., size 3" × 8½" × 9"(10½") and weight 5½lbs. Supplied complete with connecting cables, etc.

YC601

SOUTH MIDLANDS COMMUNICATIONS LTD

Head Office, Main Showrooms and all Mail Order enquiries to Totton
OSBORNE ROAD, TOTTON
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 (079683) 3223. **Howarth Jones GW3TMP,** Pontybodkin (035 287) 846. **Mervyn Anderson GI3WWY,** N.I. Tandragee 840656.

SOUTH MIDLANDS COMMUNICATIONS

YAESU

TELESCOPIC TILTING VERSATOWERS (SEE FAR RIGHT)

Telescopic (20' sections) with full tilting facility allowing for easy antenna maintenance and alterations. The relatively low unit weight and superior design of ground post allows easy and cheap installation often without resorting to concrete. Whilst stocks last, we offer the old prices on application.

ALI MASTS

TELESCOPIC LIGHTWEIGHT

1·5, 2 or 3m: Quick Lock Sections
13 versions, 6 to 21m from stock
Rigging extra. Carriage £1 VAT 8%
5 × 2m **£26.75** 4 × 3m **£28.50**
7 × 2m **£38.75** 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' Telescopic galv. steel mast with guy rings, etc., or c/w full rigging.
Carriage £2 ex stock VAT 8%
30' **£22.85** or **£41.75** c/w rigging
40' **£29.75** or **£53.75** ,,
50' **£37.95** or **£69.95** ,,

TELETOWERS

TELESCOPIC GALVANISED

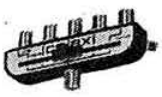
Carriage and rigging (RK) extra
42' **£121.00** (RK **£28**)
57' **£174.00** (RK **£28**)
79' **£224.50** (RK **£48**)
101' **£303.50** (RK **£76**)

COAX RELAYS

12 VDC, 50ohm, Siver plate.
EX-Stock. P & P 30p. VAT 8% only.

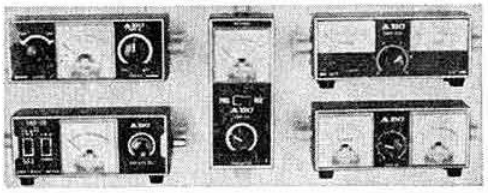
		Power Crosstalk @ 5000MHz	
CX120	50W	35dB Cable entry	**£8.50**
CX230	300W	40dB BNC sockets	**£18.25**
CX600N	600W	40dB N sockets	**£21.75**

COAX SLIDE SWITCHES



Up to: 1kW, 1.5GHz, 0.3dB loss, 1.2 : 1 VSWR.
50dB isolation. 50 ohm 'N' or 'PL' fittings available.

EX-STOCK P & P 30p, VAT 8% only
TWS 120 1 in 2 out Nickle SO239 .. .. **£4.90**
TWS 150G 1 in 5 out Gold SO239 .. .. **£10.45**



AEC METERS

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

SWR10 (TLH)	single meter horizontal type	**£8.15**
SWR20 (BLH)	50Ω, F.S., PR 10 & 100W FSD(±10%) ..	**£9.90**
SWR40 (Centre)	single meter Vert. type with F.S.	**£7.80**
SWR50A (TRH)	SWR(±5%) 3.5MHz up, Pr to 1kW(±20%)	**£9.60**
SWR50 (BRH)	as SWR50A (300μA) but 100μA meters ..	**£11.20**

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	P.O.A.
402BA 40m 2 element ..	**£146.00**	HY QUAD 10-20m 2 ele ..	**£164.50**
18V 10-80 Load Vert. ..	**£23.50**	DB1015A 10-15m 3 e.e ..	**£99.00**
12AVQ 10-20m Trap Vert.	**£23.50**	LA1 Lightning arrestor gas	**£20.30**
14AVQ 10-40m Trap Vert.	**£47.50**	LA2 Lightning arrestor spark	P.O.A.
18AVT/WB 10-80m Vert...	**£64.40**	HY TOWER 10-80m Vert.	**£159.00**

BANTEX VHF WHIPS (Carriage 90p) VAT 12½%

B5	⅝ 145MHz ..	**£6.35**	70¼ ¼ 70MHz	**£4.00**
BGA f.g.	¼ 2m fibreglass ..	**£8.75**	Trunk Lip Mount	**£5.25**
BGA s.s.	¼ 2m stainless steel	**£8.50**	Magnetic Base Mount ..	**£8.50**
B5U	⅜ 432MHz ..	**£5.00**	Standard base unwanted deduct	**£0.50**

ROPES (Carriage extra) VAT 8%

3mm HT steel .. ..yd.	**£0.13**	X150 Rustproof 150m ..	**£10.85**
¼" circ. terylene .. ..yd.	**£0.08**	7 × 18g Galvanised 100' ..	**£2.20**

AERIAL INSULATORS (Post extra) VAT 12½%

2½" polyprop ribbed ..	**10p**	SMC. 1 8" carbon polyprop	**85p**
NTI 4½" polyprop ribbed ..	**45p**	3" porcelain ribbed..	**33p**

AERIAL WIRE (Carriage extra) VAT 8%

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

COAX PLUGS (p & p extra) VAT 8%

PL259	Standard UHF plug	**£0.48**	SO239	Socket 2 hole ..	**£0.37**
PL259	P.T.F.E. UHF plug	**£0.55**		"T" adaptor ..	**£1.20**
UG175U	Reducers	**£0.12**		Right angle adaptor	**£0.90**
258	Back to back ..	**£0.80**		Phone plug/SO239	**£0.55**

CABLES RF FEEDERS (Carriage extra) VAT 8%

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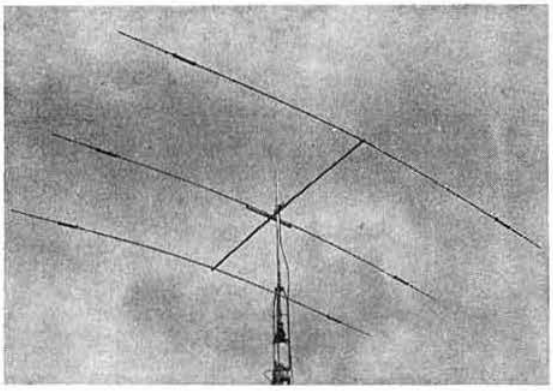

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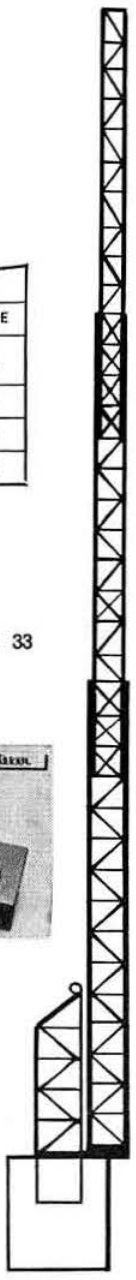

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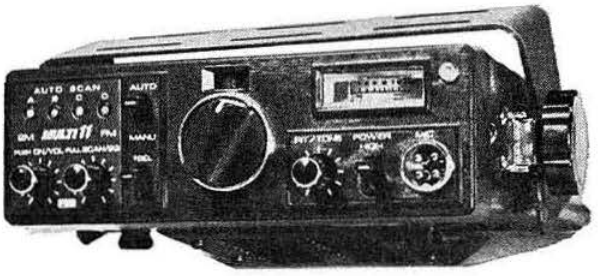

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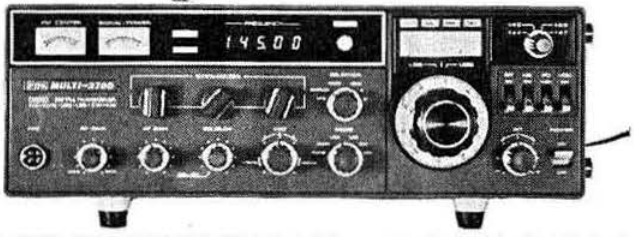

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SSB/CW Transceiver TS-520
A real "compact"; powerful, rugged and reliable. It has everything which otherwise is available only as an accessory at extra cost; built-in power supply for fixed-station use, transistorized DC/AC power converter for mobile operation, loudspeaker, fixed-channel provisions, VOX control, etc. And these are the TS-520's special features in short format:

Versatile Transmit- and Receive Operations—USB, LSB and CW on all radio amateur bands from 80m. to 10m., and—with the aid of the 2m.-Transverter TV-502—also on the VHF-band from 144 to 146 MHz, as well as fixed frequency operation on four channels. The TS-520 also allows reception of WWV stations on 10 MHz for dial calibration. By adding the External VFO-520 (optional) the TS-520 demonstrates utmost versatility: independent RX- and TX operation with different frequencies, transceive operation with slightly variable RX frequency by means of the built-in RIT circuit (Receiver Incremental Tuning) plus fixed channel operation totalling nine different combinations.

Advanced Circuitry—With the exception of the transmitter driver and final stage which are equipped with blower-cooled vacuum valves of type 12BY7A and 2 x S2001 the TS-520 is fully transistorized. The semiconductor complement consists of 44 transistors, 18 FETs, 1 IC and 84 diodes. The reliability and stability of this circuit has been substantiated by numerous contests and during rugged mobile operation.

Outstanding Receive and Transmit Performance—The transmitter section of the TS-520 features separate driver, plate and final tuning, a 2-stage ALC circuit for local and DX operation, thus assuring undistorted clearly legible TX signals even after hours of continuous operation. Provisions for linear amplifiers, such as ALC input, antenna relay switching output, etc,. are available and ready for use. Dual-gate MOSFETs are employed in all critical receiver circuits to improve the input sensitivity, cross-modulation response and spurious rejection. An 8-pole SSB crystal filter in the IF amplifier provides exceptional selectivity and stability. An optional 500Hz CW filter is available as an accessory and can be installed at any time. The switch-selectable time constant of the AGC assures perfect reception of SSB and CW signals.

Precision-type VFO—a feature of all TRIO receivers, transmitters and receivers also contributes to the supreme performance of the TS-520. The VFO is fully encapsulated and is controlled by a meshedgear dial drive (reduction ratio 4 : 1). Dial accuracy is better than ± 1 kHz, frequency drift will not exceed ± 100Hz per hour. Dial calibration is accomplished by means of a built-in 25 kHz crystal marker oscillator.

Built-in Power Supplies—for fixed station use with 120/240 VAC 50-60Hz line voltage or for mobile operation with 12-13·8 VDC by means of the built-in DC/AC converter.

Loaded with Extra Features: threshold-type RF gain control; semi-break-in circuit with sidetone; VOX/PTT/MOX-control; RIT; TUNE switch; LED function indicators for RIT, VFO and FIX channel operation; WWV receive pushbutton; 4-position fixed channel selector switch; built-in 25 kHz crystal marker oscillator; two-stage AGC; multi-function meter; terminals for optional accessories such as: 2m.-Transverter TV-502, External VFO-520, External Speaker SP-520, linear amplifier, headphone, microphone and key.

OPTIONAL ACCESSORIES
EXTERNAL VFO-520
Developed exclusively for the TS-520, this external VFO fulfils the same functions as a separate transceiver due to its numerous cross-operation and split frequency features. Design and specs. of the VFO-520 are identical to those of the TS-520's built-in VFO. It operates on oscillator frequencies between 4·9 and 5·5 MHz. Remote control and power supply are furnished by the TS-520 by means of a special interconnecting cable. In conjunction with the transceiver the VFO-520 provides a total of nine different operating modes, including RX or TX operation with continuously tunable frequencies and fixed-channel operation.

2m. TRANSVERTER TV-502
This new addition to the TS-520 accessory line extends the transceiver's scope of application to include the 2m.-VHF range which is becoming more popular every day. The TV-502 transverts the 10m.-band to 144-145·7 MHz for SSB and CW operation. By installing an optional 39 MHz crystal, the TV-502 will also cover the range between 145·0 and 146·0 MHz, thus making the entire 2m band available for the shortwave radio amateur. The unit features preselector tuning on the antenna side and IF tuning by means of a multi-gang capacitor, utilizing the TS-520's ALC meter for tuning control. The TV-502's transmitter is controlled by the ALC voltage supplied by the transceiver and provides 10 watts RF output power. The highly sensitive receiver seation responds to input signals of less than 0·3μV. Like the TS-520, this transverter can also be used for fixed or mobile stations, operating either from 120/240 VAC, 50-60Hz line voltage, or 12-13·8 VDC supplied by a car battery.

EXTERNAL SPEAKER SP-520
Styled to match the TS-520 accessory line, this 5in-speaker will greatly improve the readability of RX signals, especially in DX operation. Voice coil impedance is 8 ohms, frequency response from 100 to 5,000Hz.

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

TS520 £336.00 VAT Exc

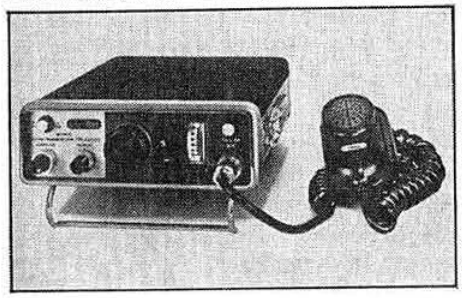
ON SHOW AT LEICESTER 28, 29, 30, OCTOBER 1976

TRIO

LOWE ELECTRONICS

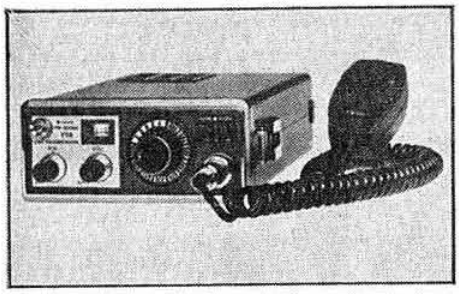
TS700G £382·50 INCL VAT

The standard by which all others are judged. Full 2 metre coverage, VFO or crystal controlled. All modes AM, FM, USB, LSB, and CW. Mains or battery operation. Normal and reverse repeater facilities. Trio exclusive tuning fork access tone generator. Plus, of course, Trio quality and reliability backed by Lowe Electronics service. If you haven't seen it yet, go to one of our branches and be prepared to be impressed.
15 Watts output. 0·25 microvolt sensitivity. European standard FM selectivity. This rig has all others beaten.



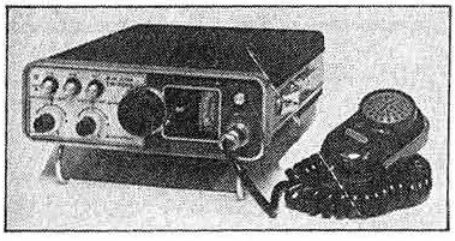
TR7200G £162·00 INCL VAT

The TR7200G has set all 2 metre FM operators talking about its outstanding performance on both transmit and receive. Not only is it the best engineered transceiver on the market, but it's also the most sensitive at 0·3μV for 15dB quieting and has the cleanest transmitted signal both in and out of band (the economy transceivers simply lack the interstage filtering to ensure that the owner is not put off the air by the Home Office.)
Supplied complete with microphone, mobile mount, power leads, spare fuses and incorporating the TRIO exclusive tuning fork access tone generator, the TR7200G includes five fitted channels (S20, 21, 22, R6 and R7). If ordered at the same time as the receiver, we can fit 3 extra channels for £10 incl VAT or 6 extra channels for £20 incl VAT.



TR3200 £148·50 INCL VAT

The newest FM handy transceiver from the TRIO range. Superb performance for the 70cm. operator, 12 channel capability in the range 432-436MHz with three channels fitted (SU8, SU18, SU20). Transmitter output switched 2W/400mW and incorporating the TRIO exclusive 1750hz tuning fork access tone generator. ¼-wave detachable antenna for high gain performance on both transmit and receive.
Supplied complete with all accessories as the TR2200G and with the new miniature handy microphone.



TR7010 Special offer price until November 1, £160·00 INCL VAT

Following the worldwide success of the TS700, Trio have taken the TS700 basic design and packaged it for 2 metres SSB mobile use.
The TR7010 sets new standards in receiver sensitivity and low spurious emission on transmit. Operating CW and SSB from 144·1-144·335MHz, the TR7010 covers CW SSB and beacon activity. 48 5kHz channels plus VXO and RIT provide continuous coverage.
Single conversion using an IF of 10·7MHz with a superb crystal filter provides outstanding selectivity. Wide range amplified AGC and newly developed FET devices in RF amplifier and mixer stages allow maximum sensitivity to be used with freedom from overload due to adjacent signals.
Single conversion transmitter with fully balanced mixer system generates a beautifully clean signal with crisp audio quality.

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The Europa B plugs into Yaesu/Sommerkamp equipment for instant VHF operation. For other HF equipment use our power supply type CPS 10,

The EUROPA B gives you:
- ★ The confidence of our most efficient back up service in the 12 month warranty period and beyond.
- ★ Highest transmit power available 200W. Highest receive sensitivity available —2dB N.F.
- ★ Compact, attractive appearance will complement your station. Size : 9" × 4½" front panel 4½" deep.
- ★ Cleanest output spectrum available. All spurious outputs —80dB.
- ★ Price: **£109.15** complete to plug in and from stock.

EUROPA COMPLETE POWER SUPPLY TYPE CPS 10
Supplies all voltages to Europa and contains a dummy load attenuator to make the Europa compatible with any HF equipment. Price **£45.00**—Ex stock.

SSM Z MATCH 80-10 METRES
This unit has been produced to satisfy the constant demand for a compact matching unit to meet the critical load requirement of the modern P.A. Receivers are also becoming more sensitive to aerial matching and our Z match can of course be used to match the aerial to your receiver. The units have been tested at 2KW CW output power into a Bird Termaline Wattmeter/Dummy load. The aerial connections can be used with balanced or unbalanced feeders and the connectors are screw terminals for wire aerials AND SO239s for co-ax fed aerials. Don't forget that multiband aerials respond as well to your harmonics as to the wanted signal. Our Z match will provide harmonic attenuation as a bonus. Price is only **£28.00.**

VHF CONVERTERS 2 METRES, 4 METRES, 70cms, SATELLITE BAND AND MARINE BAND FROM STOCK. Our own and independent tests confirm that our converters have the edge on performance of any available.

SENTINEL DUAL GATE MOSFET CONVERTERS
- ★ N.F. 2dB. Gain—30dB.
- ★ Very high tolerance crystals, 5p.p.m. for calibration accuracy.
- ★ Strong signals and overvoltage and reverse polarity protection built in.
- ★ Standard I.F.s are: 2 metres: 28-30MHz, 2-4MHz, 4-6MHz. 4 metres: 28-28·7MHz.
- ★ Size only: 2½" × 1½" × 3" long except 2-4MHz and 4-6MHz which are double conversion and 4" long. Price only **£18.00** 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**, ex-stock and IF it doesn't work send it back with **£2.25** and we will fix it. YOU CAN'T GO WRONG!

SENTINEL X 2 METRE CONVERTER
A de luxe version of the Sentinel. Performance spec. is the same but it contains an internal mains power supply and a front panel RF gain control.
- ★ Size: 5" × 1½" front panel, 4" deep.
- ★ Stock 2 metre I.Fs: 28-30MHz, 2-4MHz, 4-6MHz. Price: **£22.00**—ex-stock.

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

2 METRE or 4 METRE PRE-AMPLIFIERS. These can be supplied for Satellite and Marine Band from stock. Other frequencies to order.
Two models to choose from:

SENTINEL LOW-NOISE FET PRE-AMPLIFIER
- ★ This pre-amplifier uses a selected low noise FET to provide the ultimate in sensitivity and selectivity.
- ★ Isolated supply lines, compatible with any equipment.
- ★ Low noise figure—1dB. High gain—18dB.
- ★ Size: 1½" × 2½" × 3". Price **£8.72**—ex-stock.

PA3 DUAL GATE MOSFET PRE-AMP
- ★ *Small* about 1 cubic inch, printed circuit pre-amp. Now incorporated in thousands of transceivers.
- ★ Low noise figure—2dB. Gain 18dB. Price **£6.27** with fitting instructions.

70cm U.H.F. CONVERTERS AND PRE-AMPS
SM 70 70cm to 2 metre FET converter. This is a very high performance 70cm converter at a very attractive price. Size: 1½" × 2½" × 3". N.F. 3·5dB. Gain 30dB. Price: **£18.00**—ex-stock.

SM71 70cm (432MHz) PRE-AMPLIFIER
Selected FETs give a noise figure of—3·5dB and a gain of 18dB. Size: 2½" × 1½" × 4". This unit is also available on other frequencies, e.g. 400MHz region for satellite or radio astronomy use, for which it was originally developed. Price: **£10.00**—ex-stock.

All prices include 12½% VAT and delivery. 12 months guarantee on all units. We offer same day COD (£50 limit)

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IC-22A

THE FAVOURITE MOBILE WHICH COMES WITH

ELEVEN

CHANNELS FITTED

6 SIMPLEX 5 REPEATER

11 CHANNELS WITH A *CRYSTAL CONTROLLED* AUTOMATIC TONE BURST **£164.00 including VAT (or £33.09 deposit)**

11 CHANNELS WITH FACTORY FITTED R/C AUTOMATIC TONE BURST **(£158.00 including VAT (or £32.00 deposit)**

ISN'T IT TIME YOU TREATED YOURSELF TO AN IC-22A IN ORDER TO GET THE BEST FROM ALL THE NEW 2 METRE REPEATERS WHICH ARE OPENING UP?

WITH THE OPENING UP OF THE REPEATERS IN NORTH WALES, LANCASHIRE, BIRMINGHAM, KENT AND CORNWALL, THE COVERAGE IN THE U.K. IS GROWING ALL THE TIME.

The IC-22A is the most suitable mobile rig for repeater use. Both the crystal controlled and the factory fitted R/C tone burst are arranged by us to be entirely automatic, operating only on repeater channels when a burst of tone is given at the start of each transmission. There is no need to press buttons while driving!

The audio tailoring and limiting are ideal for repeater use, giving the characteristic clear sound associated with the IC-22A and the receiver is of top quality design giving high sensitivity and hard IF limiting. The filter provides excellent adjacent channel rejection which is so important with today's 25kHz channel spacing.

In fact the IC-22A is good solid value for money. Maybe it does lack some fancy gimmicks—but it doesn't need them. The RX light comes on when a signal is received and the squelch opened—not just to tell you that there is a crystal in the socket. (You KNOW that crystals are there on the 11 most important channels). You can work the chap next to you in the car park *without* pulling any plugs out and he *won't* blow your head off! What you get is what you want—plenty of expensive crystals and a no fuss tone burst which doesn't demand that you press an extra button when driving. (The no fuss THANET warranty is worth thinking about too).

By the way, the size of the IC-22A is $2\frac{9}{32}$" high × $6\frac{1}{8}$" wide × $8\frac{1}{2}$" deep and it fits into the excellent quick release mobile mounting bracket which is supplied with the rig.

Your IC-22A comes fitted with SIX simplex channels, SO, S20, S21, S22, S23 and S24 PLUS the FIVE U.K. Repeater channels R3, R4, R5, R6 and R7.

Look at this list and find where your nearest repeater is (those shown in capitals are already in operation.)

R3 SUFFOLK and YORKSHIRE
R4 Central Scotland, DERBYSHIRE AND CHESHIRE, DEVON and KENT.
R5 HAMPSHIRE, BIRMINGHAM and CORNWALL
R6 CAMBRIDGE, SOUTH WALES, NORTH WALES AND LANCASHIRE
R7 LONDON, WORCS., Aberdeen, N. LANCS. and W. Wales.

COMING SHORTLY FROM THE ICOM® STABLE

We are pleased to give you advance warning of the **ICOM** IC-215 which will be here in early December. It is a 3 watt 15 CHANNEL, FM PORTABLE with a generous supply of crystals. It resembles the IC-202 in size and appearance and the design is to the usual high quality ICOM standard. A demonstration model and further data will be available at the Leicester show.

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ICOM® IC-22A

WITH CRYSTAL CONTROLLED TONE BURST
£164.00 inc. VAT (£33.00 Deposit)
WITH FACTORY FITTED R/C TONE BURST
£158.00 inc. VAT (£32.00 Deposit)

22-channel capability—half full of crystals

Compare the advantages over its competitors:

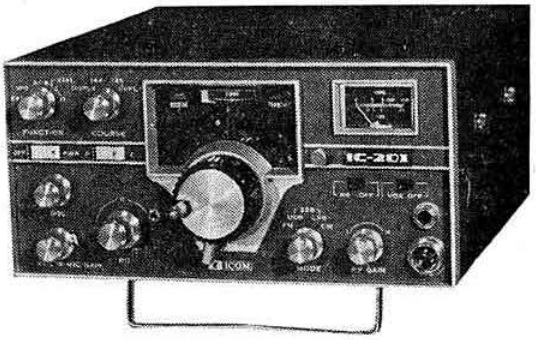
★ Automatic crystal burst introduced on repeater channels only.
★ Frequency tailoring and clipping ideal for optimum FM.
★ Fitted with all five UK REPEATER channels.
★ Fitted with the six most used SIMPLEX channels.

WE THINK THIS IS THE BEST RIG IN THE UK FOR REPEATER USE

ICOM® IC-201

£357.75 inc. VAT (£71.75 deposit)

The luxury multi-mode rig which was described in full in our advertisement in January when it was also reviewed in *Radio Communication*. It provides full 2 metre coverage on FM, SSB and CW using its ultra stable VFO. Full facilities for repeater and reverse repeater use at the flick of a switch, built in automatic crystal controlled tone burst fitted by us, full break-in facilities on CW and VOX are but a few of the excellent facilities found on the increasingly popular IC-201. Send for further details or leave a message on out ansafone during the evenings.



ICOM® IC-202

£161.10 inc. VAT (£33.10 deposit)

The new and highly popular hand held SSB portable from ICOM. 3 watts barefoot but clean enough to drive a linear up to the legal limit. See June's RADCOM for details and last month's for a review.
Linears, PSUs, N-Cads, Chargers and Desk Mic. with built in pre-amp now available

ICOM® IC-225

With crystal controlled tone burst and reverse repeat switch
£250 inc. VAT (£50 Deposit)

With switched factory fitted R/C tone burst
£225 inc. VAT (£45 Deposit)

An **80 Channel FM** mobile rig with all 80 channels fitted. Uses an excellent phase lock loop system. Channels are at 25kHz spacing which fits in with the UK and continental channels systems giving *all* the UK simplex and repeater frequencies. A *crystal controlled* tone burst is introduced when working repeaters and reverse repeater facility is available on all channels by adding one extra 11·300MHz crystal. Ex-stock at time of going to press. **£250 inc. VAT.**

REVCO mobile antennas. An excellent range of $\frac{3}{4}\lambda$ antennas with a stainless steel whip and neat loading coil. The magnetic base is a beauty. All aerials are of the hinged mounted type. $\frac{1}{4}\lambda$ whip with loading coil and base **£8.00** + **£1** carriage $\frac{1}{2}\lambda$ whip with loading coil and magnetic base and 3·5 metres of cable **£17.00** + **£1** carriage magnetic base alone with 3·5 metre cable **£12.50** + **75p** carriage.

CRYSTALS FOR ICOM®

IC-22A, IC-20, IC-22, singles **£2.70**
pairs **£4.50**
IC-201 **£3.50** each
IC-30A **£6.00** pair, **£3.50** single

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See page 712

Why not see and buy the excellent ICOM range at your nearest Thanet agent—phone for an evening or weekend demonstration.

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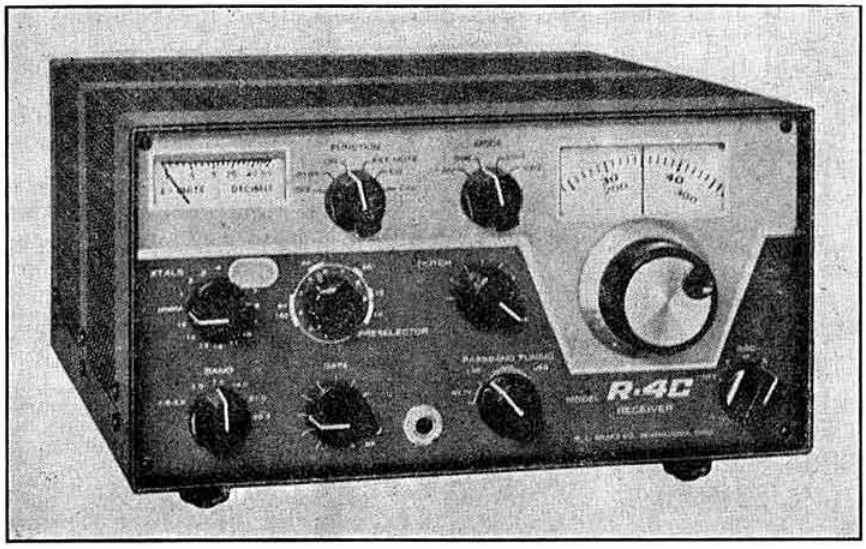

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DRAKE RECEIVERS & ACCESSORIES		£
R-4C	Receiver SSB, AM, SW, RTTY	423.00
FL250	Filter for R-4C (0·250 kHz)	37.12
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4-NB	Noise Blanker for R-4C	49.50
MS-4	Matching Speaker for R-4C	18.90
SPR-4	Receiver—general purpose	438.75
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SCC-4	100 kHz Calibrator for SPR-4	13.95
TA-4	Transceive adaptor for SPR-4, T-4XC	25.20
	DC Power Cord for SPR-4	4.05
	Amateur Bands Crystal Kit for SPR-4	22.50
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	Marine Crystal Kit for SPR-4	44.43
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SSR-1	Receiver—general coverage	202.50

DRAKE TRANSCEIVER AND ACCESSORIES		£
TR-4C	Transceiver—SSB	423.00
34-PNB	Plug-in Noise Blanker	69.75
AC-4	115/240v P.S.U. for TR-4C, T-4XC	83.25
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RV-4C	Remote V.F.O. for TR-4C	83.25
FF-1	Crystal Control for TR-4C	32.62
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MN-4	Antenna Match Network	77.40
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WV-4	RF Wattmeter 20-200 MHz	58.50
C-4	Station Control Console	292.50
DRAKE ADDITIONAL ACCESSORIES		
TV42LP	Low Pass Filter 100W	9.00
TV3300LP	Low Pass Filter 2kW	14.62
RP-500	Receiver Protector	63.00
7072	Hand Microphone	13.27
7075	Desk Microphone	27.00
Accessory Crystals for R-4C, T-4XC, SPR-4		4.05
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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

VALUE ADDED TAX

A list has now been received from HM Customs and Excise showing electronic components which are to be charged at the higher rate of VAT. Now that there is not such a large gap between the standard rate of 8 per cent and the higher rate of 12½ per cent, purchasers of components might not feel that the difference is important. However, there is always the possibility that the gap may widen, and the distinction will then become of more importance.

The list of categories to be charged at the higher rate to a certain extent begs the question; for instance, the following are caught:

All valves for higher rated goods.

Printed circuit boards, and micro circuits (including hybrid and passive) for higher rated goods.

The question that immediately leaps to mind is whether an unetched printed circuit board could be said to be suitable for higher rated goods. However, picking out the more important items, which are listed below, the intending purchaser may well be able to save some tax by purchasing components with a higher power rating.

Items charged at 12½ per cent

1. Transistors, triacs and thyristors, plastic encapsulated and less than 3A rating.
2. All plastic diodes and diacs of less than 1A rating except light emitting diodes.
3. All zener diodes of power rating less than 3W.
4. Rectifiers of a kind suitable for use in low voltage battery charger equipment, having a current rating of less than 5A.
5. Capacitors *excluding*
   (a) paper and plastic film capacitors of greater than 0·5μF and/or metal case and/or rated above 500V dc;
   (b) tantalum capacitors with liquid electrolyte;
   (c) mica (other than rivetted and bonded types) and polystyrene capacitors;
   (d) ceramic and porcelain capacitors of multilayer construction;
   (e) vacuum and pressure gas capacitors;
   (f) variable capacitors rated at or above 2,000V dc.
6. Resistors
   (a) fixed resistors—carbon composition and carbon film at or below 2W rating excluding hot moulded types;
   (b) wire wound excluding vitreous and silicone protected types, precision types and types using heat sink methods of power dissipation;
   (c) variable resistors.

The above list is not comprehensive but should cover most of the parts that we might buy. It is noted that filters (electronic) and also quartz crystals and quartz crystal filters for use with higher rated goods are caught, but this could be useful.

Traders are urged by Customs & Excise to consult their local VAT office when in doubt about the correct rate to be applied and it is felt that this will lead to even more confusion. Examination of advertisements in various radio magazines shows that some suppliers sell at the higher rate and some at the lower rate and it is suggested that the discerning amateur could save himself a few pence by reading the advertisements carefully with an eye to the lower rates.

J. O. Brown, G3DVV, Honorary Treasurer

QTC

amateur radio news

Lotteries

From time to time members write to headquarters and suggest that a lottery could be a way out of the Society's financial problems. The legal position is that if a lottery is organized, which includes registration with the local authority, the whole proceeds should not exceed £5,000 and no ticket should exceed 25p: in addition, it is unlawful for us to conduct a lottery in or through *Radio Communication*.

The suggestion is appreciated but there are legal difficulties.

"A transistorized slow-scan television monitor"

In connection with the article under the above title which appeared in the July 1976 issue it should be made clear that the author, Mr J. L. Wood, G3YQC, when submitting the manuscript, stated that the modifications to the original SM0BUO design were intended to make construction in the UK easier by replacement of hard-to-get components.

The comments of the author were not reproduced when the article was published. This omission, and any misunderstanding it may have caused, is regretted.

WARC 79

Following the recent meeting of the Administrative Council of the ITU, the agenda for the WARC 1979 has become available. This shows some omissions when compared with the original agenda that was proposed. Many member nations of the ITU apparently felt that the work of the conference could not be completed within the 10-weeks allocation. Details of the agenda are being circulated to all national societies by IARU Region 1, and the Telecommunications Liaison Committee will be giving close consideration to the matters involved. In the meantime the RSGB Telecommunication Liaison Officer has prepared for the Home Office a document setting out in detail the proposals of the RSGB concerning WARC 79. This booklet has also been circulated to all Society Regional Representatives. The next step in the preparatory work will be for the Society to take part in discussions, under the chairmanship of the Home Office, with the representatives of other services concerned with WARC 79.

To ensure the co-ordination of the amateur service proposals internationally, a meeting of IARU officers from all three regions will take place in Geneva commencing 17 September 1976. This meeting will also consider the problems of countries having few amateurs and perhaps no national society to negotiate with the administration.

Satellite broadcasts

With the co-operation of the Hungarian satellite command station, HG5BME, news broadcasts will be made through the Oscar 6 satellite commencing 1 September (orbits 17738 and 17745) and subsequently on 15 September (17915 and 17920) and 29 September (18090 and 18096). The transmission mode will be A3J and the time duration about five minutes. The broadcasts will be prepared by the Hungarian Radioamateur Society (MRAS) and IARU Region 1. Reports will be welcome and should be sent to G2BVN.

RSGB lecture at the IEE

The 1976 RSGB lecture carries the title "Image transmission". It will be given in two parts, one dealing with slow scan television and the second concerning high definition television. The principal speakers will be C. Grant Dixon, G8CGK, G6AEC/T, and Michael J. Bues, G8AAI. Both these speakers are well known in their respective fields and the occasion should be of interest to both hf and vhf operators.

The lecture will take place in the Faraday Room at the IEE, Savoy Place, London WC2, and will commence at 6.30pm on Tuesday 19 October. All Society members and their guests will be welcome.

Club liability insurance

Many clubs and societies do not have adequate insurance to protect them against claims arising from injury to or damage to the property of members of the public. The RSGB reminds members that the consequences of a serious claim can be disastrous for an unincorporated club holding no capital, and these consequences may result in individual members being faced with liabilities quite beyond their means.

There is of course no need for any member to be exposed to such serious liabilities as insurance is readily available at modest cost. The Society's insurers, the Sun Alliance & London Group, 40 Chancery Lane, London WC2A 1JB (attn: Accident Dept), will be pleased to give details of a simple insurance scheme which we hope many will consider to be of value.

It is recommended that immediate and careful attention be given to this important matter.

Double sideband suppressed carrier

The Society has received the following letter from the Home Office:

> "We have from time to time by special authority permitted the use of the above mode of transmission for radio amateurs and we have decided that it should be discontinued. It is a mode of transmission that is not permitted by international radio regulations; it is difficult to monitor without special equipment and we consider no undue hardship would be placed on amateurs at the recall of this facility."

The Society is in touch with the Home Office and hopes to have this decision amended.

Historical radio equipment on show

The collection of antique and wartime radio equipment covering the period 1900-55 owned by Ron Ham, BRS15744, is on display from 10am to 7pm on weekdays until 25 September in the Hargood Room of the Worthing Museum.

Club lines

The East London RSGB Group has been re-formed and full details are included in "Club News" in this issue.

During VHF NFD the Amateur Radio Club of Nottingham operated on 144MHz using the callsign G6CW. The club obtained this callsign last year, three years after the death of John Curnow, in order to perpetuate its use on vhf as he was a pioneer on these bands.

Welsh Amateur Radio Convention

1000-1900, 26 September 1976
Oakdale Community College, Nr Blackwood, Gwent

0930 Talk-in commences. GW3KYA/A on 145·5, 145·55MHz fm; GB3BC/R6

1100 Official opening by Mr C. H. Parsons, GW8NP, Immediate Past-President of the RSGB. Programme will include "DX operating" by G3IQP; film "Trip to Israel," by WB2AQC and WA2BAV; tape/slide lecture on HK0AA expedition to Bajo Nuveo in June 1976, by K6AHV; film/slides on Oscars 6 and 7; video-tape recording "Around the clubs"; etc

RSGB bookstall	**Raffles**	**Trade exhibition**
TV and	**Bring and**	**Exhibition**
rtty display	**buy stall**	**station GW6GW**

Refreshments

Admission.....50p at the door

Further information from R. B. Davies, GW3KYA, 16 Vancouver Drive, Penmain, Blackwood, Gwent NP2 0UQ. Tel Blackwood 225825.

Scottish VHF Convention

University of Dundee
Saturday 25 September 1976

A full programme has been arranged to include lectures, trade stands, bring and buy stall, power, frequency and deviation measurement, and RSGB bookstall. Talk-in station GM4AAF (ssb 144·20MHz, fm 145·50MHz).

TICKETS

(Including afternoon refreshments)

Convention only.....75p
Convention and dinner..... £3.50
Bed and breakfast at University Hall of Residence..... £4.50

Applications for tickets, with postal order or cheque, should be sent with a foolscap sae to John Miller, GM4AGS, "Ingleby", 70 West Road, Newport on Tay, Fife DD6 8HP, who will be pleased to supply full information.

The callsign G4ATC, formerly that of a Midlands amateur, has been issued to the Staffordshire Wing Air Training Corps, c/o G3COY, QTHR.

Old-timers 3·5 and 7MHz activity event

Contacts between British and Dutch OTs will again be renewed during the activity period 4-6 October 1976 inclusive in an event arranged by RAOTA and the OTC of the Netherlands. Details are as follows:

3·5MHz (ssb or cw)	**Co-ordination on 3,600kHz**
Each day 0830 to 1130gmt	PA0DK and G2PT
1300 to 1500gmt	PA0DK and G2PT
1800 to 1900gmt	PA0PN
7MHz (ssb or cw)	**Co-ordination on 7,060kHz**
Each day 0830 to 1130gmt	PA0PN and GW3ASW or G2RQ

It is hoped that not only will nets develop on the co-ordination frequencies but that individual QSOs will be arranged (via co-ordination) in the cw section of the band concerned or 3,610-3,690kHz and 7,060-7,070kHz on ssb.

The evening activity period has been added since many old-timers still have to work for a living.

Open University telecommunications course

An understanding of the technical advances already made in the field of telecommunication, and their practical application for the present and future, form the basis of a one year course—Telecommunication Systems—being offered by the Open University. The course, which is part of the University's Post-experience programme for 1977, examines the basic engineering principles of telecommunication systems. It deals mainly with the way in which various elements of telecommunication systems are selected and combined; the functions they serve; the way they interact and the effects which inherent imperfections have on the overall performance of a system.

In the past the course has only been available to undergraduate students who will usually have taken a course in electromagnetics and electronics or instrumentation. However, a "matching" unit, which will provide Post-experience students with the relevant materials from these two courses, has been added as the first unit. Students wishing to take the Post-experience course, however, should be familiar with elementary electronics, including such areas as elementary ac circuit theory, complex numbers, principles of amplification and feedback, and very simple transistor and diode circuits with resistors, capacitors and inductors.

The Post-experience syllabus is designed for adults who want to keep abreast of recent developments in their own field or broaden their interest out into new areas. Students study at home in their own time from correspondence texts backed up by radio and television broadcasts. There is a range of 21 subjects to choose from in the 1977 syllabus. As with all Open University courses, students need no previous educational qualifications.

Students wishing to apply for the above course or receive further information on the Post-experience programme should write to the Post-experience Student Office, The Open University, PO Box 76, Milton Keynes, MK7 6AA. The application period lasts until 15 October.

South London College lectures

Two series of lectures of interest to radio amateurs will commence in October.

"Teletext Systems", dealing with Ceefax and Oracle teletext systems for transmitting and receiving information; Viewdata as interactive information and communications via telephone network, and television/teletext receivers, will be presented by P. Darrington of *Wireless World*, and specialists from BBC Research, ITCA, Decca Ltd and Post Office Research. There will be nine lectures from 6.30 to 8.30pm on Tuesdays commencing on 12 October; the fee will be £4.80.

"Integrated Circuits", dealing with circuit techniques and ic applications in audio, television, power supply and digital systems, will be presented by staff of South London College. There will be nine lectures from 6.30 to 8.30pm on Thursdays commencing on 14 October; the fee will be £3.

Applications to attend should be made to the Senior Administrative Officer, South London College, Knight's Hill, London SE27 0TX; tel 01-670 4488.

Practical polyphase

SSB for shallow pockets

by J. R. HEY, Tech(CEI), MSERT, G3TDZ*

SOME years ago when the author first took to the air, one could actually venture onto at least one band for as little as £10 with modified surplus apparatus. His first 160/80m a.m./cw transmitter built from scratch cost just over £6. Slightly more recently, a glut of surplus business radio equipment has enabled the G8 to make a start for a modest outlay. Now ssb has established itself as the dominant dx voice communication method from 160m to uhf, how can the new G8 or G4 get off the ground; how indeed can the beginner with limited knowledge and experience, and perhaps shallow pocket, join the ssb club?

The sky-high price of ready-built ssb gear might encourage more home construction if it were not for the filter alone costing between £10 and £25; one would hardly risk this expenditure on one component where little trust existed in one's own construction. There has always been the phasing method but the average amateur on seeing those very odd component values in the af phase shifter must be somewhat inhibited. The third method has offered a new approach provided one turns a blind eye to the mathematical explanations.

To the rescue has come Mr M. J. Gingell who has described a new method [1, 2] of achieving the audio phase shift using off-the-shelf values. Now the "ten quid" ssb could become a reality rather than an absurd dream.

While information so far published has been sufficient for the knowledgeable amateur to have a go, the less experienced have shown some doubt. It is the purpose of this article to convert the purely symbolic into practical nuts and bolts.

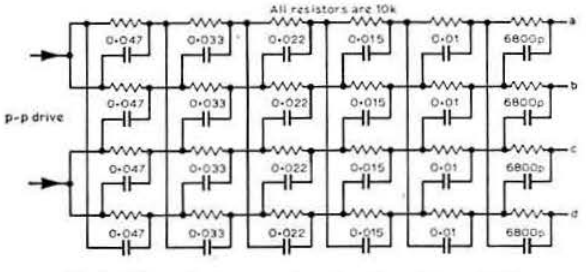


Fig 1. The polyphase network; all resistors 10kΩ

* 8 Armley Grange Crescent, Leeds LS12 3QL

The exciter

Mr Gingell's polyphase network is shown in Fig 1, and consists of six groups of RC networks, each connected in a ring configuration. The network is driven in p-p. At the four outlet ports, equal amplitude signals are present, each shifted through 90° from its neighbour. As any adjacent pair of outputs carry the required signals, a and b will be used and the other two ignored. Many such networks in audio work must be driven from a low resistance source and terminated in a load of much higher resistance; in this network the load will be around 1MΩ.

Under the banner of economy the performance must not be allowed to suffer, so by applying just a little extra thought the desired result can be achieved. The functions of microphone amplifier, bass roll-off, low-pass filter, and phase splitter are accomplished with only three ordinary inexpensive transistors, and dc coupling enables a few electrolytics to be omitted. The low value C7 working into TR3 input resistance provides the desired rising response or bass roll-off; TR3 alone producing all the necessary gain from an average dynamic microphone. A Sallen & Key low-pass filter around the TR4 gives a sharp attenuation above 3kHz, TR5 then creating the p-p drive. Bias for TR3 is derived from TR5 emitter; the circuit working points are stable over a wide temperature range. Separately decoupled, this is all the circuitry necessary before the polyphase network.

A pair of feedback amplifiers based on the compound emitter follower principle terminate the phase-shift network, each possessing three properties: high input resistance mentioned earlier; low output resistance to drive the balanced modulators, and a specific low gain. One of the circuits, however, has a pre-set resistor enabling that gain to be varied by a small amount; this affords a means of equalizing the amplitude of the two audio signals. A signal level of between 200 and 400mV is required for feeding the balanced modulators.

The phasing method further demands two rf signals having a 90° phase relationship. The output from a 10·7MHz crystal oscillator is amplified by TR2 to the required level. A link winding L2 feeds two ferrite transformers. These are made by placing two ferrite beads side by side and winding up through one and down through its neighbour, this forming one turn; round again would be regarded as two turns (Fig 3).

Both coupling transformers have four primary turns, except that T1 has a further four turns forming an overwind which provides part of the means of achieving the 90° shift. From the overwind, a 270Ω resistor connects to T2 primary, together with a capacitive coupling C29 C54 from T1 primary. T2 secondary has six turns to make up for losses in the coupling elements.

After spending 1p each for ferrite beads, extravagance in the balanced modulators is avoided by using simple diodes. The resistive element of each modulator is easily balanced by a small value pre-set resistor; capacitive balance was discovered to be more critical. It was found necessary to determine by experiment which diode required the extra capacitance; not a method which satisfactorily lends itself to easy reproduction. The answer was to add a fixed capacitor to one diode, then balance this with a trimmer across the other. A 15pF fixed value is fitted, its opposite number being a 30pF trimmer.

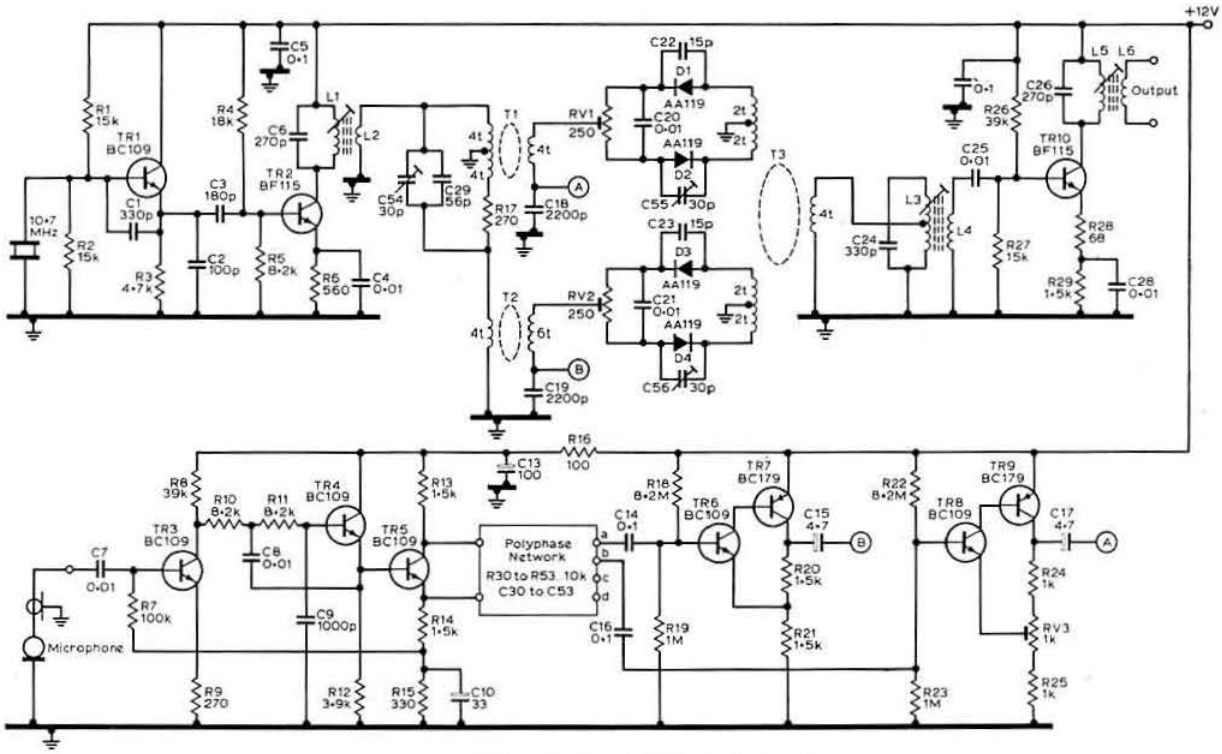


Fig 2. SSB generator theoretical circuit

The sets of sidebands generated in the balanced modulators are combined in a ferrite transformer T3 which has two centre tapped primaries and a simple secondary. This might sound somewhat daunting till one notices how few turns are involved. Again two ferrite beads are granted this most important task, for here the actual single sideband is created. A tuned amplifier lifts the low ssb signal to a more sensible level of some 100-200mV, its tuned circuits tending to reject any interference.

Construction and setting up

The circuitry so far described is housed on one printed board (Fig 4). Moderate component density is employed, with order and symmetry in layout where demanded (Fig 5). Provision has been made for both small HC25-U or HC18-U crystals and the larger HC6-U types.

Where some constructors might wish to build this basic ssb generator for use at some lower frequency, a large crystal might possibly produce sufficient voltage without its amplifier. By connecting a link between TR1 collector, where a hole in the board is provided, and TR2 collector point, all TR2 associated circuitry is then omitted. Obviously L1 L2 would require some modification, also R17 C29 would need some adjustment to maintain the 90° shift accurately. At the design frequency and for all miniature crystals where the amplifier stage is wired, connect TR1 collector to ht by the link shown in Fig 5.

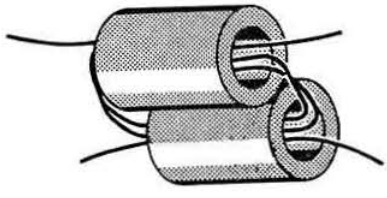


Fig 3. Detail of ferrite transformers

Coils are wound on 4mm Aladdin formers type 8A-6259-02 which fit tightly into $\frac{3}{16}$in holes in the printed board.

As green Mylar polyester film capacitors were used in the prototype polyphase network, dimensions and spacing have been made to suit these in the pc board layout (Fig 4). Actual values are not too important: some manufacturers specify values such as 0·05μF, 0·03μF, 0·02μF etc, this would be exactly the same as 0·047μF, 0·033μF and 0·022μF etc provided all four capacitors in each value group are alike. A tolerance of five per cent is desirable although those in the prototype were in fact 10 per cent. The Siemens polycarbonate range would be a good choice, but the pc would have to be altered.

Before this was prepared, local interest prompted other amateurs to copy the circuit—a valuable means of checking all was well before putting pen to paper. In one case where the local supply of 6,800pF capacitors had run dry, another four 0·01μF were fitted into the polyphase network and the four associated resistors changed to 6·8kΩ: the unit produced fine ssb.

The two audio drives connect to the balanced modulator input transformers via external leads, which must be screened. If "A" connects to "A", and "B" connects to "B", then the upper sideband is produced. A simple reversing

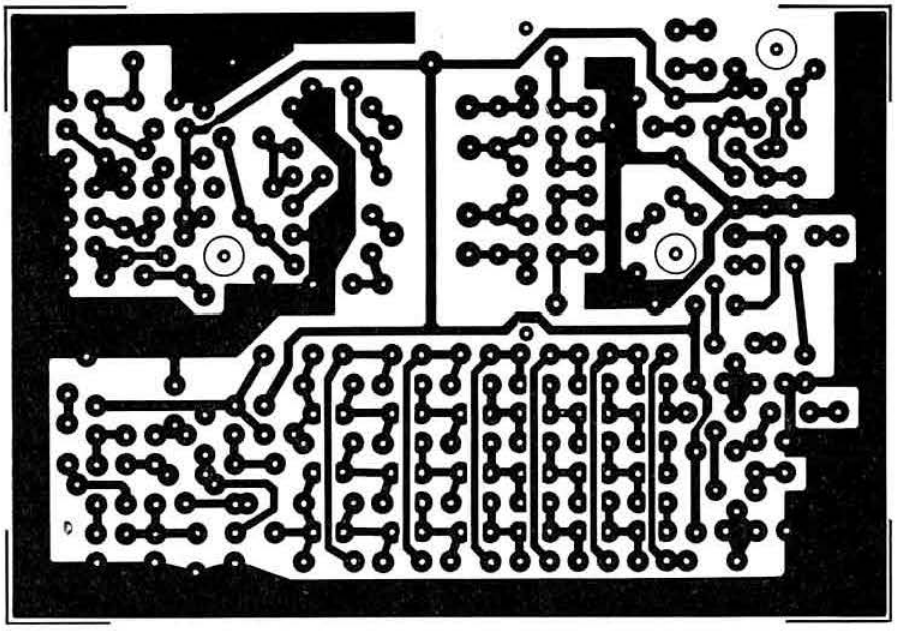


Fig 4. Printed circuit board layout

switch fitted into these two wires furnishes instant sideband switching.

When winding the ferrite transformers, guide the loops carefully into the beads to avoid the hole's sharp edges stripping insulation enamel and causing possible short-circuits later. At first sight, T3 might appear a challenge. It has been found easier to wind the secondary first and fit to the board in a position shown in Fig 5. Cut off a short piece of enamel wire, clean one end and solder into the upper primary hole adjacent to D2 positive connection. Passing free end into nearest bead, wind on two turns and preparing end, fit into second hole, but do not solder. Now cut and prepare a second length of wire, fit into second hole and solder both wires. Winding always in the same direction, complete two turns and fit into hole three—solder. Starting at hole four, similarly wind the other primary, in the same direction.

No special skills or techniques are demanded in assembling the other components; inspection of Fig 5 will indicate method of assembly. It is suggested C55 and C56 be good quality vaned or semi-solid dielectric types such as the Iskra or Mullard types. Some of the miniature ceramic disc

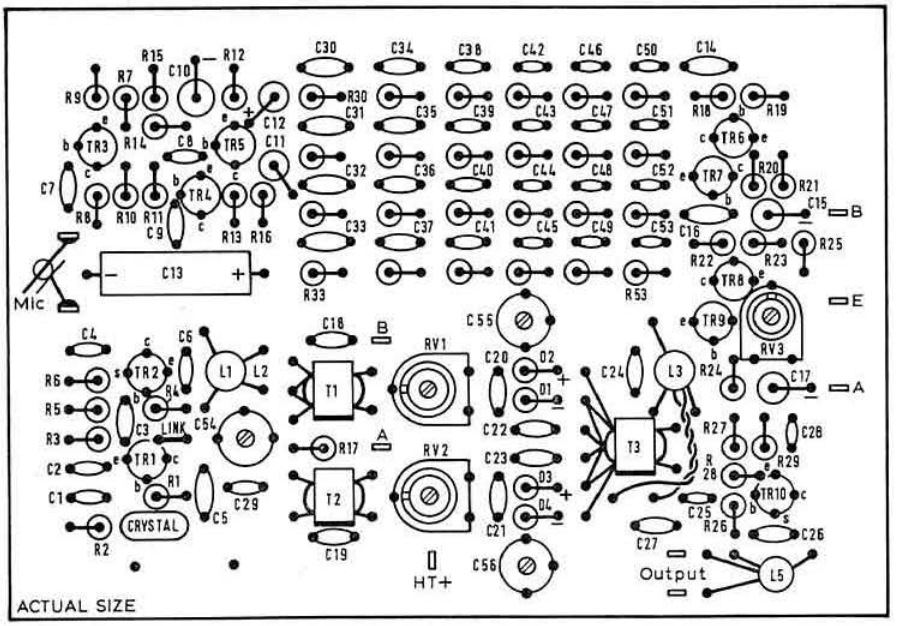


Fig 5. Component layout

PCB and other components will be available from "ELRAD", 5 Moorcroft Park Drive, New Mill, Huddersfield HD7 7NH

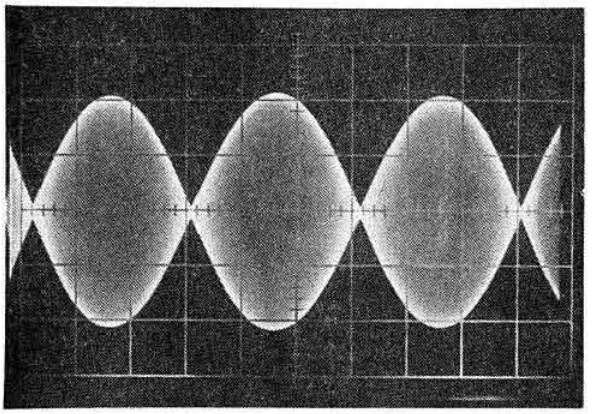


Fig 6. DSB output from one balanced modulator

trimmers made in this country seem less than satisfactory when endeavouring to obtain a fine adjustment. C54 is not so critical but a nice ceramic by Piher was found.

Alignment is carried out using an audio generator and oscilloscope. A sensitive rf probe and meter may be used, or even a general coverage receiver; however, there is nothing quite like seeing what is going on. After checking most carefully for poor solder joints and bridging, apply a supply of 12V and measure transistor voltages for normality. Connect the audio generator to the microphone and oscilloscope to point "B" adjacent to C15. With an input signal of about 3mV at 1,000Hz, a clean waveform of some 400mV should be seen. Transfer the oscilloscope to point "A" adjacent to C17 and observe a similar waveform; adjust RV3 for an amplitude equal to that at "B".

Remove the audio generator and connect the scope to the two tags marked "out", switching the timebase and the Y sensitivity up high. With no attempt at balancing having yet been made, a small 10·7MHz signal should just be observable. Adjust L1, L3 and L5 for maximum; it should be possible to back off the "Y" attenuator considerably. Adjust RV1 and RV2 for minimum amplitude. With an insulated trimming tool, adjust C55 and C56 for minimum, lowering the Y attenuator. An absolute minimum or zero Y deflection might not yet be possible at this stage.

Connect af generator to "A"; set to 1kHz, 200mV; select low oscilloscope scanning speed to portray audio content rather than rf (Fig 6). Adjust RV1 so that the lobes as shown are equal in size and shape. Adjust C55 for sharpest crossing point on X axis.

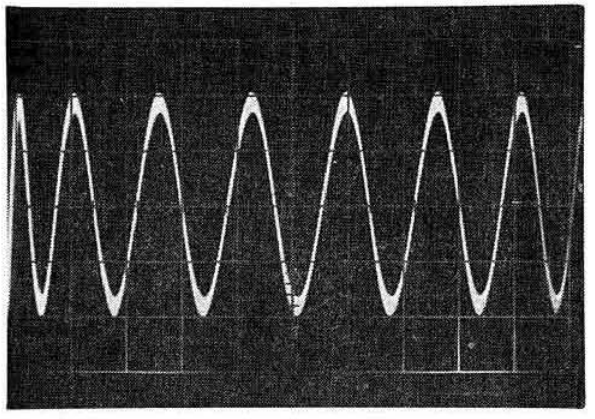


Fig 7. Single tone output at 10·7MHz

Transfer generator to "B" with time base still set for af and repeat above procedure, adjusting RV2 for equal envelope shapes and C56 for sharpest crossing. The unit is now producing two sets of double sideband signals. Connect "A" to "A" and "B" to "B" with screened wire. Lower generator's output to about 5mV, connecting to the microphone input. Increase timebase speed to show a 10MHz signal and observe for signs of a sinusoidal wave among the mush. As C55 and C56 are carefully readjusted, the waveform will become purer. Adjust now C54 and RV3 noting purity of signal. Fig 7 shows the 10·7MHz which should result from careful adjustment. Make sure L3 and L5 are still peaked for maximum output.

(Continued on p663)

Components list—ssb generator

R1	15kΩ	**C1**	330pF ceramic plate
R2	15kΩ	**C2**	100pF ceramic plate
R3	4·7kΩ	**C3**	180pF ceramic plate
R4	18kΩ	**C4**	0·01μF disc ceramic
R5	8·2kΩ	**C5**	0·047μF disc ceramic
R6	560Ω	**C6**	270pF ceramic plate
R7	100kΩ	**C7**	0·01μF film
R8	39kΩ	**C8**	0·01μF film
R9	270Ω	**C9**	1,000pF film
R10	8·2kΩ	**C10**	33μF 6·3V elect
R11	8·2kΩ	**C11**	4·7μF 16V elect
R12	3·9kΩ	**C12**	4·7μF 16V elect
R13	1·5kΩ	**C13**	100μF 16V elect
R14	1·5kΩ	**C14**	0·1μF film
R15	330Ω	**C15**	4·7μF 16V elect
R16	100Ω	**C16**	0·1μF film
R17	270Ω	**C17**	4·7μF 16V elect
R18	8·2MΩ	**C18**	2,200pF ceramic
R19	1MΩ	**C19**	2,200pF ceramic
R20	1·5kΩ	**C20**	0·01μF disc ceramic
R21	1·5kΩ	**C21**	0·01μF disc ceramic
R22	8·2MΩ	**C22**	15pF ceramic plate
R23	1MΩ	**C23**	15pF ceramic plate
R24	1kΩ	**C24**	330pF ceramic plate
R25	1kΩ	**C25**	0·01μF disc ceramic
R26	39kΩ	**C26**	270pF ceramic plate
R27	15kΩ	**C27**	0·1μF film
R28	68Ω	**C28**	0·01μF disc ceramic
R29	1·5kΩ	**C29**	56pF ceramic plate
R30-R53	10kΩ	**C30, 31, 32, 33**	0·047μF (0·05μF) 5%
RV1	250Ω	**C34, 35**	
RV2	250Ω	**36, 37**	0·033μF (0·03μF) 5%
RV3	1kΩ	**C38, 39**	
		40, 41	0·022μF (0·02μF) 5%
D1-D4	AA119	**C42, 43, 44, 45**	0·015μF 5%
TR1	BC109, BC209	**C46, 47, 48, 49**	0·01μF 5%
TR2	BF115, BF185	**C50, 51, 52, 53**	6,800pF 5%
TR3	BC109, BC209		
TR4	BC109, BC209		
TR5	BC109, BC209		
TR6	BC109, BC209		
TR7	BC179, BC206	**C54**	30pF disc type
TR8	BC109, BC209	**C55**	30pF miniature vaned type
TR9	BC179, BC206	**C56**	30pF miniature vaned type
TR10	BF115, BF185		
Xtal	10·7MHz HC25-U	**T1, 2, 3**	2 × FX1115 ferrite beads

A fourth generation cw keyer using cmos ICs

by E. B. GRIST, G3GJX*

THE author's experience of building automatic keyers goes back to the original OZ7BO "el-bug" circuit, using valves, which was highly successful until superseded many years later by transistorized designs using discrete components [1] and followed by integrated circuits used in various ways [2, 3, 4]. These ic keyers were an improvement on earlier designs, but because they used saturated logic they tended to "eat" batteries even when in a stand-by condition and the choice usually had to be made between providing a mains power pack or switching off the keyer between "overs". The advent of Cos/mos† (Complementary Symmetry Metal-Oxide-Semiconductor) elements with only microwatt supply requirements and very low prices has completely changed the picture. The keyer described in this article, in addition to providing the now normal requirements of automatic dots, dashes and the spaces in between, offers the following advantages:

(1) Stand-by current is less than 1μA;—average "key down" consumption is less than 10mA and unregulated battery supplies from 5V to 15V are possible.
(2) An easy to build circuit has been chosen to suit most suitable enclosures and paddle options are left open.
(3) Four readily available robust ICs are used, costing less than £1 in total.
(4) Excluding the case and paddle components, the keyer can be built with all new parts for under £5.

Characteristics of cmos

Although space does not permit a discussion of digital logic in general, some introduction to cmos may be helpful. Fig 1 shows the circuit of an inverter which is a basic building block for more complex arrangements. This consists of a p-channel and an n-channel insulated gate fet connected drain-to-drain across the supply. The gates offer an impedance of about a million megohms and the two IGFETS can be

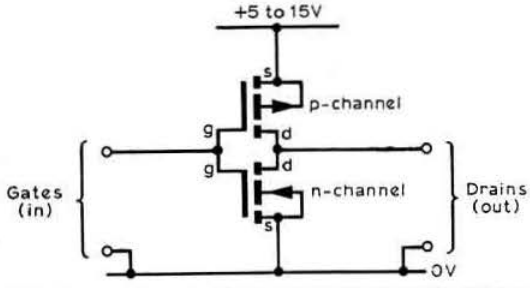
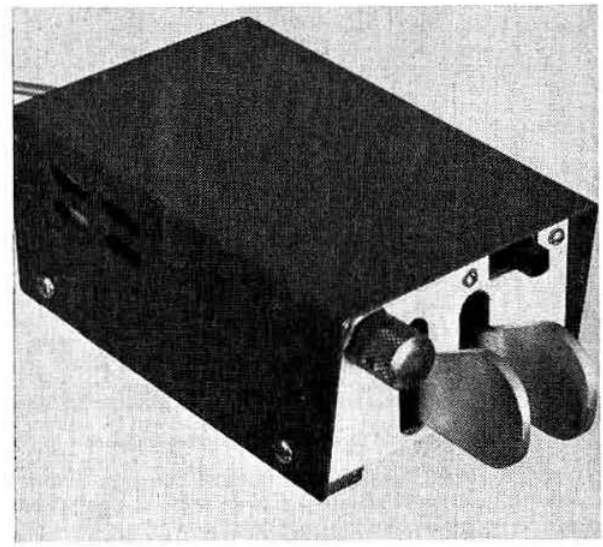


Fig 1. Basic cmos inverter (diode protection circuits not shown)



The keyer, showing the twin paddles, speed control and on-off switch

regarded as wholly voltage-controlled variable resistors. With a logic 0 (low) input to the circuit the n-channel igfet is cut off and acts like a virtual open circuit, but the p-channel igfet is biased hard on and acts like a resistance of only 400Ω (Fig 2a). When a logic 1 (high) is applied to the gates the n-channel is biased hard on and looks like 400Ω, while the p-channel igfet behaves like a resistance of 10,000MΩ (Fig 2b). In either case the total value of the potential divider across the supply rails remains extremely high and the quiescent current is limited to nanoamperes.

If the input voltage to the gates is increased slowly from 0V in a positive direction the device current is still virtually zero until the input exceeds the threshold voltage of the n-channel igfet, at which point the effective resistance of the n-channel starts to decrease and that of the p-channel increases. Under these conditions the current is dictated by the larger of the two resistances and is of measurable proportions. After the transition voltage of the device has been exceeded a semiconductor regenerative switching action takes place and the output swings sharply from one logic state to the other.

From the foregoing it can be seen that cmos ICs only draw measurable current from the supply during the extremely short moment of transition between logic states, and the average current drawn by the ic thus increases with the switching frequency. Similarly the cut-off frequency increases with the voltage of the supply and is about 5MHz (or more in certain cases) at the maximum supply of 15V. Unlike ttl systems, logic 0 and logic 1 represent the lower (Vss) and upper (Vdd) supply voltages respectively. The noise immunity of cmos ICs is much better than that of bipolar logic devices.

The insulated gate inputs in cmos ICs are well protected by diodes (not shown in Fig 1) to prevent puncture of the thin oxide layer by static charges and they are quite robust.

* 37 The Shimmings, Boxgrove Road, Guildford, Surrey.

† The name Cos/mos is a registered trademark of RCA. Similar devices are also manufactured by Motorola under the trade name Mcmos. The generic term cmos covers both makers.

Nevertheless certain rules must be observed:

(a) Keep the ICs in the conducting foam with which they are supplied (or wrap individually in tinfoil) until they are soldered or plugged into circuit.
(b) Check the earthing of the soldering iron.
(c) When in use, inputs must not be allowed to "float" and must always be returned to Vss or Vdd.
(d) Outputs are largely immune from damage from short circuits but these should be avoided as currents may flow that spoil the concept of microwatt circuitry and could cause some ICs to exceed the device limit of 200mW.
(e) Reversed polarity on the supply line may be fatal to cmos so switch off before changing batteries.

Those wishing to obtain more information about Cos/mos should see [5].

Circuit description

Inevitably there is a basic similarity in the logic sequences in this keyer and those in the ttl versions referred to earlier. The circuit diagram is shown in Fig 3. NAND gates A and B are wired to form a gated astable multi-vibrator which clocks the flip flops to generate dots and dashes. R2, RV1 and C1 control the pulse rate, which is adjustable over a suitable range, and R1 makes the prf largely independent of the supply voltage and prevents change of speed as the battery runs down. When input 1 goes high, oscillation begins instantly and there is no delay to the first dot as may occur with ttl astables.

FF1 and FF2 are D-type flip flops with the D input tied to the $\bar{Q}$ output so the circuit toggles at each positive-going transition at the input. When the paddle is at rest the set inputs are high, which ensures a high condition at the Q output of each flip flop, a low output from gate E and a cut off state for TR1. Reset inputs are not used and are returned to Vss.

When the paddle is placed in the "dot" position input 9 to gate C goes low and the output of the gate goes high, causing the output of NOR gate I and the set input of FF1 to go low, making the flip flop ready to be toggled by the astable. Diode D1 conducts and pulls down the input of the inverter K, previously held high by R3, the output of the inverter goes high and the astable delivers the first positive-going pulse to the input of FF1. D1, R3 and C2 integrate any very short pulses that subsequently appear as a result of "bounce" or other imperfections at the dot or dash contacts and this prevents false gating.

The astable prf is divided by two, providing a square wave at the Q output with a perfect 1:1 mark/space ratio. Gate E inverts these pulses and applies them to TR1, which saturates for the duration of each positive pulse at the base and causes

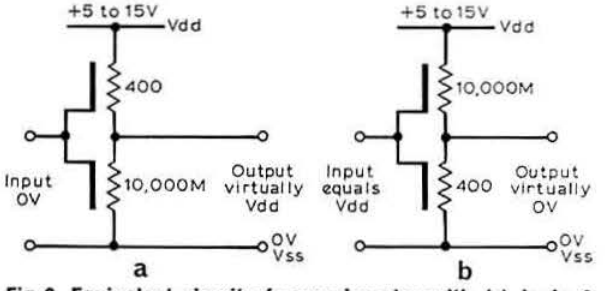
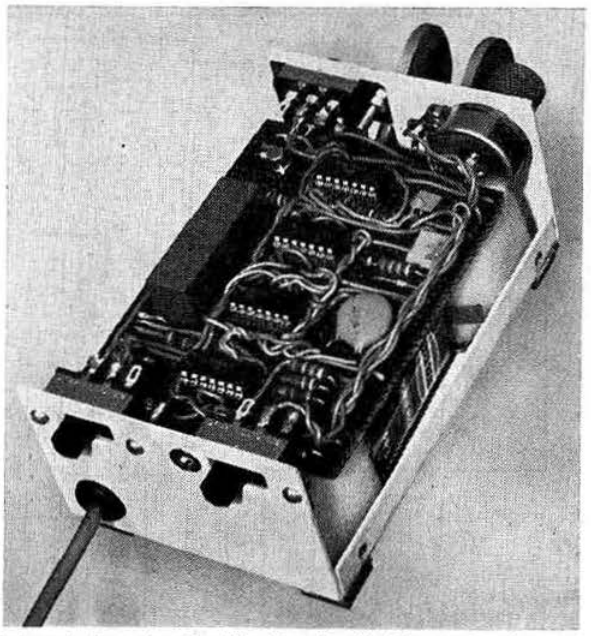


Fig 2. Equivalent circuit of cmos inverter with (a) logic 0 input, and (b) logic 1 input



Internal view showing Veroboard with ICs, reed relay and other components. Slide switches on the rear panel are for sidetone on-off and transmitter tune-up. The battery in a block of plastic foam is on the right

the reed relay to open and close the keying contacts in a near perfect dot formation limited only by the inertia of the reed contacts. R7 is chosen so as to "bottom" TR1 satisfactorily without exceeding the fan-out limitations of gate E, and may need changing if a different transistor is used.

When the paddle is placed in the "dash" position NOR gate I changes state as before and the foregoing chain of events begins but, in addition, the output of NOR gate J and the set input of FF2 goes low and this flip flop can now be clocked by the $\bar{Q}$ output of FF1. The outputs of the flip flops are combined at NAND gate E so that the space between two dots from FF1 is filled by a "dot" from FF2 so as to produce a dash at the output which is equal in duration to three dots. The output of gate E is also connected to the spare inputs of gates I and J and this holds the set inputs of the flip flops in a low state until the completion of a dot to prevent shortening if the paddle is moved in "mid-dot".

Owing to a combination of variations in the transition voltage between cmos gates of the same type and component tolerances, some experimentation with R2 and C1 must be expected and values chosen that provide the user with the speed range desired. The values of RV1 and R1 should not be changed. A simple astable of this kind does not produce a 1:1 square wave, but this does not affect the performance of the keyer because FF1 is clocked only by positive-going transitions at the input.

NAND gates F and G are used in a second astable circuit with R6 and C3 to provide an audio sidetone via a crystal microphone insert used as a speaker, which can be disconnected via S1. Adequate volume is available for most applications and a crystal earpiece is almost equally satisfactory if the earplug is discarded. Gate H is unused and although the output may be left unconnected the two inputs must be taken to Vss (or Vdd). With a 9V battery the stand-by consumption

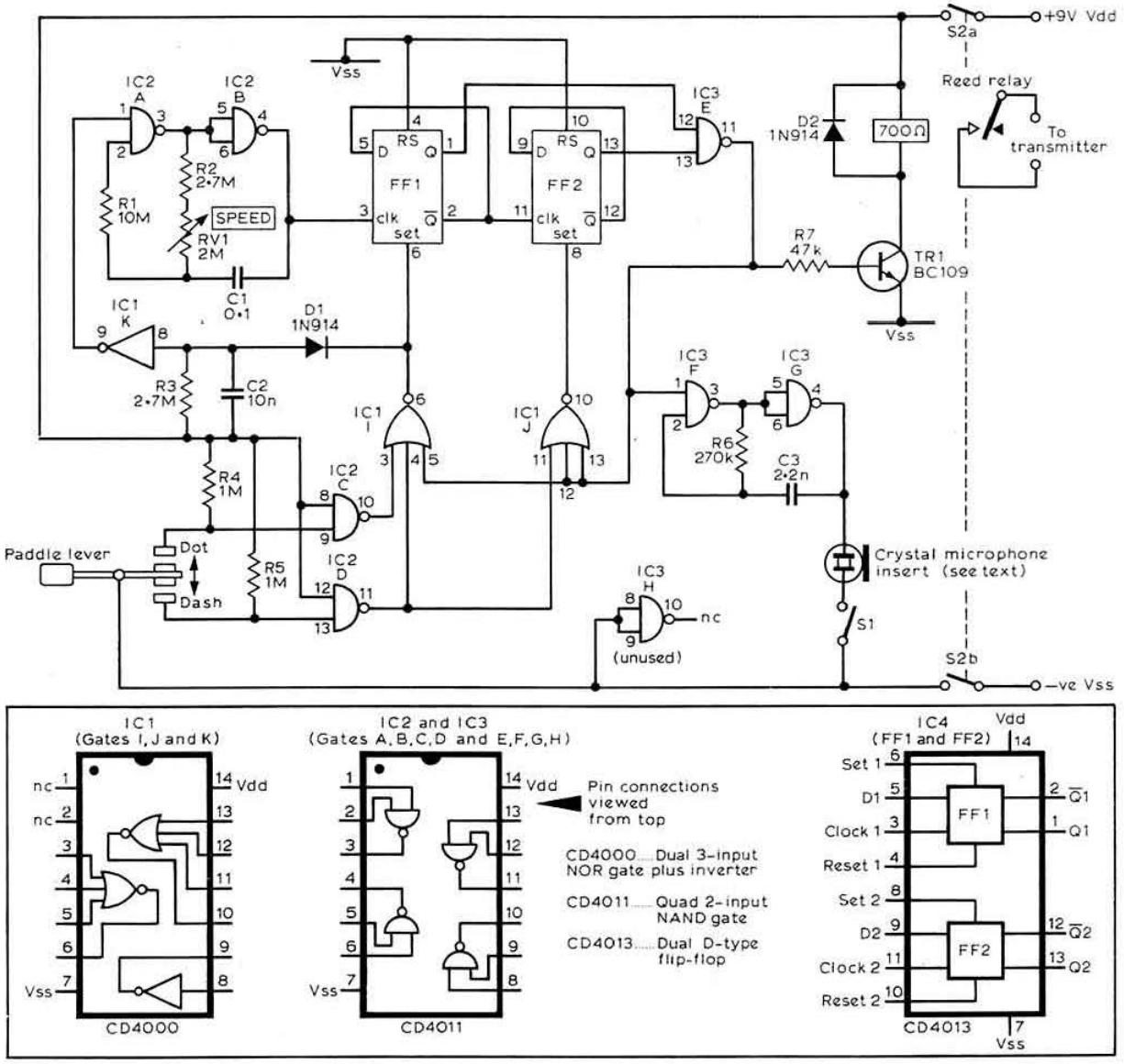


Fig 3. Circuit diagram of keyer and pin connections of ICs. Vdd(+) and Vss(—) supply connections to ICs are not shown in the circuit and must be made to pins 14 and 7 respectively in each case

(paddle centralized) is less than 1μA. When being keyed the circuit takes 10mA during dashes and proportionately less during dots. A small PP3 or PP6 battery should last even the most ardent operator a very long time. The ICs will operate quite happily down to 5V or less and the keyer could run permanently from a supply of this voltage if a different relay coil is used.

Construction

The author has constructed this circuit in a variety of enclosures, but the keyer illustrated is built in an RS Components type T105 instrument case measuring 5in by 3in by 2in using a twin-lever paddle unit (see photographs). The front panel controls above the paddles are the battery on-off switch S2 and speed control RV1. The rear panel carries two slide switches, S1 for sidetone on-off and the other to short the keyed contacts for tune-up purposes.

A piece of Veroboard with the ICs and other components is mounted horizontally between the front and rear panels and is held in position by soldering to the lower tags of the three slide switches. Although a pcb would be more elegant and allow a higher component density, readers may not wish to go to this length for a near-dc device. Veroboard of 0·1in pitch has been used, with the tracks cut to provide an ic breadboard and the wired connections patched in. This simple method adapts to almost any shape of board. The ICs can be directly soldered or, if required, 14-pin DIL sockets can be used. A low cost alternative adopted by the author is

Components list

R1	10MΩ	All resistors 0·125W or 0·25W except values over 1MΩ not commonly available smaller than 0·5W
R2	2·7MΩ (see text)	
R3	2·7MΩ	
R4, R5	1MΩ	
R6	270kΩ	
R7	47kΩ	
C1	0·1μF to 0·01μF (see text)	
C2	10nF	
C3	2·2nF	
D1, D2	IN914, OA202 or similar	
TR1	BC109	
IC1*	CD 4000AE	
IC2,* IC3	CD 4011AE	
IC4*	CD 4013AE	
S1, S2	DP change-over slide switch (RS 337-986)	
Reed relay	700Ω single contact (n.o.) (RS 348-970)	
RV1	2MΩ linear potentiometer	

Crystal mike insert or earpiece (RS 955-043)
Veroboard, 0·1in pitch
Soldercon ic socket pins (available in strips of 100)*
Battery press studs (RS 488-034)
9V battery, PP3 or PP6 etc
Instrument case type T105 (RS 509-715) or similar
Paddle components (see text)

Notes

(1) Components marked * may be obtained as a mini-kit, *together with a specially designed pc board to simplify the wiring*, for £3.50 inc post and VAT from Sintel, 53 Aston Street, Oxford.
(2) RS components may be obtained from Doram Electronics Ltd, PO Box TR8, Wellington Road Industrial Estate, Leeds LS12 2UF. A complete kit, including paddle parts, is in preparation from this supplier.
(3) Suitable ready-made paddles may be obtained from Spacemark Ltd, Thornfield House, Delamer Road, Altrincham, Cheshire.

the use of Soldercon socket pins which are supplied in strips of 100. Lengths of seven pins are cut from the strip, soldered onto the board and the unwanted web broken off using long-nosed pliers.

The reed relay is a miniature unit measuring 35mm by 10mm, but a wide range of relays is available from *Radio Communication* advertisers. Care must be taken to select a suitable coil to minimize battery drain, and a reed insert chosen which will handle the voltages and/or currents to be keyed. A crystal earpiece, not visible in the photograph, is attached to the underside of the Veroboard and a PP3 battery is positioned in a piece of plastic foam beneath the board on the left hand side of the keyer.

Paddle contact requirements for this circuit are very much simpler than those for ttl and earlier keyers where substantial currents flow and high contact resistance may cause incorrect operation. In this design the paddle lever can be earthed to the case and, due to the high impedance inputs to gates C and D and the anti-bounce circuit, even the simplest arrangements can be used. A leaf from a feeler gauge working between two solder tags has proved entirely successful on one occasion. Ready-made paddles, with either single or twin levers such as the one used in this case, are available to lend a more professional finish.

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[3] "Microcircuit electronic key" by Marvin Jahn, *QST* September 1969.
[4] "The 'yet another' keyer" by R. G. Wheatland, *Radio Communication* May 1973.
[5] *Cos/mos digital integrated circuits data book* SSD 203C, RCA 1975. □

Practical Polyphase

(continued from p659)

It must be pointed out that only good high speed oscilloscopes will show the output clearly and one might easily be misled. Instruments rated well above 10MHz are fine, but for those who can only lay hands on lesser beasts it will be found easier at this stage to switch the timebase down to af

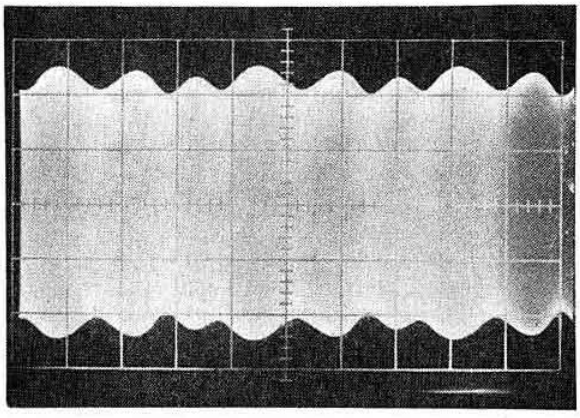

Fig 8. Single tone output showing unwanted sideband

again. The screen should show a typical a.m. envelope of very low modulation. The final adjustments are made as above but watching for minimum ripple on the envelope (Fig 8). Should the carrier reappear at any time, indicated by a bright line starting to appear in the screen centre, reset C55 and C56 for no carrier.

The residual ripple on the top and bottom of the envelope represents the unwanted sideband and should be very small. Fig 8 actually shows more ripple than is possible because at anything less the scope refused to stay synchronized long enough for the camera's exposure. Turning down the audio, only a single thin line should remain on the screen. Should carrier be thought too great when increasing Y sensitivity, very careful adjustment of C55 and C56 should remove it.

If now the oscilloscope is replaced by a receiver and the generator by a microphone, one should be able to judge the ssb quality.

The output signal level of 100mV to 200mV should be about right for driving a frequency converter to the desired band.

Acknowledgements

The author would like to thank G8FUW, G8GJR and G8INL for their assistance in pcb reproduction and proving.

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[1] *Radio Communication*, Oct 1973, p698.
[2] *Radio Communication*, Dec 1973, p852. □

The ip quad—a new versatile quad driven element

by M.J. UNDERHILL, MA(Oxon), PhD, Grad IERE, G3LHZ*

SINCE its inception, amateurs have found that for its size the quad is a very efficient antenna, giving high gain and being reasonably broadband. The general opinion from technical literature is that the multi-element quad should give a 1 to 2dB advantage over an equivalent Yagi [1]. The broadband properties of the quad also make it easier to achieve a maximum gain design without critical adjustments; this may account for even higher relative gain for the quad being measured in practice on commercial vhf designs. Until recently the quad has been much more popular for hf than for vhf operation; its higher gain and the ease with which different-sized quads can be nested for multiband operation probably account for this, while the extra mechanical complexity of supporting loops rather than rod elements has delayed the use of quads for vhf.

However, G8IBQ has demonstrated a further advantage of the quad at vhf—that quad elements are multi-polarizable [2]. When suitably excited they can radiate either a vertically-polarized or horizontally-polarized wave, and it follows that quad elements can radiate left- or right-handed circularly polarized waves, because these are simply simultaneous radiation of vertical and horizontal waves combined with a $\pm 90^\circ$ phase shift. One slight disadvantage of the multi-polarized quad is that the loop elements have to be electrically isolated from the boom. It is not possible to earth any point on the circumference of the loops, so that a "plumbers delight" all metal construction [3] cannot be used, but G8IBQ shows a construction using wooden dowelling that overcomes this difficulty. As will be seen later the new quad-driven element looks similar to a conventional quad loop supported by non-conducting wooden dowelling. However, the new element is 33 per cent larger and the supports are made conducting and used as feeders.

It was the multi-polarizable property of the quad parasitic elements that prompted a search for a single versatile driven element capable of being switched to excite any polarization mode. It was felt that a single driven element would add significant advantages to the G8IBQ quad design. However, the path to success was not direct but involved a useful digression that will be described.

Derivation of the new element

Tsukiji [4] reported an analysis of what he calls the "centre-line-driven loop antenna" (cldla), the three variants which he considered being shown in Fig 1. Type (a) can be identified as a "skeleton slot", type (b) as the kind of element much in evidence in tv and amateur vhf antennas, and type (c) as a three-wire folded dipole.

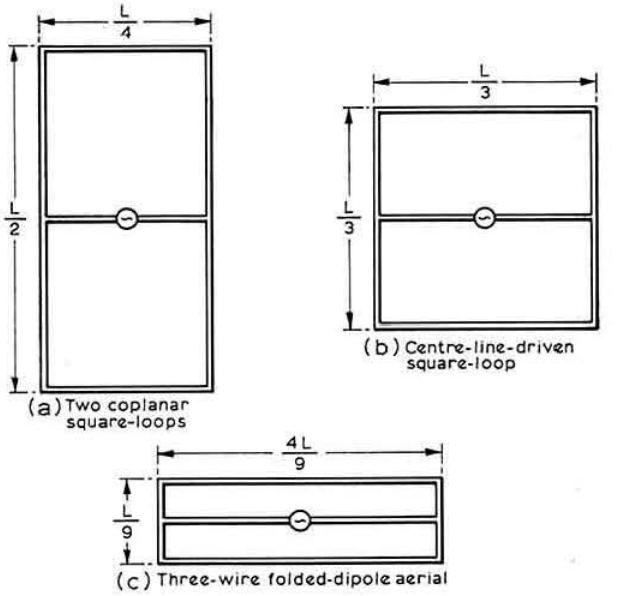

Fig 1. Three different forms of centre-line-driven loop antenna. Each antenna has same perimeter of isolated loop (*L*)

One particularly attractive feature of the centre-line-driven square loop (cldsl) of Fig 1(b) is shown in Fig 2; this is a plot of how the impedance of the antenna varies with frequency. It indicates that over the wide frequency range from about 0·8 to 2·5 times the nominal design frequency, fo, the antenna is slightly capacitative and its resistance only varies by about 3 : 1.

This impedance plot shows that the addition of a small series loading coil of about 100Ω reactance at fo should give an antenna with an swr of less than 3 : 1 over a 3 : 1 frequency range. However, consideration of the current distribution on the antenna and radiation pattern would indicate that above about 1·8 fo the main front and back radiation lobes would start splitting and the gain would start falling below that of a resonant dipole. In [1] it is shown that optimum gain should occur when the two loops are about 1·5λ, ie at a frequency of about 1·5 fo with a useful two-lobe pattern over the frequency range from 0·8 to 1·8 fo.

The author's antenna activities were confined to a spacious loft above a London flat and there was no prospect of trying out this speculative design on the hf bands, so thoughts turned to a 2m scaled-down simulation. At this stage it was realized that the square configuration of the cldsl could be modified to solve the problem of the different polarizations required on 2m; that is, horizontal for ssb, a.m. and cw, vertical for fm, and circular for satellite working. Because the antenna is square and driven symmetrically, as shown in Fig 3, no voltage should appear across the points A and A′ when rf power is applied across the X X′ inputs. At each of these points the paths to X and X′ are exactly equal and so A and A′ are balanced with respect to X and X′. It follows that any perpendicular connections made to these points A and A′ will also be balanced and will neither affect the match at the X X′ input nor have any effect on the radiation pattern.

* "Munzil", Whitehall Drive, Ifield, Crawley, Sussex.

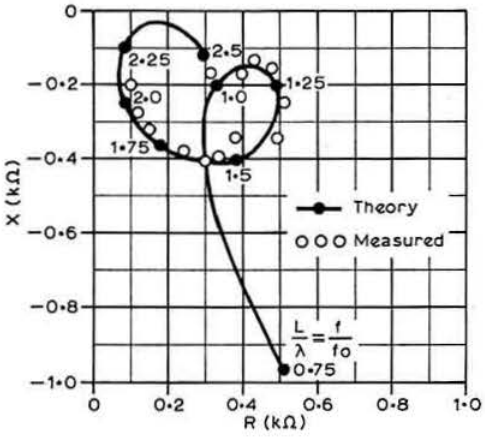

Fig 2. Input impedance of centre-line-driven square loop antenna, which is represented in Fig 1(b), $a/L = 0{\cdot}004$

The new "dual-polarization centre-line-driven square loop" (dpcldsl) element shown in Fig 3 was therefore constructed and, as expected, an rf voltage probe passed around the elements' circumference confirmed that rf applied at the input X X′ was completely balanced out at the points A A′ and Y Y′. After adjusting for exact symmetry, an isolation of 30 to 40dB was measured over a bandwidth of several per cent. The actual isolation figure achieved was dependent on reflections from near-by objects.

Having achieved the objective of a dual-polarizable element with the isolated inputs, the remaining problem was how to achieve a match to 75 or 50Ω. For the 2m tests two $\lambda/2$ baluns were constructed as shown in Fig 4; these match an unbalanced coaxial line of impedance Zo to a balanced load of 4Zo. The $\lambda/2$ length is not critical and for solid dielectric coaxial cable a velocity factor of 0·67 can be assumed. When these baluns were constructed to a dpcldsl with $\lambda/3$ sides an almost perfect 75Ω match was achieved (better than a 1·2 : 1swr).

The new element is of course 33 per cent larger than the normal 2m quad driven element. To see if this was really necessary a $\lambda/4$ sided dpcldsl was built, but this gave an swr of about 3·5 : 1. This confirmed that for a good match each half of the two *active* loops of the element should be about one wavelength in circumference, resulting in a $4\lambda/3$ circumference for the total element. Further comments on the effect of element size on antenna input impedance are made in the following description of a multi-element quad incorporating the new element.

The G3LHZ quad

First a conventional vertically-polarized 10-element quad was constructed using 14swg bare copper wire loops suspended from a bamboo boom. The element dimensions and spacings were roughly as given by G8IBQ, but with slightly closer reflector spacing, as follows: reflector 22in sides and spaced 15in from the driven element, driven element 20in sides, first director 19·5in sides, second director 19in sides, third to eighth directors 18·5in sides, with all directors being spaced at intervals of 15in from the driven element. This gives a boom length of 11ft 3in.

The match was then checked and found to be better than 1·2 : 1 swr for a 50Ω line at a frequency near the centre of the band. With an FT101 and Europa B tuned to receive GB3LO, the antenna direction was optimized and the S-meter reading noted. The driven element was then replaced by a dpcldsl with a matching balun, and a signal improvement of 1dB was noted. The match was then checked over the band (not on R7!) and the swr was again found to be better than 1·2 : 1 for vertical polarization of the dpcldsl.

However, probably because of insufficient care in construction, the match to the horizontally-polarized input was found to be poor, giving an swr of worse than 2·5 : 1. After some experimentation the solution was found to be the addition of about 4pF capacitance across the X X′ terminal. This was implemented by a short length of coaxial cable trimmed until the best match was achieved. Subsequent experiments have shown that a similar trimming effect can be achieved by a slight increase of the $\lambda/2$ balun length. After adjustment the match for both the horizontal and vertical inputs was the same. The effect of placing the elements among the parasitic elements of the full quad was found to be a lowering of the driven-element impedance from about 75Ω to 50Ω.

As a check on the gain, the new quad was compared with a proprietary eight-element Yagi with a claimed gain of 9·5dB —however, the check was carried out indoors and should be treated with some caution. An improvement of about 4 to 5dB was noted on the FT101 S-meter after a rough calibration check with a calibrated signal generator. Listening and access checks on GB3SN and GB3PI have confirmed this result. Both these signals are marginal most of the time in the author's antenna-farm loft.

At present, polarization is relay switched between horizontal and vertical but tests with two separate feeders have confirmed the good isolation between the two inputs. With careful adjustment the isolation should theoretically be enough to be able to operate a receiver connected to one input with a transmitter operating into the other input. However, the isolation between the two inputs is only maintained as long as the driven element retains an electrically symmetrical shape. For safety's sake it would be advisable to put some form of rf burn-out protection on the receiver front end. The isolation could easily be upset to a dangerous extent by a bird perching on one side of the driven element!

Matching and circular polarization

In order to obtain the circular polarization it is necessary to feed both dpcldsl inputs with equal power, phase shifted by 90°. The 90° phase shift is easy to obtain with a $\lambda/4$

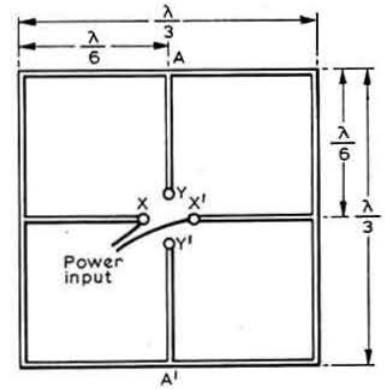

Fig 3. Isolated inputs of the new quad element

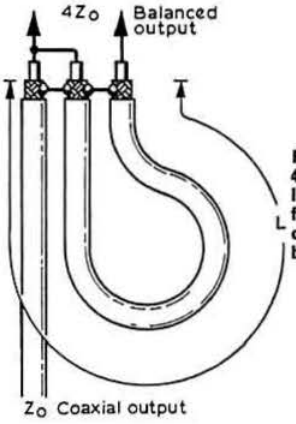

Fig 4. Coaxial balun giving a 4 : 1 impedance step-up. The length L should be λ/2, allowing for the velocity factor of the cable. The outer braiding may be joined at the points indicated

section of feeder. To obtain the equal power condition it is necessary for both antenna inputs to be exactly 50 or 75Ω. It is then possible to match a single 50 or 75Ω line using a standard phasing harness. To make sure that the new element could satisfy these conditions, some experiments on varying the match conditions were made.

From these experiments some general conclusions could be drawn. For example, it was found that, as expected, the element inputs could be independently tuned to resonance either by small shunt capacitances across the inputs (X X′ or Y Y′) or by slightly varying the length of the baluns. It was found that varying the size of the element upwards by 12 per cent made very little difference to the tuning for resonance but increased the resonant resistance by about 25 per cent. Judging by the plot in Fig 3 a further 12 per cent increase should give a total increase of 50 per cent; if so this will allow a choice of a 50 or 75Ω impedance just by varying the element size. As with all parasitic beams the driven element match is affected mainly by the spacings of the first director and the reflector. It would appear that a reasonable approximation of a λ/3-sided dpcldsl can be substituted directly for the driven quad loop in a multi-element quad and the match resistance will be much the same, perhaps a few per cent higher. This means that the dpcldsl can be used with any of the existing quad designs provided that all the parasitic elements are insulated from the boom.

General comments on broadband operation

One point should be made clear about any multi-element quad using parasitic elements. Although it is possible to use a broadband driven element which is well matched and will accept power over a wide frequency band, the parasitic elements by comparison are always much more narrow band. Because of this, the antenna pattern and hence the antenna gain is only maintained for the few per cent frequency range over which the parasitic elements operate correctly. This is true for the quad design given here; the antenna pattern and gain and the way that these vary with frequency are little changed by the use of the new driven element, but the match and swr are much more constant across the operating band.

One possible way of making use of the broadband properties of the new driven element would be to use it in place of the three driven loops of a triband quad. Correct antenna patterns and gains will then be retained on all three bands, 14, 21 and 28MHz, by the normal operation of the nested (concentric) parasitic reflectors and directors. It may even be possible to extend operation to cover any new bands at 24, 18 or even 10MHz, by adding further appropriately cut conventional quad reflectors and directors.

Another way of achieving wideband operation of a multi-element antenna is to feed all the elements through suitable phasing and matching lines. For example, it should be possible to make a two-element hf band beam covering at least a 2 : 1 frequency range by feeding the two elements through 300Ω feeders connected to a suitable tuning/phasing unit. This suggestion, gratefully received from the anonymous RSGB reviewer of this article, is likely to be well worth trying in future experiments.

Conclusions

The new quad element has two independent and isolated inputs providing polarization in the two perpendicular directions. By suitable phasing and switching of these inputs it can provide any type of polarization—vertical, slant, horizontal, left- or right-handed circular or elliptical polarization. This polarization versatility is available on the element used alone or when it is substituted for the driven element of a multi-element loop or quad beam, provided that the parasitic elements are isolated from the boom. This has been proved in practice.

The element shape is suitable for hf as well as vhf applications and would provide an easy way of continuing the K6CT experiments on the best type of polarization for signals from different directions under different ionospheric conditions [5]. On hf a single driven element can be used with the usual nested parasitic reflectors and directors to give multiband operation on 14, 21, and 28MHz, with the possibility of 24, 18 and perhaps 10MHz bands as well. Alternatively it should be possible to drive two of the new elements from a tuning/phasing unit for beam operation over a 2 : 1 frequency band. The good isolation between the inputs could be used to provide transmitter receiver isolation for repeaters. Then the element would best be rotated 45° around its axis giving slant polarization for both send and receive. However, this would give a loss of 3dB on top of the fact that the natural pattern of a vertically-polarized quad is asymmetrical by about 3dB.

The author hopes that the results so far achieved and the suggestions for further uses given here will encourage others to try the new quad element and to publish their results.

Finally, since dpcldsl is a bit of a mouthful to say, the name *ip*quad is suggested standing for "*i*ndependent *p*olarization" or "*i*solated *p*ort" quad.

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Tunable Gunn oscillators

by M. SWEETING, BSc, G3YJO*

THE availability of cheap Gunn devices on the surplus market has made their use in solid-state oscillators at 10GHz attractive, but some difficulty has been experienced when it comes to making these oscillators reliably tunable over a useful portion of the band. In this article two methods whereby reliable tuning may be achieved are described, first by mechanical means and second by electronic means using a varactor diode (also now available on the surplus market).

Basic principle

A Gunn diode may be mounted in a rectangular waveguide cavity to which it is coupled by a feed post as shown in Fig 1, the degree of coupling of the diode to the cavity being dependent on the diameter of the diode feed post. The approximate frequency of oscillation of the untuned cavity is determined by the dimension "l" according to the expression

$$l = \frac{\lambda g}{2} \text{ (where } \lambda g \text{ is the guide wavelength)} \qquad (1)$$

The distance of the back wall behind the Gunn (m) is relatively uncritical. The resonant frequency of the cavity may be obtained from λg in the table of waveguide constants [1]. The cavity itself is coupled to the guide by a suitable iris chosen to give optimum performance of the oscillator. The iris dimensions determine the degree of coupling between the cavity and the guide, and hence affects the cavity Q and the frequency of oscillation of the untuned cavity slightly. A compromise is necessary whereby the oscillator has a sufficiently high Q to be reasonably stable and of low noise, but at the same time sufficiently broadband to allow smooth tuning over the desired range with a minimum variation in output amplitude.

The cavity may be tuned by three methods:

(a) Metallic tuning

In one method of tuning, a metallic screw is introduced through the top wall parallel to the E-field plane and this has the effect of lengthening the cavity and hence reducing its resonant frequency. The screw may be introduced into the side wall of the cavity in which case it has the effect of shortening the cavity and hence raising its resonant frequency. Unfortunately the electric field in these regions is relatively small so that the tuning range is reduced.

In order to provide a reasonably slow tuning rate a standard micrometer shaft was ground down to the minimum diameter practicable (≃ 1mm) and mounted in the cavity block. This arrangement gave a tuning rate of between 10MHz/turn and 60MHz/turn depending on the depth of penetration of the screw. With care it was possible to set the oscillator frequency to within 1MHz but due to uncertainty in the precise point of contact of the screw thread the tuning was rather erratic and the mechanical stability was poor.

When the screw was inserted to substantial depths there were variations in output amplitude of the order of 25dB. A quarterwave feedthrough choke (2) was tried, but this resulted in only a marginal improvement. The tuning range with this arrangement was 1·2GHz.

(b) Dielectric tuning

In a second method the cavity may be loaded with a dielectric material (Fig 1) whose behaviour may be considered as analogous to a variable composite-dielectric capacitor acting in parallel with the cavity capacitance. Dielectric tuning screws have the great advantage over metal screws in that they require no contact reference point and cause less of a disturbance to the field in the cavity, so that they afford a very smooth tuning characteristic.

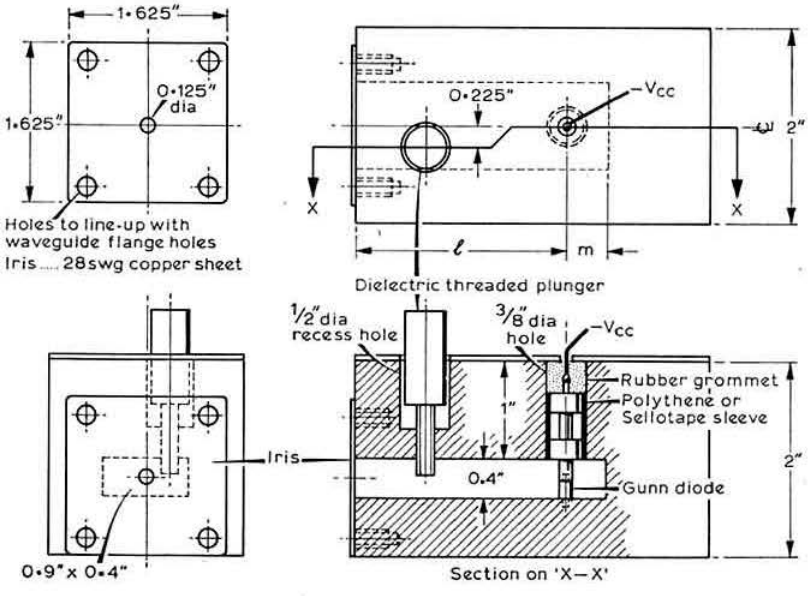

Fig 1. Simple dielectric tuned oscillator

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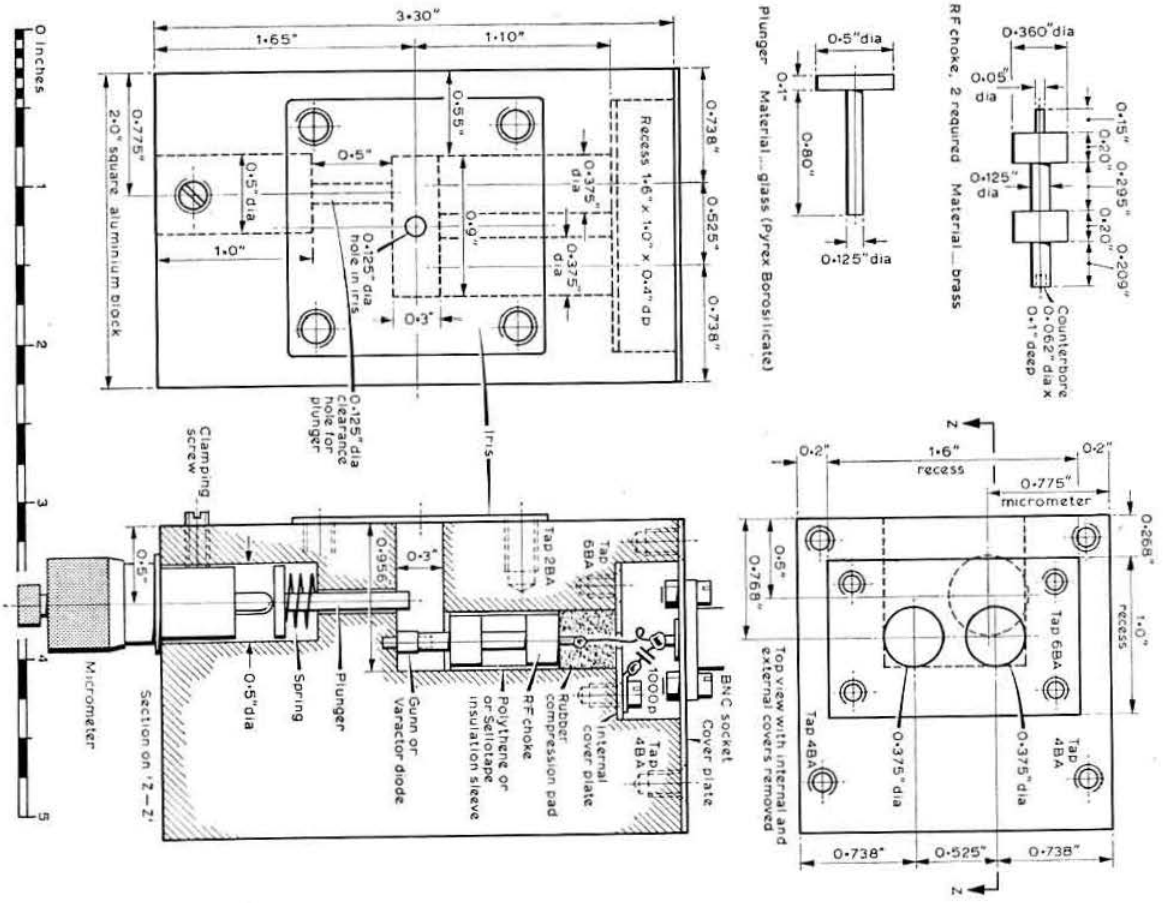


Fig 2. Complete dielectric and varactor tuned oscillator

The dielectric tuning rod when mounted in the cavity block may itself be considered as a circular dielectric-filled waveguide and its cut-off frequency should be sufficiently high above the highest required oscillator frequency to ensure that there is no radiation from the cavity through it. For such a circular rod the cut-off wavelength is given by

$$\lambda c = 1{\cdot}70\ d\sqrt{\varepsilon'} \qquad (2)$$

where d is the rod diameter and ε' is the relative permittivity of the rod material. When the circular waveguide is in this mode the attenuation per unit length is given by

$$\alpha = \frac{54{\cdot}57}{\lambda c}\sqrt{1 - \left[\frac{\lambda c}{\lambda o}\right]^2}\ \text{dB cm}^{-1}. \qquad (3)$$

isolation = α × length of dielectric tuning rod.

This effectively limits the rod diameter and ε' of the tuning rod before appreciable radiation occurs through the rod. ((2) and (3)).

The tuning rate of the dielectric screw is linear (decreasing frequency with increasing depth of penetration), except at the extremities of the cavity, ie the screw first entering the cavity or approaching the opposite wall.

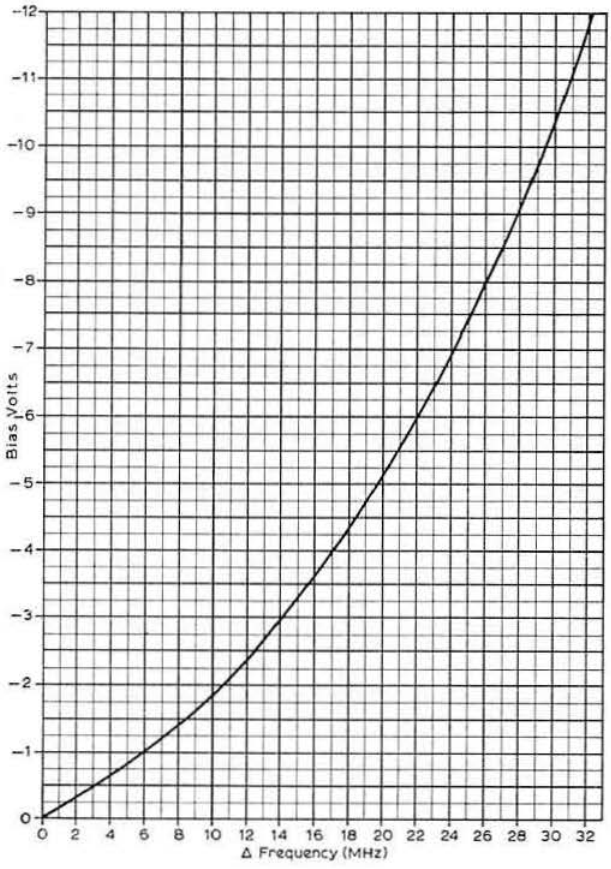
Initially a 6BA nylon dielectric screw was introduced instead of the metal screw and this gave a greatly improved tuning characteristic although the tuning range was limited to 170MHz. A slight degree of torsion was experienced with the nylon screw, so a 4BA threaded plunger was made from Perspex and thus gave excellent backlash-free results. With this screw the oscillator frequency could easily be tuned to within 300kHz and with care could be tuned to within 30kHz (mechanical limit). The tuning characteristic was again linear (when not at the extremities of travel) and very smooth, providing a tuning range of 230MHz with a maximum amplitude variation of 3dB. The sensitivity to lateral force on the plunger knob was ±3MHz for 500g force and the leakage from the dielectric tuner was −45dBm. The lf jitter on the oscillator frequency was less than 5kHz and the drift from switch-on was less than 3MHz after one hour.

A second oscillator was built in which mechanical tuning was achieved by a Pyrex glass spring-loaded plunger driven by a standard micrometer (Fig 2). A Pyrex tuning plunger of 4·2mm diameter gave the following results:

Isolation: 36dB
Max output amplitude variations: 4·6dB
Mechanical tuning range: 640MHz (top 500MHz used)
Tuning rate: 50MHz/turn (very nearly linear)
Sensitivity to lateral force: ±1·8MHz for 500g force.

The oscillator could be set easily to within 0·5MHz and with care to within 50kHz.

The following table of dielectric materials may be found useful: where ε' is relative permittivity, tan δ is loss tangent.



Graph 1. Frequency against varactor tuning voltage for Gunn oscillator

Material	ε′	tan d
Nylon	3·6	0·02
PTFE	2·1	0·0001
Polymethyl methacrylate (Perspex)	2·65	0·015
Glass (Soda-borosilicate)	4·38	0·0045
Glass (Pyrex-borosilicate)	5·1	0·0085
Quartz (Vitrosil)	3·78	0·0001
Quartz (Spectrosil-synthetic)	20	
Aluminosilicate	5·8	0·008

(c) Electronic tuning

In the third method the cavity may also include electronic tuning by means of a varactor tuning diode placed alongside the Gunn device (Fig 2). The tuning now resembles mechanical tuning obtained by dielectric loading of the cavity. Varactor diodes have a capacitance characteristic which is continuously variable with bias voltage, from a small value at large reverse (negative) bias to a large value at forward bias. The Q of the diode is maximum at high reverse bias, decreasing steadily towards zero as the bias is reduced and reversed.

The varactor feed post is an inductive element in series with the diode; the rf fields are in part looped around the post, and coupling is by mutual inductance. The Gunn device is itself coupled to the cavity in a similar way.

The change in frequency is proportional to 1/Cv which is in turn approximately inversely proportional to the square root of the bias voltage applied, where Cv is the varactor tuning voltage. However, a proportion of the rf power generated by the Gunn is dissipated in the varactor tuning diode and may be as high as 60.

The varactor afforded a maximum tuning range of 35MHz with less than 1dB variation in output. The oscillator frequency could be tuned electronically easily to within 100kHz and with care to within 10kHz (Graph 1). The ability to tune the oscillator electronically enabled afc to be applied to the diode bias circuit and this worked very satisfactorily.

The varactor used was a Mullard Series 821 CXY/D type but there is no reason to believe that surplus diodes should not perform as well.

When a varactor was included in the second oscillator (designed for use as a local oscillator to produce an i.f. of 432MHz) the following results were achieved:

Tuning range: 35MHz max @ 9·8GHz
24MHz min @ 9·35GHz
Max o/p amplitude variation: 1dB pk-pk
Tuning rate: approx 40MHz/turn (using 270° pot)
AFC capture range: ± 6MHz
LF jitter: less than 18kHz

Mechanical details

The oscillator cavity was milled from a solid block of aluminium, thus providing a low-loss rigid structure with high thermal inertia. A selection of circular and rectangular iris were fabricated from thin copper sheet (28swg) with iris dimensions varying from 2mm to 8mm diameter (circular). The diode feed posts were made from brass as described in [2, 3].

Measurement details

Measurements of tuning range and frequency resolution were carried out using a Hewlett Packard 851 spectrum analyser, while a Hewlett Packard power meter type 430C was used to measure the output variations with frequency. Frequency measurements were made with the analyser backed up with a cavity wavemeter, and If jitter estimated by using the storage facility on the analyser. The switch-on drift was measured in an open laboratory at 21°C from switch-on to one hour later.

Conclusions

The oscillators described performed very well when used in a transceiver. The first oscillator using a dielectric tuning screw was used to generate transmit power and was frequency modulated using the "pushing characteristic" of the Gunn. The second was used as a local oscillator running between 9·568 and 10·068GHz into a 432MHz i.f. This allowed the whole 10GHz band to be tuned independently of the transmitter which was tunable over the bottom 170MHz.

Acknowledgement

The author would like to thank Messrs Q. V. Davis and M. S. Hodgart of the Department of Electronic and Electrical Engineering, University of Surrey, for their invaluable assistance and criticism.

References

[1] *Radio Communication* December 1973, p858.
[2] *Radio Communication* April 1971, p271.
[3] *Radio Communication* May 1974, p289.

LEARNING ABOUT LOGIC by P.J.Horwood, G3FRB*

Part 4. Dividers and counters (2)

Before continuing with the further development of the variable divider and its use, the author wishes to explain the philosophy behind this series of articles.

To give some purpose to our consideration of logic circuits, it was decided to use the phase-locked-loop frequency synthesizer as the ultimate goal; it could equally well have been, for example, the frequency counter. The author hopes that when the series is complete he will have generated enough comprehension and interest in those with no foreknowledge to encourage further study of the enormous subject loosely called logic circuitry.

It is for this reason, as the more experienced will have noticed, that no mention has been made of other uses of the flip-flop, such as the ring and Johnson counter, and the shift register.

It was not intended to write a treatise covering the whole field, this would probably demand an article a month almost indefinitely. Such a series is in fact appearing currently in a contemporary of this journal.

The variable divider (counter)

At the end of Part 3 we arrived at the synchronous bcd circuit, various methods of modifying the count sequence having been shown. In theory it would be possible to develop a fully variable divider from any of the methods but in some cases the switching problems would be impractical.

The method most often used is related to the skip counter illustrated in Part 3, but instead of skipping a number of counts part way through the sequence the count is shortened by commencing to count from some number greater than 0. For example, if a bcd counter were to commence at 3 then only seven counts would take place. This process is called pre-loading.

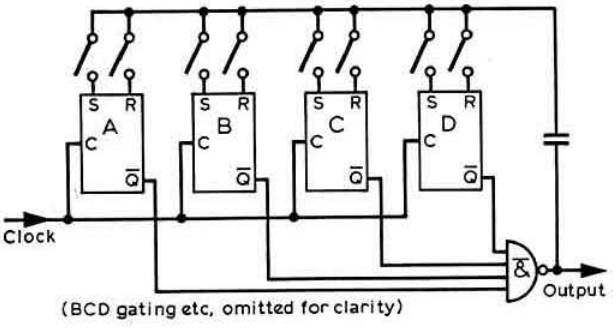


Fig 26.

Preload	D	C	B	A	Count
0	0	0	0	0	10
1	0	0	0	1	9
2	0	0	1	0	8
3	0	0	1	1	7
4	0	1	0	0	6
5	0	1	0	1	5
6	0	1	1	0	4
7	0	1	1	1	3
8	1	0	0	0	2
9	1	0	0	1	1

Fig 27.

Fig 26 shows the basic bcd synchronous divider with an additional NAND gate. The gate has inputs from $A\bar{Q}$, $B\bar{Q}$, $C\bar{Q}$ and $D\bar{Q}$; this is equal to 10. These inputs go high at the tenth trailing edge of the clock. The gate output goes low and via the coupling capacitor passes a low pulse to the appropriate set and reset inputs. The switching is shown using separate make and break switches; in practice a wafer switch designed to give a bcd output on four pairs of lines (four set, four reset) with 10 positions would be used. It is important that at the time of pre-loading, all the flip-flops are set to 1 or reset to 0 as appropriate for the particular preloaded number. Fig 27 gives the shortened count for each pre-loaded number.

Cascading dividers

So far we have examined only one variable decade divider. We shall see in the next article how this would allow 10 increments of frequency in a phase-locked-loop frequency synthesizer; for instance, a range of 1 to 10MHz. If we wished to provide increments of 100kHz, 10kHz and 1kHz, further dividers would be required. However, we will restrict the description to two cascaded dividers.

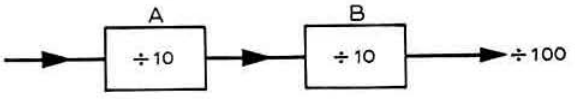


Fig 28.

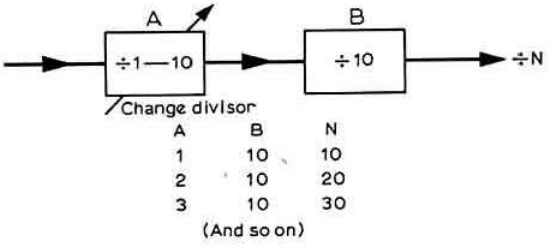


Fig 29.

If two dividers are connected in series (Fig 28), the resultant divisor is the product of the two individual divisors. While both these dividers are fixed, in Fig 29 one is made variable, 1-10. It is apparent it does not matter whether A or B is variable; N being the product. However, in practice it is more likely A will be fixed, becoming what is called a pre-scaler, reducing the input frequency to B by 10, and thereby making the inevitable self-capacitances etc of the switching associated with variable dividers less critical and allowing cheaper ICs to be used.

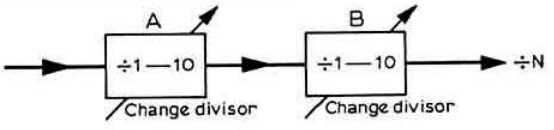


Fig 30.

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The last example of simple cascading is given in Fig 30. N is the product of any number A 1—10 multiplied by any number B 1—10. For example, if A = 7 and B = 4, N = (divide by) 28. This arrangement, although giving variable division from 1—100 is not very convenient, as A and B do not have a distinct tens and units relationship. Take the previous example:

A	B	N
7	4	28

Whereas with a tens and units relationship, A being units and B tens:

B	A	N
4	7	47

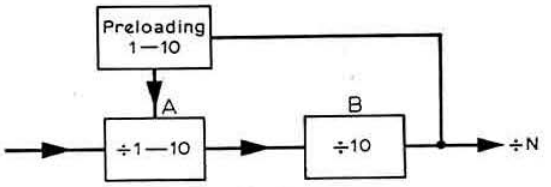


Fig 31.

A counts ten times

4	10	10	10	10	10	10	10	10	10
1	2	3	4	5	6	7	8	9	10

Fig 32.

B counts to ten

B	A	N
9	4	94

To achieve this it is necessary to extend the preloading principle (Fig 31). Divider A is preloaded every time B reaches 10; thus although A divides 10 times before this, *the first time only* it counts from whatever number was preloaded and on up to 10, all subsequent counts being 10. It could be called a "First-time-round" process. The variable count preloaded into A (for example, in Fig 32, six), will decide the first time round count, all other counts being 10. Therefore the variation 91-100 will be available in steps of 1.

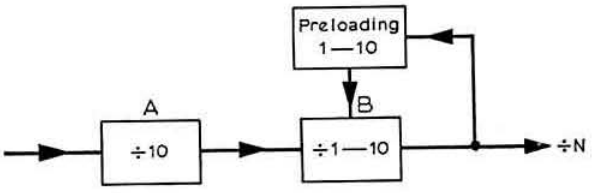


Fig 33.

A counts seven times

10	10	10	10	10	10	10
1	2	3	4	5	6	7

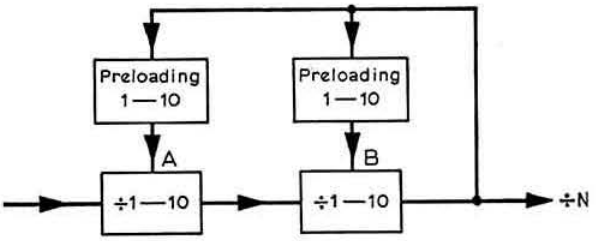
Fig 34.

B counts to seven

B	A	N
7	10	70

If the preloading was applied to B (Fig 33) each time B becomes full (reaches 10) a number will be preloaded into B. For example, in Fig 34 B was preloaded with three and therefore counts seven times. The total variation available is 10-100 in steps of 10.

Having shown preloading applied to A or B it is now necessary to consider preloading applied to A and B. The two



A counts seven times

4	10	10	10	10	10	10
1	2	3	4	5	6	7

B counts to seven

B	A	N
6	4	64

Fig 35.

previous examples have been combined in Fig 35. As an example, A is preloaded with 6 and counts to four the first time round, B is preloaded with 3 and therefore counts seven times, the first count being shortened as A only counts to 4. The total variation available is 1—100.

This article has been devoted almost entirely to logic circuit design; next month's article will deal with the embodiment of the variable divider in the phase-locked-loop synthesizer. □

CATALOGUES RECEIVED

Doram Electronics

The third edition of the Doram Electronics catalogue was available at the recent Radcomex 76 exhibition and provides up-to-date details of the many items now obtainable. Some prices have been reduced and special terms are now available to clubs and approved groups of amateur constructors. Of particular interest are the first two of a new range of mobile antennas for the range 130–174MHz. These comprise a $\frac{5}{8}\lambda$ unit with a loading coil and a $\frac{1}{4}\lambda$ antenna.

The catalogue is a quality production, freely illustrated and invaluable to any constructor. The cost is 60p, obtainable from Doram Electronics Ltd, PO Box TR8, Wellington Road Industrial Estate, Wellington Bridge, Leeds LS12 2UF.

Ferranti guides and price list

Three new semiconductor publications are now available from the Electronic Components Division of Ferranti Ltd. They are an E-line plastic transistor product guide, a metal can transistor product guide, and a discrete components price list. The two 20-page product guides give comprehensive details on a wide range of npn and pnp transistors, together with product indexing and cross-references. The discrete components price list is indexed alpha-numerically and covers in detail the available range of Ferranti semiconductors.

Further information on these publications may be obtained from Ferranti Ltd, Electronic Components Division, Gem Mill, Chadderton, Oldham OL9 8NP.

technical topics

Pat Hawker, G3VA

SEPTEMBER implies that two-thirds of the year has already gone: for many of us with far less than one-third of our "good intentions" (in the form of technical projects) even started, let alone completed. But at least as the evenings draw in and this remarkable summer sunshine retreats into memory, it is possible to take a vicarious pleasure in finding out what other, more energetic, amateurs have been up to—and just occasionally to stir ourselves into following their example. Several of the items this month could provide a gentle prod that it is time to get busy.

Making crystal ladder filters

For many years most of the crystal filters used as ssb filters or in receivers have been based on the half-lattice or lattice configuration. To form bandpass filters in this way requires the use of a number of crystals of carefully defined (and different) frequencies, and often the use of centre-tapped inductive components. While in the 'fifties and 'sixties many amateurs built their own ssb filters around 470kHz, relatively few seem prepared to tackle the construction of filters with centre frequencies around 9 or 10·7MHz. Even keen home-constructors seem usually to end up buying a complete filter, inevitably an expensive item, or using one of the various phasing techniques that have featured prominently in *TT* during the past few years.

Relatively little has been published in amateur journals about an alternative filter configuration—the ladder network—that appears to offer very useful features to those who wish to save money by building their own filters. The little that has been published—for instance in current advertisements for the Atlas solid-state transceiver—suggests that very high ultimate rejection figures can be achieved with this configuration (though we have heard some amateurs wondering what sort of measuring equipment can be used to check to 120dB with the filter connected in circuit).

The absence of information on building ladder-type crystal filters has to some extent been rectified by a most useful article by J. Pochet, F6BQP, in *Radio-REF* (May 1976, pp388–391) covering filters using two, three and four crystals *all of identical frequency*. The article includes detailed laboratory measurements, including a careful comparison with the well-known XF9A 9MHz filter (which incidentally proved better than the manufacturer's claimed specification).

F6BQP shows clearly that very useful ssb filters can be made, seemingly with few problems, by anyone having on hand, say, four identical crystals. His own prototype filters were based on 8,314kHz crystals (simply because these happened to be available). He achieved with four crystals a filter which, while not having quite such a good shape factor as the XF9A, had much better ultimate out-of-band rejection and represented an extremely useful ssb filter, *provided* that it is correctly matched into the correct input and output terminating impedances. He also provides a simple circuit that ensures the correct terminations are obtained.

F6BQP has in fact built and tested ladder filters based on two, three and four crystals and measured their characteristics on precision laboratory equipment. He points out that ssb filters can be made in this way at any frequency from roughly 5 to 20MHz, although the capacitance values and impedances favour the use of 8 to 10MHz. Ladder networks are also well suited to narrow-band cw filters, which could use crystals of lower frequency and could be designed for lower impedances.

The accompanying table gives comparative details of his filters alongside the XF9A. It will be seen that insertion loss, ripple content and out-of-band rejection are all most satisfactory with four crystals, and rather less so (but still useful) with two and three crystals. Correct termination is most important as otherwise passband ripple will increase very rapidly. To prevent leakage around the filter it is advisable to screen the filter and to lay it out carefully.

Fig 1 indicates the ratio of capacitance values in the form of coefficients. To find actual values it is necessary to

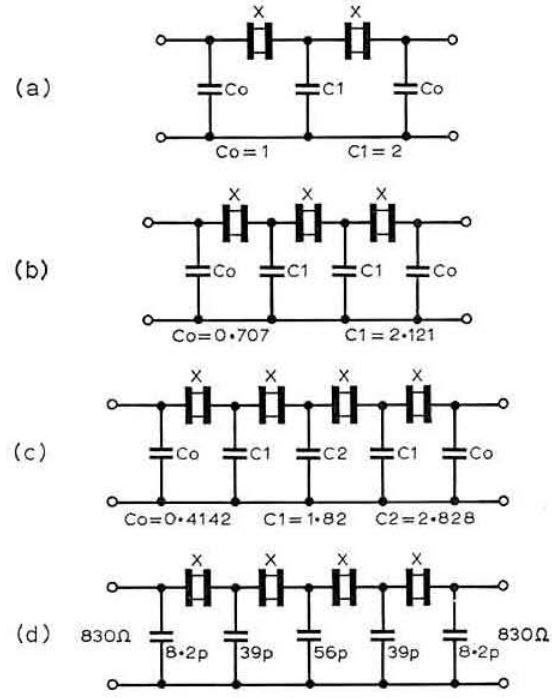


Fig 1. Crystal ladder filters, investigated by F6BQP, can provide effective ssb and cw bandpass filters. All crystals (X) are of the same resonant frequency and preferably between 8 and 10MHz for ssb units. To calculate values for the capacitors multiply the coefficients given above by $1/(2\pi fR)$ where f is frequency of crystal in hertz (MHz by 10^6), R is input and output termination impedance, and 2π is roughly 6·28. (a) Two-crystal unit with relatively poor shape factor. (b) Three-crystal filter can give good results. (c) Four-crystal unit capable of excellent results. (d) Practical realization of four-crystal unit using 8,314kHz crystals, 10 per cent preferred-value capacitors and termination impedance of 820Ω. Note that for crystals between 8 and 10MHz the termination impedance should be between about 800 and 1,000Ω for ssb. At lower crystal frequencies use higher design impedances to obtain sufficient bandwidth. For cw filters use lower impedance and/or lower frequency crystals

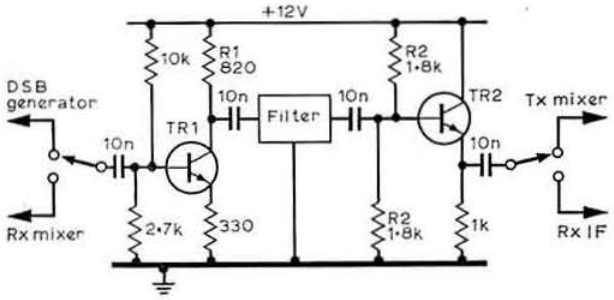


Fig 2. One method of connecting crystal filter into transceiver circuit to ensure correct termination impedances. TR1 should preferably be capable of handling a large dynamic range of signals

multiply these coefficients by $1/(R\omega)$ where R is the impedance, ω represents $2\pi f$, with f in hertz. Once the theoretical values have been found, it is possible to use the nearest 10 per cent preferred values.

As an example, with f as 8·314MHz and R as 830Ω, then $1/(2\pi fR)$ is $1/(830 \times 6{\cdot}283 \times 8{\cdot}314 \times 10^6)$ or roughly 23pF. Multiply this by the appropriate coefficients and one obtains for a four-crystal filter C0 = 0·4142 × 23 = 9·5pF (or, say, 8·2pF); C1 = 1·82 × 23 = 41·8pF (or, say, 39pF); C2 = 2·828 × 23 = 65pF (or, say, 56pF). The coefficients for a three-crystal filter are 0·707 and 2·121; for a two-crystal filter, simply 1 and 2. Thus for filters at 8,314kHz and 830Ω these would give preferred values of C0 and C1 of 15 and 47pF and 22 and 47pF respectively. The important thing to note is that the values are determined by the frequency of the crystal, the design impedance, and the use of the coefficients to determine the actual values.

With 8,314kHz crystals the bandpass is about 8,314 to 8,316kHz and it is the series-resonant frequency of the crystals which determines the lower edge of the bandpass. This again provides a very useful factor: it is possible to use a further crystal of the same frequency as that used in the filter to provide the carrier oscillator frequency.

In choosing a suitable design termination impedance, it will be found necessary to raise the impedance in order to obtain sufficient bandwidth for ssb with lower frequency crystals (eg about 1,500Ω at 5MHz). This also implies that by using relatively low-frequency crystals with low design termination impedances, excellent cw filters can be designed.

COMPARATIVE RESULTS REPORTED BY F6BQP

	Homebrew ladder filters			XF9A
	2xtals	3xtals	4xtals	(9MHz)
Insertion loss	0·9dB	1·1dB	1·4dB	2·5dB
Ripple	nm	nm	0·8dB	0·8dB
Ultimate rejection	>50dB	>75dB	>95dB	>45dB
Impedance	830Ω	830Ω	830Ω	500Ω
Bandpass				
−3dB	nm	nm	1,800Hz	2,350Hz
−6dB	2,150Hz	2,050Hz	2,050Hz	2,540Hz
−10dB	2,700Hz	2,350Hz	2,250Hz	nm
−20dB	4,850Hz	3,400Hz	2,950Hz	3,200Hz
−30dB	8,900Hz	5,050Hz	3,900Hz	nm
−40dB	16,100Hz	7,500Hz	5,200Hz	4,250Hz
−50dB	nm	nm	6,950Hz	4,650Hz

Note nm (not measured) arises from the combining of two different tables in F6BQP's article. All ladder filters were formed from 8,314kHz crystals.

Fig 2 shows a way of connecting a filter into circuit without using any inductive components and yet making certain that the filter is correctly terminated. The collector resistor, R1, is made equal to the filter termination impedance, while the two R2 resistors are each twice the correct figure. As mentioned earlier, the filters should be made in screened enclosures to minimize leakage of signals around the filter; they can use small printed circuit boards, or can be just wired up in position.

F6BQP points out that his notes are intended to provide an introduction to the subject and that further experimentation would be very interesting. For instance, results using FT243 surplus crystals of the same channel number, or Citizens Band crystals with 9MHz fundamental, etc. Again, more mathematically orientated readers might suggest suitable coefficients for the design of filters using five or six crystals. It would also be interesting to have comments on results actually achieved by those trying out this approach since the information given here is based entirely on the F6BQP article: this certainly makes it sound an easy and virtually sure-fire way of building excellent bandpass filters significantly cheaper than those currently available. But if it is so simple why has it taken so long for the idea to surface in such a digestible form?

Using epoxy resins

A useful article by L. E. Field, ZS5WP, in *Radio-ZS* (June 1975) provides a good deal of very practical information on the use of epoxy resins, a subject which over the years has become increasingly complex due to the development of something like 2,500 different curing agents. It seems worth summarizing some of the points made by ZS5WP if only as an introduction to the subject.

He gives three fundamental rules if optimum results are to be achieved:

(1) Mix the compound in the ratio supplied and do not attempt to add more curing agent to make the material set quicker.

(2) Select the right compound for the right job and note, for instance, that electrical properties may need watching, particularly for vhf applications.

(3) Prepare surfaces properly—eg remove grease if you want the epoxy to stick; coat the surface with a release agent such as polyvinyl alcohol, silicones or even grease or wax, if you merely want to form a moulding compound.

He provides information on two of the most commonly used curing agents—amine and polyamide—but notes that such listed properties apply to the cured, *unfilled*, resins. The addition of fillers, such as sand, may improve certain properties like compressive strength, but may detract from others such as electrical strength.

Among ideas and applications which ZS5WP recommends from personal experience are the following:

(1) *Coating printed circuit boards.* Use a solvent-borne polyamide cured epoxy varnish.

(2) *Encapsulating.* Use solvent-free polyamide cured compound.

(3) *Alignment tools.* An amine cured (very liquid) system was allowed to set in previously greased laboratory glass tubing. When set the glass was broken away and the resulting epoxy rod filed to the desired shape. Sockets can be made by greasing a suitable Allen key and immersing in the top of an old ballpoint pen top that has been prefilled with low viscosity resin: ZS5WP emphasises, "Don't forget to grease the key".

(4) *Coil formers, insulators etc.* When cured, both amine and polyamide types can be turned in a lathe and threaded.

(5) *Electrically-insulated floor covering.* A self-levelling polyamide-cured coating may be applied to a thickness of about 3 to 6mm to provide a non-conducting, safe, floor coating for a shack or workshop.

(6) *Masts and towers.* Aluminium and steel towers may be fabricated using epoxy adhesives instead of welding. ZS5WP normally drills sections, coats lap joints with an epoxy/polysulphide adhesive and then secures into position by bolting. Aluminium masts can be made without any bolts by using epoxy adhesive and jigs, although special care must be given to surface preparation. Once erected, masts may be protected against corrosion by coating with a coal-tar epoxy paint; this provides a black glossy finish which, if required, may be overcoated with a bituminous aluminium paint. Note that elements of beams, verticals etc should *not* be coated with epoxy varnish since *thin films* of such varnish are attacked by ultra-violet light and should not be used out of doors. A clear polyurethane varnish is, however, ideal for the external protection of aerial elements.

(7) *Buildings.* Epoxy/polysulphide adhesives can be used to butt-joint new walls to existing structures to form amateur shacks, etc.

ZS5WP notes that epoxy resin compounds when cured are non-toxic and safe to handle; but some curing agents are toxic and prolonged skin contact can give rise to dermatitis. Care should be exercised and any material that does get on to the skin should be washed off with soap and warm water. Do not let youngsters play with uncured epoxy compounds; most important, if using material containing solvents ensure good ventilation and do *not* smoke while applying the material.

Simple power controller

Attention has been drawn in the past to the use of a series-diode to reduce the power delivered to a soldering-iron on "stand-by" and a similar idea has also been used to provide "instant-tv", etc. However, J. D. Adams, G3ZSE, has come across a rather more sophisticated use of this technique. He writes:

"Having at times become rather involved with more and more complex power controller circuits utilizing zero point switches and the like, I found it rather refreshing to come across the circuit shown in Fig 3 controlling a small motor in an industrial application. D1 was an IR type 5A4 diode but the choice would depend on load current. RV1 was an open type (large) wirewound component with about 250° of travel and was wound in three sections to provide a non-linear law, as indicated. I am sure that this basic idea could find many odd uses around an amateur shack, saving the need for 'complicated' thyristors or triac units."

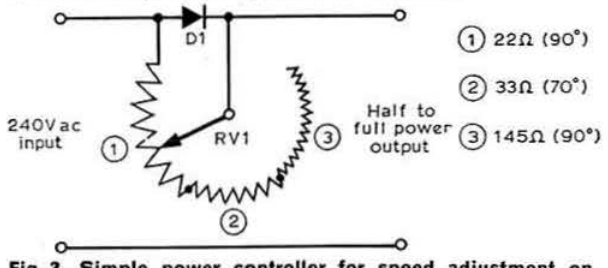


Fig 3. Simple power controller for speed adjustment on motors, soldering iron control etc

It will be appreciated that the output from this simple form of power controller will not be true sine-wave ac except at full power (zero resistance) but this should not be a problem in many motor or heater-element applications, though it might have to be considered in some cases. Resistor values will of course depend upon the load but the values given in Fig 3 indicate the sort of tapering needed to obtain a smoothly-acting control.

Class F amplifiers

The principles of Class D and more recently Class E (*TT* September 1975) high-efficiency, switching-mode amplifiers have been described from time to time. It was interesting to find that the first 1kW broadcast a.m. transmitter (Harris type MW-1), seen at Chicago in March, uses 12 power amplifier modules, each consisting of two rf power transistors operating Class D push-pull, enabling efficiencies close to 90 per cent to be achieved without the use of the special shaping circuits used in comparable valve amplifiers.

Some years ago, after referring to some UK work on Class D amplifiers, we received a letter from Frederick Raab, WB8LQK (ex WA0ATT), in connection with a thesis he was writing on high-efficiency amplifiers. Since then he has published a series of papers on this subject, including *IEEE Trans on Communications*, August 1973, *Ham Radio* (October 1974) and *IEEE Circuits & Systems Journal*, 1975, Vol 7, No 10, pp3-11. It should be emphasized that the objective in increasing amplifier efficiency is not just the extra rf output but the significantly lower dissipation in the device, reducing the requirements for heat sinking and allowing some devices to be used with much greater input powers.

In his *Ham Radio* article, WB8LQK included a brief description of an amplifier using two of the D-mos FETS type SD200 in parallel to provide 300mW output at 25MHz with an efficiency of 73 per cent. This amplifier is described in much greater detail in *Electronics* (10 June 1976) and he now designates this mode of operation as Class F. By using one of the new Siliconix Mospower VMP1 devices, mentioned in *TT* (July), such an amplifier could provide some 12W of output into 50Ω. Class F can provide some 27 per cent higher efficiency than Class B and takes advantage of the high input impedance (low drive power) of field effect devices.

In this arrangement (Fig 4), the device is driven into switched-mode operation and the main novelty is the connection of a quarter-wave transmission line immediately at the output drain connection of the device; this can conveniently be a coiled length of coaxial cable. An equivalent circuit, showing the fet as a simple switch, plus series saturation resistance (R_{on}) is shown in Fig 5. The switch opens and closes on signal frequency; the load R_L is shunted by the usual tank circuit (LC) that theoretically has infinite impedance at the signal frequency and zero impedance at all of its harmonics. The impedance as presented to the fet drain at the far end of the quarter-wave line will depend on frequency: at the fundamental, the line acts as a quarter-wave transformer so that its input impedance is R_O^2/R_L where R_O is the impedance of the cable. At even harmonics the same line represents an integral number of half waves and so reproduces the short-circuit impedance of LC. At the odd harmonics, it will always act as a quarter-wavelength, converting the short-circuit impedance of LC into an open circuit at the drain end.

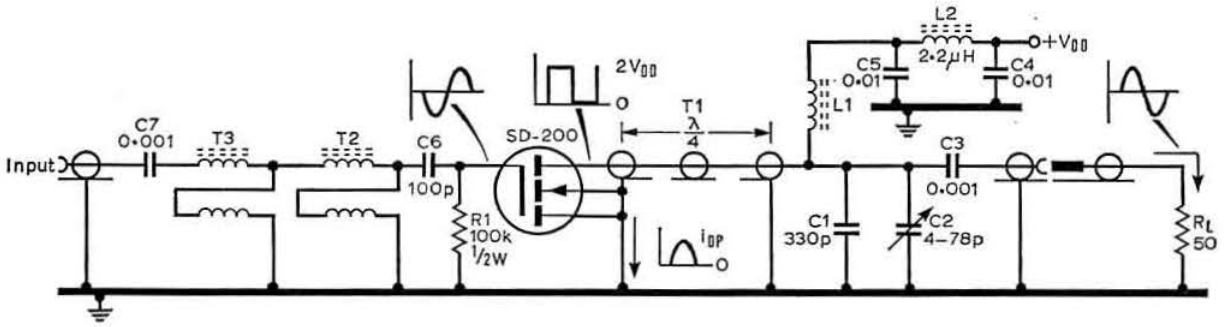


Fig 4. Class F amplifier providing about 330mW into 50Ω load at 25MHz. Without the quarter-wave of coaxial cable between source and tank circuit it would function in Class B at lower efficiency. In original amplifier: T1 is about 2·85m of RG638/U, 125Ω coaxial cable; L1 106nH consisting of 4 turns of No 26 enam wire on Permag No 57 8656 core; T2, T3 11 turns of No 26 enam wire on Permag No 56 8656 cores

It is this set of impedances that governs the high-efficiency of the stage since it tends to produce a square-wave drain voltage but a half sine-wave drain current. Since drain voltage is near zero while drain current is flowing, the fet dissipates very little power; theoretically it could be zero power so that ideally such a stage could be 100 per cent efficient and we would obtain out as rf power whatever dc power was put in. In practice the maximum attainable efficiency will depend on such questions as choosing the correct load line etc.

The inclusion of a quarter-wave transmission line as an inherent part of a power amplifier does of course present practical difficulties, particularly for band-switched stages or for bands below about 21MHz, although one could conceive situations in which it might actually be useful to be able to separate the tank circuit from the amplifier device(s).

Because of their high input impedance, such amplifiers can be fed directly from oscillators or frequency multipliers etc, as the necessary drive voltages can be achieved with almost negligible drive power. For the SD200 about 17V are required; it should be noted that devices fitted with protection diodes, such as the SD201, cannot be used. The SD200 could be used to above 100MHz.

As someone who has long believed that the power fet has a useful role to play in transmitters, this Class F technique seems worth remembering. It would appear to have excellent characteristics for amplitude modulation, something which is not usually true of bipolar transistor amplifiers, and would of course also be well suited to nbfm.

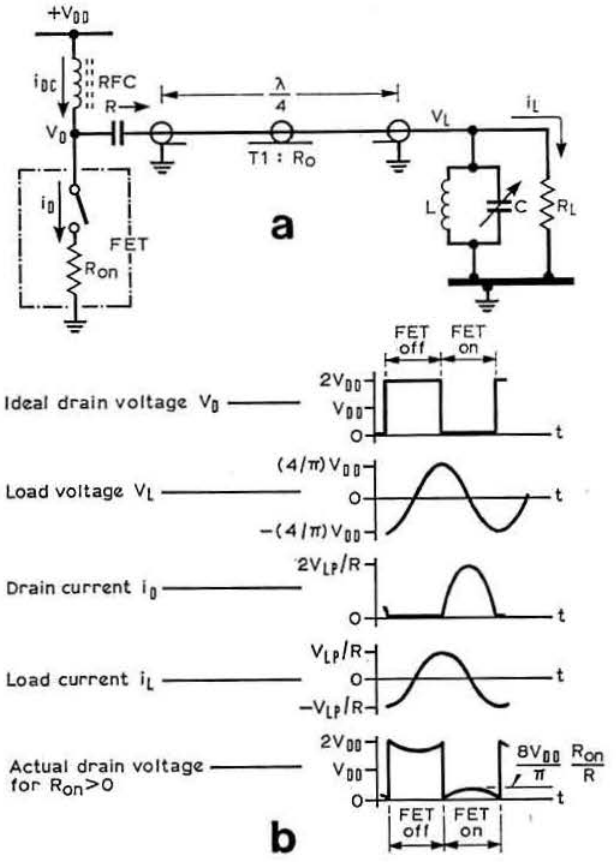


Fig 5. Equivalent circuit showing operation of Class F amplifiers. The switching action of the fet produces square drain-voltage wave, but the tuned circuit and transmission line remove harmonics and thus produce sine-wave output. In the example shown $R_O = R_L = R$

Progressive series modulation

The problem of effective amplitude modulation of transistor amplifiers, noted above, has been tackled in the Harris MW-1 broadcast transmitter by a system called progressive series modulation. American broadcast transmitters are normally rated for 125 per cent modulation on positive peaks which is achieved by asymmetric modulation, and in the MW-1 the 12 pa modules can provide 1,100W output at 125 per cent modulation without using modulator transformers or chokes. The following description is taken from the company's brochure:

"A conventional series modulator is shown in Fig 6a. It has one active device (TR1) as modulator which regulates the 100V supply to provide the correct voltage at carrier and the modulation voltage to the pa. Its drawback is its inefficiency. Under carrier conditions only 50V is required at the pa; this means that 50V is also across TR1, which must pass the full current of the pa.

"Assume 24A and 50V are required at the pa to provide a 1kW carrier. This will mean 1,200W dissipated as heat in TR1.

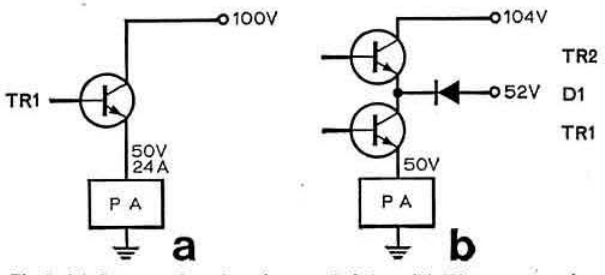


Fig 6. (a) Conventional series modulator. (b) The progressive series modulator used in the Harris MW-1 transmitter

"The MW-1 system (Fig 6b) depends on having two series modulators in series and two voltage rails. One (52V) is a little higher than that required to produce the correct voltage for the pa under conditions of no modulation; the second rail is sufficient to provide the required positive peak.

"For carrier only, all the power comes from the 52V line with about 2V lost across TR1. During the positive peak all power for the pa is drawn from the 104V supply since D1 turns the 52V supply off when TR2 turns on. During the negative peak, TR2 is 'open' and the voltage is supplied from the 52V line through D1 and TR1. By suitable adjustment of these voltages the 125 per cent positive peak modulation capability can be provided."

While we are not suggesting that many amateurs will want to run 1kW a.m., this modulation technique would seem to have more general application.

Thoughts on inverted-Vs

In the radio communication business it is easy to get left behind in changes of terminology. I do not mean just that we tend to go on measuring "condensers" in "jars" (we don't) or go on talking (as we do) of megacycles and not megahertz. But look at the "inverted-V". Early amateurs knew this in the form of the Bruce end-fed terminated design (one of the first fixed beams) and not in the modern form of almost any centre-fed "drooping" dipole.

It was the Bruce terminated design that was described in the first editions of *The Amateur Radio Handbook* as the inverted-V, yet few amateurs today remember this unidirectional, vertically-polarized, high-gain aerial (Fig 7). The old handbook used to add the warning that it needed a high mast and because of variable ground losses tended to be more suitable for reception than transmission. In this form, L

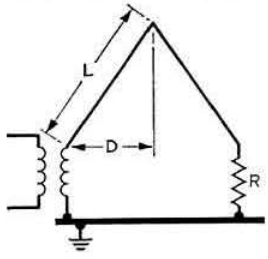


Fig 7. The original form of Bruce or "inverted-V" aerial as described in early editions of *The Amateur Radio Handbook*. When L is one half-wave greater than D, signals in the horizontal direction and in the plane of the "V" add up. When used without the terminating resistor R (about 400Ω) it is bi-directional; with R unidirectional and basically vertically polarized. Modern versions are often called side-terminated half-rhombics and design information for rhombics can be adapted

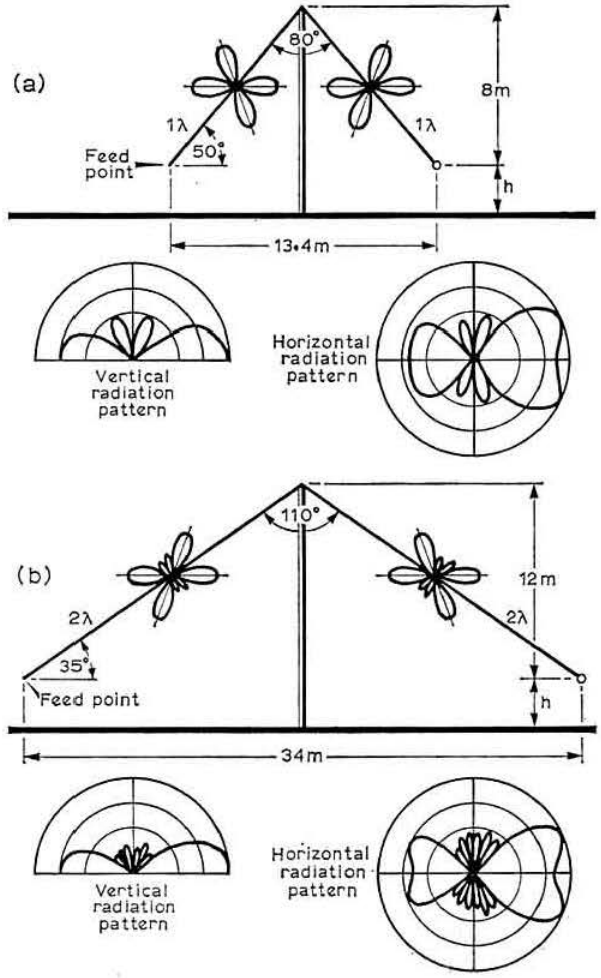


Fig 8. Two unterminated end-fed inverted-V aerials described by ZS6U showing polar diagrams for 28MHz operation. The aerials are voltage-fed from 50–75Ω coaxial cable via an L-network as shown in Fig 9

should be one half-wave longer than D so that the signals in the horizontal direction in the plane of the inverted-V add up.

Nowadays this form of aerial may be implemented in a rather squatter form (ie without a particularly high support) and is generally called a "half-rhombic" since it is in effect half of a rhombic turned on its side. Despite the very high gain that is possible it is little known to many amateurs. For hf it does require a lot of space, but this does not apply to vhf —and indeed it is no disadvantage in such applications as portable field day operation where space usually *is* available.

Just as the rhombic can be used as a terminated or non-terminated configuration (the non-terminated system providing bi-directional characteristics) so can the half-rhombic or end-fed inverted-V, and interesting examples of both these designs have been noted recently.

The unterminated inverted-V

One of the few published references to a long-wire end-fed inverted-V is by Colin Dickson, ZS6U, ("More about the Minishack Special" *Radio-ZS*, August 1975, a follow-up to

an earlier article in January 1973). This shows that the end-fed long-wire erected as a multiband hf aerial to specific slope angles can provide useful gain on the higher frequency bands: about 6dB on 28MHz with 34m ground space and single 12m-plus support, representing a 2 + 2λ aerial which can be fed on any hf band by means of a switched L-network aerial coupler. Because of radiation loss, the maximum gain is towards the *free* end of the aerial (as for all unterminated long-wire systems). Remember that there will be high rf voltages at each end so that safety precautions may be needed if the low-ends are within reach. Two designs are shown in Fig 8.

Where space is limited a "half inverted-V" can be used with same tilt and height; this is then in effect simply a sloping long-wire, and often useful to those operating in high buildings who feed the system at the high end.

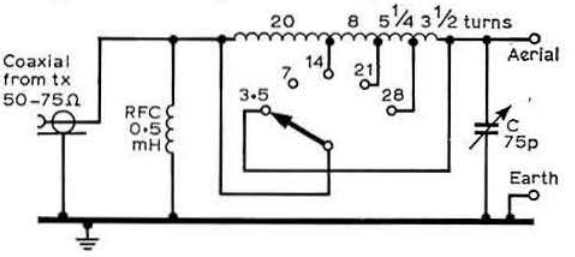


Fig 9. Matching network used by ZS6U with his end-fed inverted-V aerials

Coil diameter	Coil length	Wire diameter
35mm (1·375in)	38mm (1·5in)	0·95mm (0·0375in)
38mm (1·5in)	47mm (1·84in)	1·17mm (0·046in)
41·3mm (1·625in)	56mm (2·22in)	1·4mm (0·055in)
44·5mm (1·75in)	66mm (2·62in)	1·65mm (0·066in)
47·6mm (1·875in)	77mm (3·0in)	1·9mm (0·075in)
50·8mm (2·0in)	88mm (3·5in)	2·2mm (0·87in)

Terminated inverted-Vs

When the far end of an inverted-V long-wire aerial is correctly terminated to ground (or to a quarter-wavelength of wire forming an artificial ground) the current flowing in the wire is virtually a travelling wave. The absence of any reflected waves means that the whole thing becomes a uni-directional broadband array. The terminating resistor, which should be non-inductive, is usually described for transmission as requiring a power rating of one third of the output power, though for ssb average output is very much less than p.e.p. rating.

Some idea of the effectiveness of such arrays can be gleaned from a description of a massive array of half-rhombics built on San Clemente Island, off the coast of California, to monitor by means of hf doppler radar, the direction and magnitude of sea waves in the Gulf of Alaska: "A broadband antenna array for sea scatter measurements" by M. T. Ma and L. H. Tveten, (*IEEE Transactions on Antennas and Propagation*, May 1976, pp340–346). This system is built out over the sea so that it provides an excellent ground-plane and provides maximum gain at extremely low angles to the horizon (of the order of 2°–3°).

Basically, it shows that a single half-rhombic with a total length of 240m can provide a power gain of some 16·7dB at 10MHz—a power multiplication of over 45 times! Or some 10dB above what Les Moxon, G6XN, once described as the gain-barrier for Yagi-type hf beams. Admittedly, not many of us could run out 600ft of wire over the sea but it shows

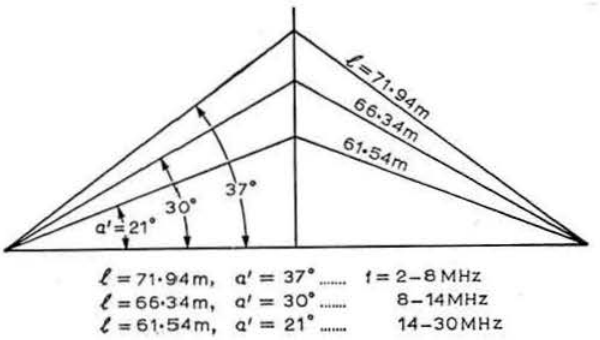


Fig 10. Showing how three side-terminated half-rhombics are used with single support to form the basic elements of a 2–30MHz high-gain hf radar array (terminating resistors not shown)

what can be done—and dimensions can be scaled down at vhf. Incidentally the power gain of the complete system of 25 of these half-rhombics for transmission and reception (taken together as it is a radar system) is around 55dB at 11MHz.

Fig 10 shows how three of these side-terminated inverted-Vs are arranged on a single mast to provide coverage from 2 to 30MHz, although most amateurs would be happy enough with the 14–30MHz section with 60 + 60m wires and a mast height of about 20m.

Inverted-Vs and rhombics on vhf

The half-rhombic paper set me thinking once again about the curious lack of interest among vhf/uhf operators in all these long-wire techniques. Recently, as a result of some articles I wrote in *Television*, I received a letter from a New Zealand tv-dx enthusiast who has been experimenting with vhf rhombics to receive 190MHz transmissions regularly over a 65-mile path and who is also interested in Australian tv transmissions. He mentions the improved performance achieved by adding two more wires to the sides of the rhombic, adding that when this was done: "no commercial tv aerial could match the gain and performance of this aerial". He sent along a copy of an item in *Radio & Electrical Review* (NZ) giving details of a Channel 2 (about 50MHz) rhombic with an overall length of 26ft providing some 10–12dB of gain.

The value of rhombics for uhf tv reception—together with the design of a simple tapered impedance matching device to allow the 600Ω balanced feed-point of a rhombic to be connected to 70Ω coaxial cable was described by A. B. Starks-Field, formerly G6YG, in *Wireless World*, December 1974. His loft rhombic with six-lambda legs had a theoretical gain of 19dB.

To anyone who has ever had access—if only for non-amateur purposes—to an aerial-farm of hf rhombics and Vs, and heard the magical way in which weak signals emerge from the noise, such long-wire aerials remain etched into the mind as the standard of comparison for all others. Admittedly these are *fixed* beams but we suspect that for vhf/uhf operation a few fairly compact high-gain fixed beams could prove extremely useful. It was while researching for these notes that we discovered with a shock that all mention of rhombic aerials has now disappeared from *The Radio Amateur's Handbook* while the latest RSGB *VHF/UHF Manual* makes no reference to *any* form of long-wire systems!

4-2-70

Martin Dann, G3NHE*

DX news

Richard Rimmer, GD3YEO, made what must be the first 144MHz GD/9H1 contact when he worked 9H1BT at 0821gmt on 29 June. His first sporadic-E contact of the season was made on the previous day when he worked YU1BKL (KE13j) at 1845gmt, QRB 2,054km. He also heard YU3BDE, but the opening faded while he was attempting to work him. The following morning, apart from working the 9H1, he heard two IT9s but could not make himself heard through the QRM. Richard also sent us an anomalous propagation report on 144MHz operation of the Isle of Man club station, GD3FLH/P, on the night of 14/15 June. From their site near Peel, 1,433ft asl, and under apparently normal conditions, they had 42 contacts between 2100 and 0035gmt, with 15 PA0, 4 DL, ON, EI, GM, GD and G. He attributed these contacts to ducting, and makes the interesting observation that the Wrotham beacon increased in strength by about 5 S-points on descending to 1,200ft asl.

More sporadic-E success is reported by Gordon Pheasant, G4BPY, of Walsall, who managed to work 9H1BT on 29 June. This was around 0800gmt, and G4BPY also heard 9H1CD and IT9 but could not raise them. He did, however, work IT9TDN at 1720gmt on 30 June, followed by I0DLP in GB03f. Gordon heard ZB2VHF from 1548 to 1615 on the same evening, and copied EA4OK at 1859gmt. G4BPY is hoping to set up skeds with CT2BS at a QRB of nearly 1,600 miles.

The 30 June opening extended at least as far north as Driffield in North Humberside, when G3UHH (ZO77d) worked 9H1CD (1710gmt) and IT9TAI in GY66c at 1718gmt. On 21 July there was yet another sporadic-E opening, again in the direction of Malta. G8FHB, operating portable near Buxton in Derbyshire and using a Liner 2 into a slant-polarized 5-el, worked 9H1CD on 144·27MHz ssb at 1602gmt, reports being 59 both ways. During the same opening G8KNO (Yeovil) worked IT9PLT (HX77h) using 10W of 144MHz ssb to a 10-el Yagi in his loft. This was at 1716gmt and reports were 55 each way.

Although he does not mention the exact date, it was during the mid-summer tropo opening that GM3DZB had his most interesting contact, working OY5NS. Sandy Duncan, of Banff, reports that OY5NS also worked several Dutch stations, but he did not seem to be able to attract the attention of any other UK stations.

Claus Neie, DL7QY, of Berlin, is usually in the thick of things when dx is being worked, but this time he appears to have been just a little too far to the east to catch the best of the summer tropo. However, he did manage a handful of UK portables during VHF NFD, all on 432MHz, no luck being had when trying the next band up.

G3NEO, of Sheffield, provides a measure of just how good the conditions have been on uhf. On 6 July Phillip realized that conditions were very good, but had no uhf aerial up; undaunted, he fired up 5W of 432MHz cw to a *10m dipole* and promptly worked OZ5AH. This he followed by working GM3ZBE, PA0HOP (from whom he received a 589 report), G4CMT (Hull), G3DAH (Herne Bay) and G3BHW (Margate). The only failure was with SK6AB who was 559 with G3NEO, but the power difference was too great.

Further south, G3UDA, of Shrewsbury, experienced an unusual contact on 144MHz ssb on 27 July. While finishing a QSO with a local, with his beam to the south-east, he was called by LA3WU in QRA CU47d. Despite 360° rotation of the beam, the Norwegian's signal continued to peak at strength 4 to the south-east, and LA3WU confirmed that he was beaming due south. A glance at the map suggests that reflection was taking place somewhere over Belgium or Northern France. It would be interesting to hear from anyone else who experienced any anomalous propagation on that day.

A final note on the spectacular sporadic-E season comes from IT9TAI. Dom was highly delighted to work so many British stations, and wishes to congratulate all concerned for the orderly way in which they queued to work him and for the snappy contest-style contacts that ensued. He apologizes to the GC and GM stations who called him but whose callsigns he was unable to copy completely. IT9TAI has already sent all QSLs direct, or via the RSGB bureau, but if anyone is missing one he will be pleased to put things right.

FM channel

GM4BVU is a newcomer to 144MHz fm mobile, but has already noticed the lack of Scottish accents on the fm channels in the north. In a recent large local net he realized that his was the only local accent among all the visitors from south of the border. Norrie hopes that the coming of GB3CS will bring all the locals out of hiding.

Another Scottish amateur looking forward to the imminent operation of the Central Scotland repeater is Victor Budas, GM3VTB, of Glasgow. In order to assess the capabilities of repeater operation, he and GM3XWJ mounted a 144MHz expedition aboard a narrow boat on the Macclesfield, Trent and Mersey canals. Using the callsigns G3VTB/P and /M, between 10 and 15 July they contacted 106 different stations through the Moel-y-Parc repeater, GB3MP, and the equipment they used was a Multi 2000 and a ground plane aerial.

Victor provides an interesting breakdown of these contacts: 51 per cent were mobiles, 45 per cent were fixed stations and the rest were portables. He also noted that 64 per cent of his contacts were Class A licensees. GM3VTB and GM3XWJ express their thanks to all the regular users of GB3MP who allowed them to access their repeater so frequently.

Much to the delight and surprise of the Kent Repeater Group, permission was received on 25 June for Dover 144MHz repeater GB3KR to go on the air some three months earlier than they expected. The next fortnight saw the burning of a good deal of midnight oil, but on 10 July at 0600gmt the repeater was switched on and the first contact took place.

Only one problem has occurred since the repeater went into operation: intermodulation noise occasionally appears on the input channel. This fails to respond to any changes of filter or other equipment, but as a shower of rain seems to do the trick it is being assumed that the "rusty bolt" effect is responsible and the necessary steps are being taken. Coverage is much as expected and comment from users is favourable. A

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particularly appreciated feature is the facility to re-access someone who has inadvertently "timed-out".

Margate repeater GB3EK was due to go into operation on 30 July on channel RB2 (434·65MHz input, 433·05MHz output). Because high occupancy is unlikely, this repeater has been designed with as few restrictions as possible. There is no "time-out" but users are requested to keep overs to no more than 2min. Two seconds after the end of each over the repeater will send a "K" in morse, which is the signal for the other party in the QSO to transmit. This pause is to allow other stations to call in if they wish. Another simplification over the 144MHz repeaters is that a toneburst to access GB3EK is unnecessary. A 300ms burst is required to switch the device on but thereafter it is carrier operated. The initial toneburst is nominally 1,750Hz, but as the repeater will accept 1,700 to 1,800Hz it should be easy to whistle it up.

The repeater ethic

Repeaters, whether they be satellite borne Oscars, or static devices on UK hilltops, are among amateur radio's most advanced developments. There is no doubt that the British repeater chain has revolutionized mobile communication in a manner few would have forecast five years ago, and the Oscars have brought vhf and uhf to many parts of the world where no such activity has ever existed before. Even the serious anti-repeater faction (we discount the lunatic fringe) do not deny the technical achievement involved: the problem as they see it lies with the operators using the device.

The latest doubts about repeater operation come not as one might expect from the "opposition", but from one of our regular correspondents who is, himself, an enthusiastic repeater user. He foresees a growing disenchantment with the use of these devices due to their inherent operating constraints: the one-minute contacts, or lack of any contact at all due to the queue waiting to get in, and their susceptibility to abuse. He suggests that there is an "Everest syndrome" about repeaters: they offer a challenge to design and build, but after the technical summit has been scaled, the every-day use is something of an anticlimax.

In the writer's experience, the builders and users of repeaters are among the most enthusiastic of present-day radio amateurs, but we cannot help wondering whether our correspondent is right when he suggests that groups may have gone a little too "repeater mad", and that the time has come for a reappraisal.

Four metres

The comments by G4CVI in July's *4-2-70* about the need for dx stations to keep clear of the calling channels on 70MHz prompted G5UM (Leicester) to check his running totals of stations worked on this band. He found that they point strongly to a considerable upsurge in activity, explaining G4CVI's QRM problems. In the first six months of 1976, Jack's total number of contacts on 70MHz was 372, compared with 202 in the same period last year. He also notes an increase in the number of new stations appearing on the band; 41, compared with 36 in the first half of 1975. This may be small in comparison with the growth on 144MHz, but is indicative of the increasing attractiveness of the band to many operators, especially now that tvi is no longer a problem in many parts of the country.

The possible distances which can be worked on 70MHz are rather limited due to the lack of other countries licensed to use the band. Inter-UK distances, therefore, take on more significance than on the other bands, and what must be approaching a record in this respect was the contact made by Nigel Hoult while signing GM4CIK/P from the Isle of Islay this summer. His best contact was with G3AUS in South Devon at a QRB of 360 miles. If anyone has bettered this we should be interested to hear from them.

GD3YEO now has 70MHz working from the Isle-of-Man, with a low-band Pye Ranger converted into a transverter, and an added QQV06/40A pa. Operating portable during VHF NFD, Richard worked 123 stations with this gear, so all seems to be satisfactory. On 6 July GD3YEO tried a cross-band 144/70MHz contact with PA0JVY, who could detect the Manx station's signal, but no more. PA0JVY confirms the view of many that propagation conditions on 70MHz are often at variance with those on the higher frequencies.

Two metres

GM8LHE would like it to be known that GM8AZS, GM8FFK, GM8KMO and he are active from the Moray Firth area most evenings from 2100gmt on 144·188MHz ssb. He also has a sked with GM8FFX in Aberdeen on Thursdays at 2100 and Sundays at 1130, both on 144·188MHz. Ron Adams adds that the calling frequency is monitored most of the time and any contacts would be much appreciated.

Seventy centimetres

There has been a noticeable lack of comment on this band and although conditions were up at the time of writing, with good signals from the Continent, activity seemed poor. Harold Meerza of Chatham (BRS34348) feels that since VHF NFD, 432MHz activity has been the lowest for two years. Perhaps operators have been catching up on their sleep after all those late night sessions during the June/July openings.

Expedition news

G3ONP and G8IZS are arranging a vhf expedition to the five counties of South Wales: Gwent; Mid, West and South Glamorgan, and Dyfed. They plan to operate ssb on 432MHz, 144MHz and 70MHz, using a frequency 30kHz below the calling channel on each band. The trip starts in Gwent on Sunday 12 September and ends in Dyfed on Thursday 16th. Skeds are welcome for 432 and 70MHz and requests should go to G3ONP, QTHR.

A postcard from Aberdeen bears sincere apologies from G4ALG to those expecting to hear him as GM4ALG/P from those parts. Due to circumstances beyond his control he has been unable to operate on 70MHz as promised, but he is determined to return to the same sites next year without fail.

Project Aurora

The appeal here in January by Alan Strong, G3WXI, of the Space Physics Group at Sheffield University, for assistance with a research project on radio aurora had a good response and by the time this is written the project should be in full operation. At the beginning of August a 69·1MHz beacon went into service in the Edinburgh area, initially beaming south for test purposes, but by now being switched 9min north and 1min south for identification. The experimental callsign issued to the beacon is G9RAJ, transmitted on fsk.

Power at the moment is 20W to a 4-el beam, but it is planned to raise this to 1kW. The project should provide useful information on auroral propagation, and G3WXI would be pleased to receive any reports, QTHR.

Beacon news

Geoff Kennedy, GM4ESD (ex VE2AIO), finds the news that the RSGB is considering the setting up of a 50MHz beacon very heartening. Before leaving Montreal in 1974 he was quite active on 6m, with a particular interest in auroral E*s*, and multi-hop E*s* propagation (including 70MHz signals from the UK). He is convinced from his observations that two-way 4–6m cross-band contacts across the Atlantic are possible by these modes, and believes that a 50MHz beacon would be a great encouragement in this direction. Geoff hopes that any 50MHz beacon in the UK would work on a 24h basis, for he recalls the difficulties experienced in Canada in checking the effective E*s* muf after UK tv services had closed down.

G4BPY of Walsall was also interested to read of the 50MHz beacon possibility and looks forward to hearing more details. He is very interested in the band, and has a home-built converter and 2-el beam, although he has heard nothing but European tv signals so far.

The Angus beacon, GB3ANG, has now been activated on its new frequency of 144·975kHz. The beacon on installation was 2kHz high in frequency, has an output of 9W, fsk keying, and radiates from a 4-element Yagi SSE. The beacon keeper is GM8BZX.

Contest news

The good conditions and ducting which provided so many Continental contacts for stations located over much of the country during VHF NFD did not quite reach the Isle of Man on 144MHz. The local club station, signing GD3FLH/P, only scraped 200 contacts compared with 352 last year, but the 70MHz station (GD3YEO/P) fared comparatively better with 123 contacts.

From much further to the east, the Martlesham and Ipswich group found conditions during field day very much to their liking, their biggest problem being cross-modulation from strong Continental stations on 432MHz. John Quarmby, G3XDY, reports that conditions dropped off with frequency, their most spectacular results being on 1,296MHz and 432MHz, with 144MHz not nearly as good and 70MHz the least successful band.

Conditions for the 144MHz QRP Contest on 25 July, while not as outstanding as those for VHF NFD, were above average, particularly on the NE/SW path. Continental dx was audible, but difficult to raise with just 1W from the north.

The 70MHz Open on 7/8 August brought mixed comment about the timing, but activity seemed to be good and conditions somewhat above average. The two GCs active were working well to the north, and from Scotland GM4DMZ/P and GM3YOR/P were particularly good signals with the writer.

Channelized operation

Users of channelized equipment on 145MHz can normally check that it is working by switching to one of the many repeater outputs. This does not apply on 70 or 432MHz of course, unless the operator happens to be located near one of the 432MHz repeaters, of which there are few as yet.

It is useful to add a "beacon channel" to 70 and 432MHz equipment, which would not normally receive the two beacons on each of these bands. In the absence of amateur signals such an extra channel will at least confirm that the equipment is functioning.

Awards

Supreme Award No 14: G3EHM of Stoke-on-Trent earns himself the coveted supreme award by adding 1,296MHz award No 10 to his 144 and 432MHz seniors. Ken Parkes found the 1,296MHz award the hardest of the three due to the infrequency of openings on that band. Although G3EHM has recently obtained some commercial equipment on 432MHz and 1·3GHz, most of his contacts on all bands for these awards were made using home-built gear. Congratulations to Ken on a fine achievement.

144MHz Senior Transmitting: No 97 to G8IWA of North Humberside; No 98 to G8IL of Salisbury.

The vhf awards manager tells us that he will be delighted to countersign applications for foreign awards (and many have been coming in since the big mid-summer openings) so long as every check list submitted is accompanied by the appropriate QSLs and adequately stamped SAEs.

G8JAJ is worried by the present rules for FMD Awards. As he correctly points out, a station worked before the county boundary changes took effect for awards purposes in, say, Bristol, would count as Gloucestershire. The same station worked now would count as Avon, and Gareth feels that this represents a handicap to those coming on the band since the boundary changes. The problem G8JAJ raises was carefully considered at the time of the rule alterations, and unfortunately the alternatives had to be rejected. The change-over was bound to cause some anomalies, but the suggested method of counting a station as being in the new county regardless of when he was worked would have presented great difficulties. Imagine the trouble that would have to be taken determining whether a borderline station whose card said "Yorkshire" was now South or West, or even North Yorkshire, and Humberside is only a short distance from the junction of all three.

G8JAJ is quite right, the newcomer to the band *is* at a slight disadvantage, but this will soon disappear as fewer claims include cards for pre-1975 contacts.

Miscellany

Geoff Stone, G3FZL, has been appointed RSGB vhf manager for the rest of 1976, with the newly-appointed chairman of the VHF Committee, Tom Douglas, G3BA, as his deputy. For the present, the vhf manager will deal with overseas matters, and his deputy with home affairs.

It has been said before, but seems to require constant repetition: operators not yet listed in the *RSGB Callbook* should state their location frequently both during a CQ call and when in contact to enable others to orientate beams appropriately.

Always ensure that the county is clearly shown on outgoing QSL cards, especially if operating portable. The absence of county identification may jeopardize the checking of an FMD certificate claim.

Finally, comment, news and views for inclusion in the October issue should reach G3NHE by 9 September, and for the November issue by 6 October. □

microwaves

Dain Evans, G3RPE*

The sixth microwave round table

The most recent round table was held on 18 July in Winchester when about 60 people attended. Apart from the usual redistribution of junk, and the use of the sophisticated facilities for testing 10GHz equipment, there was much discussion of microwave topics in general, perhaps the most important part of these events. From these discussions came two suggestions of significance. The first was that a microwave net should be established on 144·33MHz, spreading as necessary downwards towards 144·30MHz. Thursdays and Fridays at 9pm was suggested as being suitable particularly for circulating information about activities over the following weekend. The second suggestion was for activity periods on 10GHz (as well as other microwave frequencies) on the last Sunday of, at least, the summer months: it did not seem practical to fix any particular operating times as people felt it would become of increasing interest to take advantage of any early-morning or late-evening "lifts".

The main business was concerned with trying to answer the question "Where next on 10GHz", and this seemed to produce rather more additional questions than answers. It was pointed out that we had already made much progress on 10GHz, the most important factor probably being the unprecedented degree to which amateurs had used calculations to try to relate equipment parameters with its performance. These calculations, for once, gave encouraging results and led directly to our successes with low-power equipment, firstly over long line-of-sight paths, then over knife edges and, perhaps most spectacularly, to the dx contacts using super-refraction via humidity ducts formed over water. As far as was known, there was no reason to believe that the latter mode could not be used to work Germany and the Scandinavian countries. Clearly it would be an enormous help if beacons could be established on both sides of the North Sea.

An important propagation mode which has hitherto received virtually no attention by amateurs is that via overland ducts. There was a limited amount of evidence already available suggesting that these ducts were more common than perhaps expected, and it is an obvious first step for someone to unearth what is known and to assess it in amateur terms. It was recognized that it would be an advantage to have more stations operating from home rather than just portable, and ways of getting an aerial in the clear were discussed. Some of the points made were:

(a) One of the simpler methods was to have a waveguide feed directly to the aerial. However, with the cost of new guide from existing sources at about £1/ft there was a real need for alternative cheaper sources. Waveguide runs from ships' radar was one possible source suggested.

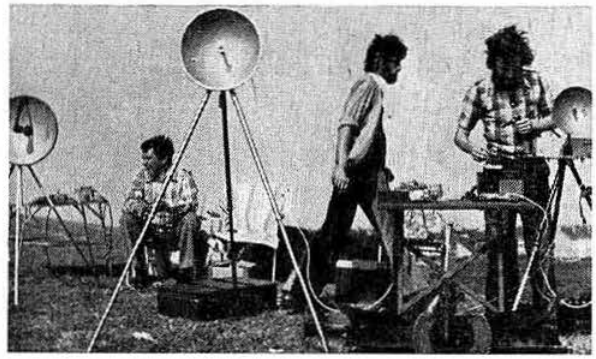
(b) Several people felt that the answer was to mount the equipment, suitably waterproofed, up with the aerial and to run the dc, af and i.f. supplies down to ground level.

(c) There was much interest in using omnidirectional aerials of reasonably high gain to avoid the complication of rotating the aerial and feeder. There would be a requirement for many dozens at least, as well as those required for beacons, which would make some form of their mass production worth setting up. While some progress has been made already in the electroforming of reduced-height waveguide for one form of aerial, the final precision machining of the radiating slots still presents problems. One possibility suggested was to electroform the slots at the same time as the guide—this would be ideal if it could be done. Other forms of omnidirectional aerial were also being considered.

(d) The "flyswatter" aerial was briefly mentioned but rather surprisingly did not arouse much enthusiasm. In one version of this the main aerial is mounted low down and pointed vertically upwards towards a plane reflector mounted at the top of a mast and angled to reflect the signals horizontally.

The conclusion reached at the end of the day was that while none of the problems raised were insuperable, a lot of ingenuity was going to be required to cope with many locations. The rewards, however, promised to make it all worthwhile.

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



10GHz activity on 4 July at Petten on the north coast of Holland. Left to right: ON6TS, the son of PA0KTZ and ON6JC. The equipment on the right is that used by PA0KKZ to work G4ALN over the 306km path to the Isle of Grain in the Thames estuary

Operating news

At the beginning of July G8IFT (Birmingham) worked PA0VV and ON6DH on 1,296MHz with a mere 3W and a 9-el Yagi . . . G3FZL called "CQ" on this band and stations from three countries came back . . . G4BYV (Norfolk) worked SM on 1,296MHz and had a one-way on 2,304MHz, and worked PA0VTW on the latter band at 58/9. On 10GHz, G8AGN (Sheffield) is looking for schedules . . . G3JHM has had some super-refraction contacts from Alderney back to the south coast, and at the time of writing is operating from northern France . . . apparently there has been at least one attempt to work GM/PA0 on this band.

New 10GHz world record

What surely is a new world record on 10GHz was set up on 14 August when GWPPF operating G4BRS at Pendeen Watch in Cornwall worked GM3OXX/P at Portpatrick in Scotland over a 521km (324-mile) path. This appears to exceed by a handsome margin the previous best contact of 426km (265 miles) made in 1960 by W7JIP/7 and W7LHL/7. They used their normal 10–15mW transmitters feeding small dishes, and the contact was made directly on 10GHz without the use of any talk-back. More details next month as they become available. □

swl news

Bob Treacher, BRS32525 *

Contest thoughts

Now that the field days for 1976 have passed, many listeners will be turning their minds to home-based contests during the autumn months. There are plenty to choose from, especially those sponsored by the RSGB, without thinking of the dx bonanzas of CQ World Wide and Worked All Europe. This year the RSGB 7MHz contests are to be held on 16-17 October (phone) and 6-7 November (cw), and the 21/28MHz phone contest takes place on 9-10 October. A very attractive cup is the award for winning the latter event. It is hoped that each of these contests will attract a large number of entries.

The rules of the Cray Valley RS 8th SWL Contest appear on p711 of this issue.

Summer laziness

The mail this time reflects the fact that Britain is becoming the place to be during the summer, now that we seem assured of Costa Brava-type weather conditions. Unfortunately, however, radio does not figure very highly in many listeners' priorities and those reporting this month have little interesting news due to lack of activity and poor hf band conditions. However, we do have two new correspondents, Colin Chilton, A9199, and Hal Collard, BRS3466. Until recently Colin had been mainly a vhf listener but is now gaining enthusiasm for the hf bands. An FR50B is used into a long wire which is beginning to pay dividends for Colin, who has also had QSL cards printed.

Hal is an old hand, having signed as both G2CVA and ZE2JO for over 40 years. He is now a very keen swl and runs a Trio JR310 into a long wire and $\frac{1}{2}\lambda$ dipole for 20m. His listening habits favour 21 and 28MHz, when it is open for dx traffic, and he is contemplating a beam for those bands. He is also interested in propagation, particularly pertaining to unusual conditions (auroral and other ionospheric quirks). Over the years he has experienced many unusual spells and particularly remembers the old 5m band which, at times, produced much USA dx.

Andrew, A8849, has been in the throes of exams, which has caused him to be QRT. However, with exams behind him, he has been back beside his receiver with welcome results on 10m (HP, TI, W, YN, 8P6, 9K2 and 9Y4) and 20m (KJ6, KG6 and KH6), but the all-time new countries are beginning to be a little harder to find. Andrew suggests yet another table—an all-time one showing total countries on each band from the beginning to the present. If sufficient entries are received a table could be published next time, to be reproduced alternately with the 80m table.

Our friend Crosbie, BRS32286, has, unfortunately, suffered further heart trouble and is convalescing at home—with his receiver in the garden shed. He hopes someone will soon remedy that for him.

The notice regarding a Dumfries club in the last column produced yet another swl and they have set up a group meeting for September at which they hope to assess the potential of the group and get a club formed. These pages have now thrown together 23 amateurs and SWLs in and around Dumfries.

Robert Small, A8841, writes for the first time. He is the son of G3ALI and became interested in the hobby through his father. He is now keen to do even better. He seems to be well on the way judging by the hordes of Pacific dx he has QSL cards from. Since October 1974 Robert has heard 231 countries and has 188 verified and has over 450 dx QSL cards, mainly returned via the RSGB bureau.

On the topic of QSL cards, Ken Steele, BRS36883, has a large collection, but he finds more pleasure QSLing British stations. This practice is fine if listener reports are useful and informative, but the majority are not and the rate of return is then found to be poor for all-too-obvious reasons. Ken is holidaying in Lincolnshire in September and is hopeful of meeting some amateurs during his stay.

G4DWV writes regarding 4X4SL/JY, mentioned last time. He is doubtful if the Jordanians have licensing arrangements with Israel and thus queries the legality of this station. It would be interesting to learn if anyone knows more about this situation.

Latest 160m news comes from both Noel, BRS35608, and Dave, A8312. Between them very little seems to get away. Dave has had a quiet 160m period, hearing nothing new, but Noel reports LU1DZ, 5B4YK, C31JX and ZE7JX (O210 on 1,802) all on cw. Dave, however, comments on a 160m "call-in" frequency being organized by Dave, G3YXM, for daytime G-dx QSOs.

Mail is acknowledged from As 8808 and 8883, A8890 holidaying in France, A8961, A9191 and BRS36797.

Please remember that comment, news and table updates should reach your scribe before 28 September. □

1976 HF Countries Table

Station	10m	15m	20m	40m	80m	160m	Total	Mode
BRS35608	67	141	196	156	102	35	697	cw
BRS17567	56	142	206	62	127	10	603	ssb
A8883	49	132	208	77	107	5	578	ssb
A8890	66	121	184	79	91	23	564	ssb/cw
A8312	28	109	155	71	101	23	487	ssb/cw
BRS 35943	3	101	166	81	125	3	479	ssb
A8849	48	114	155	63	84	12	476	ssb/cw
BRS32286	55	112	148	47	92	0	454	ssb
BRS33823	29	82	147	59	92	17	426	ssb/cw
BRS35454	14	99	164	61	79	7	424	ssb
A9172	10	54	134	48	38	3	287	ssb
A8841	16	51	163	10	38	0	278	ssb
A9123	14	65	99	28	55	9	270	ssb/a.m.
A8961	6	54	128	27	44	9	268	ssb
A8808	33	56	85	27	50	4	255	ssb
A9191	36	44	116	17	15	0	228	ssb
BRS36208	0	8	75	21	25	1	130	ssb
A9199	9	9	26	7	2	1	54	ssb

NEW PRODUCT

Microwave printed circuit laminates

The availability of D-Clad laminates is announced by Suffolk Circuits. Two types are obtainable, viz 522 with a dissipation factor of 0·001 at 1MHz and 0·0025 at X band and 527 with a dissipation factor of 0·0019 at X band. The laminate comprises a ptfe coated glass fabric. Suffolk Circuits, Lady Lane Industrial Estate, Hadleigh, Ipswich IP7 6BQ, tel: 047-338 2992.

* 392 Rochester Way, Eltham, London SE9 6LH.

RAE COURSES 1976-7

(See also p597, August issue)

Bangor. Bangor Technical College. Tutor, C. A. Billington, GI3WSS. Mondays and Thursdays, 7-9.30pm, commencing 20 September. Enrolment from 8 September. Details from the college or from GI3WSS, tel Holywood 4277.

Bedford. Westfield School, Queens Park, Bedford. Tutor, E. Elsley, G3YUQ. Wednesdays, 7-9pm, commencing mid-September for 20 weeks. Details from the headmaster, Mr Kiggins, tel Bedford 67353, or G3YUQ, tel Bedford 65171 ext 56.

Birkenhead. Birkenhead Technical College. Tutor, L. Roberts, G3EGX. Thursdays. Enrolment early September. Details from G3EGX, 18 Croxteth Avenue, Wallasey.

Borehamwood. Borehamwood College of Further Education, Elstree Way, Borehamwood. Tutor, G. L. Benbow, G3HB. Wednesdays, 7-9.30pm, commencing 22 September. Morse instruction will be included if there is sufficient demand. Enrolment 8 and 9 September, 4-8pm.

Brentwood. Brentwood Evening Institute, Shenfield School, Essex. Tutor, T. E. Downing, G3MXH. Thursdays, 7.30-9.30pm. Enrolment 8 September, 7-8.30pm. Details from the institute, tel 0277 216722, or G3MXH, tel 0277 226503.

Bridgnorth. Bridgnorth College of Further Education, Stourbridge Road, Bridgnorth. Mondays, commencing 20 September.

Burgess Hill. Marle Place Adult Education Centre, Leylands Road, Burgess Hill. Tutor, F. R. Canning, G6YJ. 30-week RAE course commences 7.30pm, 21 September. 20-week basic electronics course commences 7.30pm, 20 September.

Colchester. Colchester Institute of Higher Education, Sheepen Road, Colchester. Tutor, Dave Mason, G4AZK. Details from G4AZK, tel Colchester 70271 ext 66.

Crawley. Sarah Robinson School, Ifield, Crawley. Tutor, R. Scrivens, G3LNM. Mondays, 7-9pm, commencing 27 September. Enrolment 17 September, 7-9pm. Details from G3LNM, tel Crawley 22540.

Doncaster. Doncaster Metropolitan Institute of Higher Education, Waterdale, Doncaster. Commencing week beginning 20 September. Enrolment 13, 14 and 15 September. Details from D. Smith, head of dept of electrical engineering at the institute.

Dudley. Dudley Technical College. Tuesdays and Wednesdays, 6.30-8.30pm. Enrolment 7-8 September (evenings). Details from dept of electrical engineering and science.

Enniskillen. Enniskillen Technical College. Commencing September. Details from GI4CZW.

Framwellgate Moor. Durham Technical College, Framwellgate Moor. Tutor, G3ZJY. Commencing 20 September. Prior enrolment essential.

Harrow. Hatch End High School, Headstone Lane, Harrow. Tutor, D. T. Busby, G8ELB. Commencing 29 September, 7-10pm (with morse). Enrolment 18 September, 10-3pm, and 21 September, 6.30-8.30pm at Nower Hill High School, Pinner Road, Pinner. Fee £11.70. Details from G8ELB, tel 01-864 4411 ext 39.

Heanor. South East Derbyshire College, Ilkeston Road, Heanor. Wednesdays, 7-9pm commencing September.

Huddersfield. Celandine Nook Adult Education Centre, Newhay Road, Huddersfield. Enrolment 9 September, 7-9pm. Fee £7.80 for three terms. Details from G3SDY, tel Kirkburton 2905.

Ilford. County High School for Girls, Gants Hill, Ilford. Tutor, W. G. Hall, G8JM. Wednesdays, 7.15-9.15pm, commencing 29 September. Enrolment 13 and 16 September. Fees £7.50 (over 18), £3.75 (under 18).

Knottingley. Knottingley High School, West Yorks. Tuesdays, 7pm, commencing 21 September. Enrolment 16 September, 7pm.

Langley. Langley College of Further Education, Station Road, Langley. Mondays, 5-6.30pm (operating techniques), 6.30-8pm (morse), 8-9.30pm (theory). Students may enrol for any combination of these sections of the course. The college is also holding an advanced amateur radio class for those who are licensed or who have passed the RAE. Holders of class B licences may also take morse lessons in order to obtain a class A licence. Enrolment for both classes 7, 8 and 9 September, 2-8pm. Details from E. C. Palmer, G3FVC, senior lecturer in charge of amateur radio courses at the college.

Leeds. Airedale and Wharfedale College of Further Education, Calverley Lane, Horsforth, Leeds LS18 4RQ. Tuesdays, 7-9pm, commencing 13 September. Enrolment 6-7 September, 6.30-9.30pm. Morse class Mondays, 7-9pm. The college is also holding an advanced amateur radio course designed for newly-licensed amateurs, covering choice of equipment, its adjustment and detailed operating procedure. Details of both courses from R Greenhalgh, head of engineering, tel Leeds 581723.

London (Acton). Acton Technical College, opposite Acton Town Hall, High Street, Acton, London W3 6RD. Tutor, W. G. Dyer, G3GEH. Wednesdays, 6.30-9pm, commencing 22 September. Enrolment 9, 13 and 15 September, 6.15-8.15pm. Fee £6.50 for three terms.

London (Chingford). Chingford Community and Adult Education Centre, Friday Hill House, Simmons Lane, Chingford, London E4. Tutor, G8EAY. Commencement and enrolment 20 September. Class 7.30-9.30pm. Fee £6. Details from G8EAY, tel 01-500 6034.

London (Holloway). Grafton Radio Society, Holloway Institute (annex), Highgate Hill, London N7. Tutor, B. C. Bond, G3ZKE. Commencing 20 September, 7-10pm. Enrolment commences 13 September. For details tel 01-485 7065.

London (Paddington). Paddington Institute, Amberly Road, Paddington (opposite St Mary's Hospital, Harrow Road; No 18 bus). Tutor, D. T. Busby, G8ELB. Commencing 23 September (without morse). Enrolment 13 September, 6.30-9pm. Details from G8ELB, tel 01-864 4411 ext 39.

Loughborough. Loughborough Technical College, Radmoor, Loughborough. Tutor, D. R. Doughty, G3FLS. Tuesdays, commencing 14 September, 6-7pm (morse practice), 7-9pm (theory and practical). Enrolment 6, 7 and 8 September, 6-8pm. Fee £7.20.

Manchester. Openshaw Technical College, Whitworth Street, Openshaw, Manchester. Tutors, A. B. Langfield, G3IOA, E. Horne, G8IYX. Commencing 21 September, 6.45pm. Enrolment 6, 7, and 8 September. An advanced course is also offered for licensed operators wishing to progress beyond the theoretical standards of the RAE.

Manchester. Moorside High School, East Lancashire Road, Swinton. Thursdays, commencing 30 September. Details from G8BFP, tel 061-794 3706.

New Ollerton. Dukeries Comprehensive School, New Ollerton, Notts. Tutor, C. J. Morgan, G8LPX. Tuesdays, 7pm, commencing 21 September. Details from the adult education office at the school or from G8LPX, 113 Henton Road, Edwinstowe, Mansfield, Notts.

Newcastle-upon-Tyne. Gosforth Adult Association, Gosforth Secondary School, Gosforth. Tutor, D. R. Loveday, G3FPE. Tuesdays, 7-9pm, commencing September. For details write to the principal, or tel Newcastle-upon-Tyne 668439.

Princes Risborough. Princes Risborough Adult Education Centre, County Secondary School, Princes Risborough. Tutor, R. Whiting, G3POF (morse instructor S. Ford, G4ACV). Mondays, 7-9pm (theory), Thursdays, 7-9pm (morse), commencing week beginning 20 September. Enrolment 8 and 9 September, 7-9pm, or at first class.

Redruth. Cornwall Technical College. Mondays, 7-9pm, commencing 20 September. Details from W. D. Old, G3CZZ, head of electrical engineering at the college, tel Camborne 3066.

St Ives. St Ives County Secondary School, St Ives. Mondays, 7-9pm, commencing 1 October. Details from headmaster D. W. Blackford, tel St Ives 5438 (home), St Ives 5608 (school).

Scunthorpe. Scunthorpe Amateur Radio Club, The Shack, Grange Farm Hobbies Centre, Franklin Crescent, Scunthorpe. Commencing September. Details from G3MSB, or from the club on Tuesday or Thursday evenings.

Sheffield. King Edward VII Lower School, Darwin Lane, Sheffield 10. Wednesdays, 7pm, commencing 6 October. Details from G3JON, tel 367774.

Southend-on-Sea. Southend-on-Sea College of Technology, London Road, Southend-on-Sea. Commencing September. Enrolment 7 and 8 September. Details from G3KMT, tel Southend-on-Sea 353931 ext 043.

Stockport. Avondale School, St Lesmo Road, Stockport. Tutor, G8AJB. Thursdays, 7.15pm, commencing 30 September. Enrolment 21-23 September. Details from Stockport Town Hall, tel 061-480 4949, or from G8AJB.

Wembley. Copland Evening Institute, Wembley. Tutor, Dave Hoare, G8FQJ. Commencing early October (with morse). Enrolment early September. Details from the institute, tel 01-903 3323.

Wigan. Wigan Adult Education Centre, Parsons' Walk, Wigan. Tutor, T. Austin, G3RCA. Commencing 20 September, 7-9pm, with an extra evening to suit students to be arranged. Enrolment 6, 7, 8 and 9 September, 6.30-8.30pm, or on the first evening. Fee £8.70 for 30 weeks.

the month on the air

John Allaway, G3FKM *

THE "QTC" pages of August *Radio Communication* listed an item concerning a meeting of African societies which had been held in Botswana recently. More encouraging news has been received from Andrew Pomfret, 9G1LZ, concerning the fact that the Ghana Amateur Radio Society was re-formed on 1 June and now has a special callsign—9G0ARS—for use on special occasions. Readers may recall that the President of Ghana visited a previous special event amateur station, and it is most encouraging to hear of the authorities in a leading African country showing their interest in and appreciation of the amateur radio service and its value to their nation.

News from overseas

Les Anstead, who was formerly in the Cayman Is using the callsign ZF1JA, has been posted to Bahrain after spending a year studying in the UK. He has been issued with the call A9XBJ and is currently active on 14MHz—mostly around 14,300kHz. He hopes to be on 3·5MHz later in the year.

In a letter dated 20 July, Eric Trebilcock, BRS195, informed your scribe that his world trip and stay in Britain had to be curtailed on account of family illness. Eric had already spent three weeks in this country but had unfortunately not been able to see all those he was hoping to meet and extends his sincere apologies.

Ann Buckby, G4EYL, and her husband G3VGW, recently spent a two-week spell in Gibraltar. Ann operated as ZB2YL and believes that she may have been the first lady operator on the air from ZB2. She was pleased to be able to give G3XBR his YL DXCC, as he had previously worked 99. The equipment used was an FT101 and a dipole loaned by G3ATU/ZB2CJ. News of current Gibraltar activity is that Graham, ZB2GF, was due to return to Norfolk by the end of August. ZB2DN (who was formerly ZD8RR etc) left in July and will be in Bermuda by the time this is being read. The RAF club station ZB2A was off the air because it was being moved to a new location but operation should have resumed late in August with an FT200, tri-band quad, and dipoles. ZB2U is a silent-key, but it appears his callsign is being used by a pirate. ZB2CJ has returned to Sunderland but hopes to return before the end of the year, and at least two potential licensees are awaiting their RAE results.

10m Activity Day

A repeat of the successful event held in April has been arranged for Sunday 3 October, from 0001 to 2359. All amateurs and listeners are asked to take part. Call "CQ 10 metre activity day", and exchange reports and serial numbers (starting from 001). It is suggested that cw stations restrict themselves to the band 28,000 to 28,100kHz, and ssb 28,500 to 28,600kHz. This is another propagation study of the 28MHz band at the bottom of the sunspot cycle. Please send a summary of all stations heard and worked, together with any comments on conditions, and please include beacon signals but *not* those arriving via oscar. Reports should be sent to David Whitaker, BRS25429, 57 Green Lane, Harrogate, N Yorks.

At least 400 UK amateurs are known to have come up on 28MHz for the April test, and it is hoped that double that number will take part this time in order to demonstrate that the band is still very much usable.

DX news

K4II is touring around the Pacific area and should be heard as K4II/ZL at the beginning of September. Following this he expects to be in American Samoa as K4II/KS6 from 7 to 10, and K4II/KH6 from 11 to 13 September. Al, WA6QFN/KM6 and his wife Gerry, WA6QFO/KM6, are hoping to visit Kure Is in the near future—QSL cards for either of them should be sent to WA6QFO. Following the death of W6DAB, 5W1AB is now asking for QSLs to be sent to the address given in "QTH Corner"; ZK1DA's QSL manager WA5OCN has a new address which will be found in the same place. Simon, VR1AF, has been noted around 14,270kHz between 0630 and 0830. VR8A closed down at the beginning of August and is now in New Zealand where he has the callsign ZL2BJU. An area not often heard—Wallis Is—is currently being activated by Michel, FK8CO, who is on the island for a six-month tour of duty and who is using the callsign FW8CO. He has been a good signal on 14,110kHz ssb in the French-speaking net area of the band.

Since the departure of A35AF from Tonga at the end of June there has been no resident amateur on the islands. Kazu now seems to be on Niue Is and to be using the callsign ZK2AR. He has been reported on 14MHz ssb, and it may be recalled that he often used to join the Pacific DX Net on 14,265kHz at 0600 when he was operating from Tonga. He asks for QSLs via JR1ATU.

Ron Miles, who was formerly VQ9M, is in the Marshall Is area and using the callsign KX6MK. Those who would like a contact with Lord Howe Is may try looking for VK2FT/LH who has been reported on 7,005kHz and 14,028kHz. QSLs for contacts made since May this year should be sent to K1TZQ.

Current activity from the Solomon Is includes Jim Simister, VR4AA; Dave Newman, VR4DN (who is newly licensed and awaiting delivery of a TS520); Wes Elton, VR4DX, and Neville Green, VR4EX—who finds that he can work the world with his 10W and dipole.

VK5WV is said to have logs for contacts made by VK0IN during his stay at Mawson between 17 December 1975 and 25 January 1976. VK0IN himself may be on Macquarie Is during October.

9X5VF was previously 9U5BH and is believed to keep a schedule with his QSL manager ON4LM on 21,210kHz between 1200 and 1300 daily. 5H3JR should have left Tanzania during August and returned to using his W3EHG call from Washington. He should return to 5H3 in the early part of 1977. Stations in Botswana have been using the special prefix 805 to celebrate their country's 10th independence anniversary.

Guy, FR7ZL, was expected to be on the air from Europa Is for a two-month period from July. He reports that there is currently no activity from Tromelin or Glorioso Is, and none from Juan de Nova apart from himself. He uses an HW32 and 12AVQ and dipole aerials.

* 10 Knightlow Road, Birmingham B17 8QB.

Although the situation with regard to licensing in Libya is not clear, both DJ4LW/5A and DJ8LP/5A have been reported on 14MHz ssb, and it is believed that QSL cards from the latter have been accepted for DXCC credit.

There is no fresh news of the rumoured expedition to Iraq by a group of Polish amateurs, but September is said to be a likely time.

West Coast DX Bulletin says that AP2KS is willing to make schedules on any band from 3·5 to 28MHz. Please send requests to M. Khalid Shakoor, 3411 D Shami Hoka, I/S Lohari Gate, Lahore, Pakistan, accompanied by IRCs and an sae.

Those awaiting QSL cards from stations for whom INDXA has been listed as QSL manager may wish to contact WA4NRE who, according to the source mentioned in the previous paragraph, may be able to provide quicker service. He also has BV2B cards, and may be reached at Box 1895, Knoxville, Tenn, 37901, USA.

CE9BSA appears to be an operator called Jorge, who is using his personal callsign from CE9AV's station. He requests QSLs via CE2MZ. CE9AV (S Shetlands) appears quite frequently on 14,050 or 14,120kHz at 1800. Other CE9s (including AT, AU, AW, AY and AZ) are believed to keep alternate watches on 14,120kHz between 1600 and 1745 daily.

JX2FL is now active from Jan Mayen and will be there for one year. JX2HK and JX6DS have left the island.

Many strange callsigns have been heard emanating from the USSR. These are stations using the R prefix—eg R1AR (QSL to UK1OAA), R3FL, and R9NO, and they are marking the 50th anniversary of amateur radio in their country.

Those still waiting for a 5A1TA QSL card may be interested to learn that the holder of that callsign is now GW3ZNN.

Contests

Congratulations to the winners of this year's **Bermuda Contest**—these are Peter Gambles, G4GI, and Al Slater, G3FXB, who won the phone and cw sections respectively. Both will enjoy a week of Bermudian hospitality in late October as reward for their efforts.

The CQ WW DX Contests

0000 30 October to 2400 31 October (phone).
0000 27 November to 2400 28 November (cw).

All bands 1·8 to 28MHz. Exchanges consist of RS/T plus CQ zone number (UK is in zone 14). Three points are gained for contacts with other continents, and one for contacts with one's own. Stations in one's own country may only be worked for multiplier credit and no QSO points counted. The multiplier is the total number of zones and DXCC and DARC countries worked on each band added together. Final score is arrived at by multiplying the total of QSO points by this figure. In the case of single-band entries the score is the QSO points multiplied by the number of multipliers. There are three categories of entrant: (a) single-operator single- or multi-band, (b) multi-operator, single transmitter (all band), and (c) multi-transmitter multi-operator. In category (c) several transmitters may operate simultaneously but only one signal may be radiated on each band. Entrants should use separate log sheets for each band and follow the layout of the official form with 40 QSOs per sheet. Log and summary sheets may be obtained from *CQ* by sending IRCs and a large self-addressed envelope. A supply is also available from G3FKM (sae please). Logs should be posted to CQ WW DX Contest Committee, 14 Vanderventer Av, Port Washington, LI, NY, 11050, USA. Phone entries must be postmarked by 1 December and cw logs by 15 January 1977.

W1WY has kindly supplied the following results of the **1975 CQ WW DX Contests:**

CW SECTION—SINGLE-OPERATOR

Callsign	Band	Points	Callsign	Band	Points	Callsign	Band	Points
G3LNS	**All**	**893,784**	**G3JKY**	**All**	**16,684**	G3PVA	14MHz	63,583
G3MXJ	,,	759,780	G3ZDD	,,	15,132	**GM3WRN**	,,	**15,533**
G3FXB	,,	714,875	G3MWZ	,,	11,470	G8DI	,,	10,665
GD5BOY	,,	**469,116**	**G2BOZ**	**28MHz**	**2,442**	G6NK	,,	5,312
G3ESF	,,	170,016	**G3RZI/A**	**21MHz**	**87,340**	GM3SSB	,,	4,060
GI3JEX	,,	**158,725**	G4CNY	,,	52,360	G3CWL	,,	320
G3DYY	,,	119,646	G3LCJ	,,	22,673	**GM6RV**	**7MHz**	**10,340**
G3ZQW	,,	106,264	**G3HCT**	**14MHz**	**247,294**	**G3HTA**	**3·5MHz**	**72,917**
G4ALG	,,	105,165	G3RUX	,,	172,700	**GD4BEG**	**1·8MHz**	**8,932**
G4BUE	,,	71,374	G3KDB	,,	164,754	**GM3YOR**	,,	**2,679**
G3XBN	,,	51,054	G3TXF	,,	113,715	**G4BXT**	,,	**2,071**
GM3CFS	,,	**48,000**	G3GRL	,,	107,930	G3YMC	,,	1,700
G2AJB	,,	26,244	G3SXW	,,	104,312	**GW3XNS**	,,	**792**

CW SECTION—MULTI-OPERATOR, SINGLE-TRANSMITTER

G3RAC	**361,108**	G4EOK	104,280	**GM3ZRC**	**51,040**
G3GIL	187,748	G3YEC	87,368		

Certificate winners are listed in bold type. Congratulations to **G2BOZ** (world sixth on 28MHz), **G3HCT** (world sixth on 14MHz), **G3HTA** (world sixth on 3·5MHz), and **GD4BEG** (world second on 1·8MHz).

PHONE SECTION—SINGLE-OPERATOR

G3LNS/A	**All**	**2,595,692**	G4DXW	All	5,609	G4DJC	14MHz	330,222
			GW3MUZ/A	,,	2,232	G5BEF	,,	217,256
GC5AGA	,,	**460,596**	G3SGC	,,	884	G4CVZ	,,	37,940
G3TXF	,,	303,438	**G4CQM**	**28MHz**	**15,066**	**GW3SLA**	,,	**13,630**
G3YBH	,,	156,252	G2BOZ	,,	14,694	**GM4CHX**	,,	**13,072**
G3NFV	,,	121,270	**GW4CYD**	,,	12,084	GM3SSB	,,	12,264
GM3BCL	,,	**113,393**	**G3WJN**	**21MHz**	**533,943**	**G4AMT**	**7MHz**	**44,748**
GD5DZ	,,	**66,700**	**GW3NNF**	,,	206,240	**G4DKT**	**3·5MHz**	**19,581**
G4DJZ	,,	46,440	G3RFR	,,	10,191	**GM3YOR**	**1·8MHz**	**1,358**
G2AJB	,,	24,750	**G3XYP**	**14MHz**	**810,434**	G4BXT	,,	992
G4BBA	,,	20,570	G3HCT	,,	704,459	G3YMC	,,	518
GM4ENN	,,	**6,240**						

PHONE SECTION—MULTI-OPERATOR, SINGLE TRANSMITTER

G4DAA	**2,728,028**	G3RAC	1,108,978	GW3XNS	145,920
G3WYX	2,488,990	G8JC	838,662	G3UNU	90,147
GW4ENT	**1,450,086**	G5YC	718,788	G3EBH	76,024
G3RCV	1,400,888	G3KMI	648,456	**GM3ZRC**	**63,427**

In the multi-operator, multi-transmitter section GB3MCG scored 3,123,195 points. **G3LNS** was world fifth in the multi-band class and won the European Phone Trophy, **G3WJN** was world highest score on 21MHz, and **G3XYP** and **G3HCT** world fourth and sixth respectively on 14MHz.

The VK/ZL Oceania DX Contest

1000 2 October to 1000 3 October (phone).
1000 9 October to 1000 10 October (cw).

All bands 1·8 to 28MHz. Two points for each contact with VK or ZL, and one point for contacts with each Oceania contact other than VK or ZL. Final score derived by multiplying total QSO points by the sum of VK/ZL call areas worked on all bands. (The same area may be worked on each band for credit.) Exchanges consist of RS/T and serial number (from 001). Logs should show date, time, station worked, band, number sent and received. Each new VK/ZL area worked should be underlined and a separate log should be submitted for each band. A summary sheet giving callsign, name and address (in block letters), details of equipment used, and for each band QSO points and multipliers. A signed declaration that all rules and regulations have been observed should be included. Entries may be multi- or single-band. A special NZART Jubilee Plaque will be awarded to top scorer in each continent in each section of the contest, and a Jubilee participation certificate will be sent to all submitting a log—these will be sent direct to those enclosing postage. All logs should reach NZART Contest Manager, Box 489, Wellington, New Zealand, no later than 31 January 1977. Listeners

QTH Corner

A9XBJ	L. Anstead, c/o Bahrain Telephones, PO Box 14, Manama, Bahrain.
C31FO	F3BW, Yves Prat, Cie de Gendarmerie, 79300 Bressuire, France.
C31HL	F6BKP, Willy Petit, 48 R de l'Avenir, 76620 Le Havre, France.
FG0CRZ/FG7	L. D. Burns, 5125 Tangle Lane, Houston, Texas, 77027, USA.
FP0BB	VE3ECP, J. W. Russell, PO Box 7, Fonthill, Ont, LO5 1EO, Canada.
FW8CO	Hihifo Airport, Wallis Is.
JX2FL	via LA4YF, Hans E. Kinck, 3800 Bo I Telemark, Norway.
DL7NS/OH0	via DL7SI, Benekendorffstr 13, 1000 Berlin 28, Germany.
ST2SA/0	WB7ABK, 3049 Doris Ct, Lake Oswego, Oregon, 97034, USA.
TJ1BG	via K4ZLZ, J. F. Hester, RFD 2-Box 194, Bladenboro, NC, 28320, USA.
TY9ER	Rudi Egner, PO Box 1587, Cotonou, Cameroon.
VR1AF	via W7OK, W. D. Brickley, Box 95, Las Vegas, Nev, 89101, USA.
VR6TC	via W6HS, C. Moser, 2153 Lyans Drive, La Canada, Cal, 91011, USA.
VR8A	now ZL2BJU, N. K. Thompson, 12 St Andrews Rd, Waiouru, New Zealand.
ZK1DA	via WA5OCN (new QTH) 10703 Dunlap, Houston, Texas, 77096, USA.
3D2AJ	via W6SC, E. H. Hale, 412 E Arbor Av, Sunnyvale, Cal, 94086, USA.
5W1AB	now via P. J. Rivers, PO Box 112, Apia, Samoa.
9G0ARS	Ghana Amateur Radio Society, PO Box 3773, Accra, Ghana.
9X5VF	via ON4LM, Max Hermans, Stropstraat 119, B-9000 Ghent, Belgium.

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

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may enter this contest—only VK and ZL stations should be logged and date, time, call, station being worked, RS/T of the VK/ZL, serial number being sent, band and points. Scoring is otherwise the same.

Awards

There have been changes in the handling of awards issued by *CQ Magazine*. Applications for the **WPX Award** should now be sent to Bob Huntington, W6TCQ, 5014 Mindora, Torrance, Calif, 90505, USA. **DX Award** applicants now send their forms to Rod Linkous, W7YBX, 5632 47th Ave SE, Seattle, Wash, 98136, USA. Note that **WAZ** applications still go to Dr John Attaway, K4IIF, Box 205, Winter Haven, Fla, 33880, USA, and **Bicentennial Award** to Bernie Welch, W8IMZ, 7735 Redbank Lane, Dayton, Ohio, 45424, USA. Please note that forms of application for the WAZ and DX Award are available from G3FKM, who also acts as UK check point for the QSLs, thereby obviating the need to post cards to the USA. No checking is required for WPX—application forms are also available from your scribe. A brief reminder of the requirements for applicants is set out below:

WAZ Award

For confirmed contacts with all 40 *CQ* zones since 15 November 1945. Phone, cw, two-way ssb or mixed-mode endorsements are available, also single-band versions (which must be all one mode) and for which all contacts must have taken place since 31 December 1972. The fee for each is eight IRCs. (This award is not available to listeners.)

CQ DX Award

For confirmed contacts with at least 100 countries on the *current* DXCC list (note that deleted countries may not be counted). All contacts must have been either on cw *or* on ssb—mixed awards are not issued. Endorsements are available for 150, 200, 250, 275, 300, and 325 countries. Fee for basic certificate is eight IRCs. (This award is also not available to listeners.)

WPX Award

Available to listeners as VPX Award. CW, phone, two-way ssb, and mixed modes. Certificate is issued for a basic 400 prefixes confirmed for all-mode, 300 for single-mode. Endorsements for bands as follows: 1·8MHz—35 prefixes, 3·5MHz—150, 7MHz—250, 14MHz—300, 21MHz—300, and 28MHz—250. Endorsements are also issued for continental prefixes on the following basis: N America—126, S America—88, Europe—146, Africa—80, Asia—68, and Oceania—51. An sae and one irc is required for an endorsement and a separate form used for each applied for.

Would readers please note that the last paragraph in the "Awards" section of August MOTA referring to the committee of the ARMS should have appeared before the details of the Mobile Century Award. The two certificates listed are issued by ARMS and *not* by G4BUE!

To celebrate the 10th anniversary of Barbados independence, the Amateur Radio Society of Barbados is issuing a special award in connection with the use of the special prefix 8P7 by Barbados amateurs during October and November. The climax of this special activity period will be all-day operation on 30 November. Overseas amateurs who make contact with at least five Barbados amateurs during this period may claim the award by sending proof of contacts, such as copies of logs, with USA $1 to ARS of Barbados, PO Box 814E, Bridgetown, Barbados.

Band reports

The feature of the past few weeks seems to have been the relatively large amount of activity on 28MHz, with signals from the east coast of the USA breaking through occasionally.

At the time of writing, your scribe's receiver was registering the loudest signal it has ever recorded—unfortunately this was a pulse transmission emanating from the Soviet Union which has been making 14MHz entirely unusable for long periods. It has also been interfering with other services and seems to suggest that only lip service is paid to ITU regulations in some countries.

Many thanks to the following for information supplied: G2HKU, G3HB, G4RZ, G5JL, G6GH, G3s APZ, KSH, LOL and NKQ, GM4CHX, G4s DXE and EAN, BRSs 17567, 36928, and As 8713 and 8961.

Stations listed in italics were using cw.

3·5MHz. **0000** PY1YP, TF5TP, W1UF. **0100** CZ20, PY, TF3TF. **2200** JY3ZH. **2300** A2CBW, KZ5HP, PY, ZB2DL, 9G1JX.

7MHz. **0000** *W2, W3.* **0400** HC6TA, TI8CAM. **0500** *CE, CO, HI,* HK0BKX, *TI, VE7, VE8,* VK, *VP1MPW,* YV, *XE, ZL.* **2200** AP2P.

14MHz. **0200** VU2GDG. **0500** FR7s AD, BE. **0600** FB8ZJ, FO8s DH, EL, 5W1AX. **0700** FO8DO, *JY9CR,* KJ6CF, TA1ZB, ZK1CX. **0800** AH3FF, KH6, KJ6DL, KS6GK, VR3s AH, AK, ZK1BA, 5W1AB. **0900** FW8CO, VR8A, 3D2AJ. **1200** VQ9DF, 5R8WC. **1400** FG0CRZ/FS7, FP0BB. **1500** D6A, HK0BKA. **1600** A4XGB (QSL to G4CTQ), JT1AS, 9V1NR. **1700** ST2SA/0. **1800** VQ9HCS, *VR4CW.* **1900** JW1SO (Besr Is), ZB2RB. **2100** 7X2EPM (Box 2, Algiers). **2200** CZ20, HC8RG, *JAs, JT1AM, VP2MFB* (QSL to W2OFB). **2300** *VK, VS5MC, YS1O, ZL.*

28MHz. Many European signals throughout the day. **0700** 5B4, 9H. **0800** VQ9HCS. **0900** HV3SJ, JY9CR. **1000** EA8CR, SM0EKT/OH0, 7X4MD. **1400** W2, W4. ZB2DL, 9J2BO. **1600** OY1A, UH8HAI. **1700** *CX4LO.* **1800** EA9EO, *F0AOJ/FC* (QSL to HB9ASZ). **1900** LU, PZ, *ZD8TM,* ZP9AC. **2000** *PZ9AB,* W1. **2100** VP9AD, W1-W4, W8, 6W8AAD, 8P6, 9Y4NP. **2200** AJ4DPN, FM7WR, HI8MOG, KP4, TI2TB, VE3, YV4BDB. **2300** W1-W3 until 0100 occasionally WA0LAK, *5B4CY.*

Very many thanks to all correspondents, and to the authors of the following for items obtained from their publications: *CQ Magazine* (**W1WY**), the *Ex-G Radio Club Bulletin* (**W3HQO**), *DX News Sheet* (**Geoff Watts**), the 29 *DX Club Newsletter* (**VK6RV**), *Long Skip* (**VE1AL/3**), the *West Coast DX Bulletin* (**WA6AUD**), and *DX'press* (**PA0TO**).

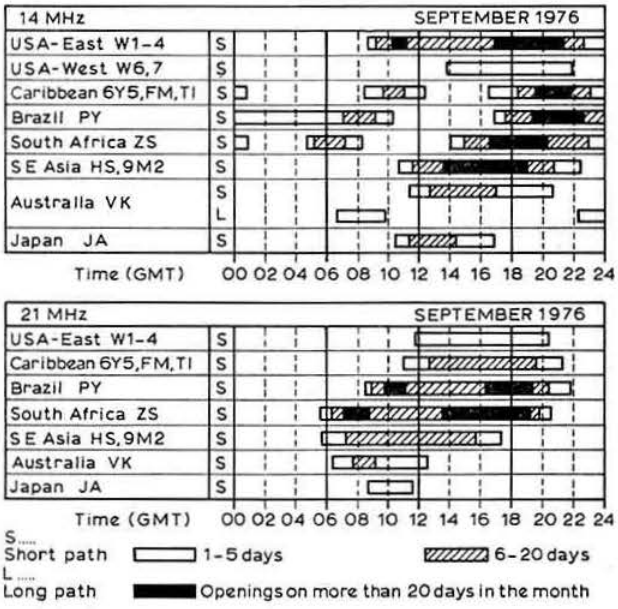
Please send all items for **October** issue **to reach G3FKM** no later than **8 September**, and for **November** by **6 October.**

Propagation predictions

A slow improvement in conditions on hf bands will occur during September. This will be noticed less on **28MHz** which will remain of little use for dx. The season for short skip will also come to an end on both 28 and **21MHz** during this month. Dx traffic with Central America, South-East Asia and Australia on **21MHz** will improve slightly compared to the previous months.

Longer nights and the coming autumn mean almost no dx during the latter half of the night on **14MHz.** Because of this, **7MHz** will become the main carrier of dx during this period. Contacts on this band and on **3·5MHz** will be possible when the greater part of the path lies in darkness: this is most important for 3·5MHz. Longer nights and the decline of static will improve dx conditions on 7 and 3·5MHz. Local traffic will be interrupted by the dead zone at various times in the latter half of the night.

The provisional sunspot number for June 1976 from the Swiss Federal Observatory was 12·4. There was a limited amount of solar activity during the second half of the month. The observatory notes that in the first half of 1976 42 new sunspot groups have appeared, of which only six belong to the new cycle. The predicted smoothed sunspot numbers for October, November and December are 6, 5 and 4 respectively.



Special event stations

GB3RF, 9-11 September
This station will be operated during Rayleigh Fair 76. Rayleigh Round Table are reviving the fair, which was held for 300 years until 1899. Operation will be on all bands 160-2m. Details from G4CEU, QTHR.

G3HWW/A, 11 September
Operational during the Diamond Jubilee of the Cub movement at their HQ, Snowball Plantation, Stockton on Forest, nr York. Details from G3WVO, QTHR.

GW3EOP/A, 11-12 September
This station will be operated by the Port Talbot ARS during the third South Wales Model Show, which is being held in the Recreational Centre, Bridgend. The exhibits are notable for their range and quality and should appeal to old and young. Operation will be mostly ssb on all bands, with most time probably being spent on 80, 40 and 20m. Commemorative QSL cards will be sent. Details from GW4ESV, 8 Cerise Close, Aberavon, Port Talbot, W Glam, tel Port Talbot 6712.

G4ATC, 12 September
This station will be operational during the Staffordshire Wing Air Training Corps' Exhibition at RAF Stafford. The event coincides with the ATC's annual parade and the visit of AOC air cadets. Operation will be on 160, 80, 20 and 2m, and equipment will be operating on the ATC's own hf and vhf channels. Details from G3COY, QTHR.

GB2DYF, 18 September
The 405th Venture Scout Unit are operating this station during the Denton Youth Festival at Edgerton School, Denton. Operation will be on 80, 20 and 15m and special QSL cards will be sent. Details from G4EAP, QTHR.

G3TIH/P, 19 September
Operational during Cub/Scout Diamond Day, the Diamond Jubilee of the Northamptonshire Cub/Scout movement, at Daneholme Park, Daventry. Operation will be mainly on 80m for contacts with other Scout groups and amateurs within the UK, and will begin at 1pm.

GB3STD, 24-26 September
Operational on 80-10m and 2m from St Dunstan's, Ian Fraser House, Ovingdean, Brighton, by members of St Dunstan's ARS. Details from G3SEJ, QTHR.

GB3PS, 16-17 October
This Jamboree-on-the-Air station, operated by the 3rd Prestatyn Scouts and members of the Rhyl & DARC, will be located at Bastion Road Field, near the beach, Prestatyn, Clwyd. It will operate on 80-15 and 2m. There will be scouting and amateur radio exhibits and special QSL cards will be sent. Details from GW3JGA, QTHR.

GB3OCV, October
This station will be operational on the hf and vhf bands throughout October to mark the 30th anniversary of the Cray Valley RS. Commemorative QSL cards will be sent. A 2m contest is to be held on 10 October and a 160m contest on 17 October. A certificate will be awarded to stations collecting 30 points for working/logging Cray Valley callsigns and those of its members during the month. Details from G3YWO, QTHR (enclose sae).

HF propagation study

Predicted hpfs (MHz × 10) for September 1976

gmt =	00	02	04	06	08	10	12	14	16	18	20	22	24
Aden	143	128	139	225	262	281	279	285	295	233	183	152	143
Ascension	155	149	140	125	244	277	285	295	305	319	276	177	155
Bahrain	135	122	144	215	253	266	266	267	275	230	177	145	135
Bangkok	117	111	150	200	230	241	242	241	202	183	167	136	117
Barbados	147	124	122	116	148	228	248	247	246	252	246	208	147
Bermuda	140	114	115	111	115	201	228	233	228	229	230	204	140
Bogota	143	121	117	114	140	171	244	242	241	243	242	210	143
Buenos Aires	148	138	134	130	147	252	270	270	270	288	274	200	148
Cape Town	148	140	128	201	265	285	291	299	317	308	244	173	148
Colombo	125	120	150	213	249	258	260	257	257	216	183	141	125
Cyprus	128	115	124	191	230	249	247	247	255	244	186	136	128
Dakar	144	134	129	145	229	270	277	282	284	307	270	178	144
Denver	134	114	103	102	110	110	153	185	201	211	199	169	134
Fairbanks	130	120	115	128	148	148	155	157	168	168	167	139	130
Falklands	152	139	135	135	143	252	272	275	280	300	272	194	152
Gibraltar	92	84	82	103	144	172	173	169	171	173	157	110	92
Hongkong	111	110	145	190	216	227	230	192	174	161	149	134	111
Honolulu	130	115	108	114	159	139	130	124	152	191	174	144	130
Iceland	89	79	79	88	128	144	154	154	150	152	139	102	89
Jamaica	143	119	115	112	139	161	229	233	229	232	229	202	143
Lagos	155	149	131	182	258	284	291	299	317	324	252	173	155
Las Palmas	138	124	119	129	197	238	244	239	242	255	230	162	138
Lima	150	129	126	120	150	164	257	251	252	258	252	209	150
Los Angeles	134	114	103	102	116	110	111	174	200	204	191	163	134
Malta	106	97	97	143	180	204	204	201	205	205	171	117	106
Mauritius	148	130	136	230	272	285	289	295	304	281	214	155	148
Mexico	136	111	101	103	143	128	181	214	214	220	208	182	136
Moscow	96	92	92	152	176	190	199	196	196	190	147	116	96
Nairobi	150	134	135	219	266	285	286	295	309	294	220	158	150
New Delhi	121	115	153	205	238	247	248	246	229	181	153	138	121
New York	139	116	111	110	110	171	199	215	218	220	211	186	139
Osaka	112	110	125	176	196	206	197	167	143	138	135	134	112
Perth	129	119	150	213	247	257	228	197	182	162	148	140	129
Rio de Janeiro	153	139	135	134	159	263	272	275	274	286	274	197	153
Salisbury	153	140	133	213	268	289	291	300	321	305	232	164	153
Seychelles	150	129	138	229	262	276	277	286	301	276	208	148	150
Singapore	121	115	153	205	238	247	248	246	243	229	173	131	121
Suva (s)	122	114	112	155	183	191	199	185	148	173	141	133	122
Suva (l)	145	154	135	176	181	158	149	147	117	157	238	180	145
Sydney (s)	111	110	145	190	216	227	194	181	172	144	144	134	111
Sydney (l)	147	129	128	120	154	130	121	117	115	117	183	205	147
Teheran	130	120	150	213	249	258	260	257	266	234	176	141	130
Vancouver	133	116	110	110	126	122	124	152	158	173	181	153	133
Wellington (s)	112	110	120	174	191	188	186	169	155	139	140	124	112
Wellington (l)	143	141	135	139	139	120	107	107	110	164	188	188	143

RSGB RADIO COMMUNICATION EXHIBITION REPORT

In mid-1975 the idea of reviving the RSGB Radio Communication Exhibition was canvassed among traders at the Woburn Abbey Rally and later at the Leicester ARRA Exhibition. Following a favourable response from the trade, the decision was made by the Society to hold a three-day exhibition at Alexandra Palace at the end of July 1976, and potential exhibitors were advised of this in February 1976.

Around the beginning of July 1976 the Amateur Radio Retailers Association (ARRA) circularized their members and potential non-member exhibitors to the effect that any dealer who attended any major exhibition in 1976 would not be invited to attend the ARRA Leicester Exhibition at the end of October 1976. In consequence of this, the RSGB also circularized potential exhibitors giving the background to the planning of its exhibition and commenting on the salient points in the ARRA circular.

Although during the time the RSGB Radio Communication Exhibition (Radcomex 76) was being organized the ARRA had not communicated the feelings of its members to the RSGB, the Society made strenuous efforts to contact the secretary of the ARRA to arrange a meeting to discuss the problem which had arisen. Contact was eventually made and the secretary agreed to arrange a meeting, but in the event this meeting did not take place.

The Society did not accept that holding its exhibition in London in July was in conflict with the Leicester Exhibition in October. The Society has a duty to its members to organize conventions and/or exhibitions which will attract the maximum number of members and the general public, and with a population in London and the SE region of 10–12 million, the number of members in that part of the country is correspondingly high.

Although several well-known amateur radio traders did not attend Radcomex 76, a considerable number did so and expressed satisfaction with the event. During the three days of the exhibition the attendance was almost 5,000, and the Society is grateful for such magnificent support.

RADCOMEX 76 was opened at noon on 30 July by Lord Wallace of Coslany. In his opening address he spoke of his long-felt desire to become a radio amateur and how, although personal circumstances had never permitted him to realize this ambition, he had felt some consolation in the fact that a member of his immediate family had taken up the hobby instead.

The contact with the Society that had ensued had led him to raise various issues concerning amateur radio in Parliament and this in turn had brought an appreciation of the great achievements of the Society and its members in the fields of research and emergency service.

It was, he said, his profound conviction that the value and service of radio amateurs had not been given the recognition and publicity they deserved, and that there was still "a good story to be told".

After the formalities were over, Lord and Lady Wallace toured the exhibition, accompanied by the Mayor of Haringey, Councillor Vic Butler; Mrs Joyce Butler, MP; Roy Limb, G8FLA, Chief Executive of Haringey; and RSGB President John Allaway, G3FKM.

There was a reception for overseas visitors held during the evening of 30 July which was attended by radio amateurs from New Zealand, Norway, the Sudan, Sweden and the USA.

Each day there was a raffle held for a Marconiphone 12in tv receiver, and the following were the lucky winners: J. Carney of Luton (Friday), F. S. G. Rose, G2DRT, of High Wycombe (Saturday) and W. A. Dix of Chelmsford (Sunday).

Around the stands

Aarvak Electronics displayed an interesting selection of new and surplus components, including a useful-looking range of ferrite rings and rods suitable for use in braid-breakers.

The **Amateur Radio Bulk Buying Group** was showing examples of equipment built from its kits, including the now-classic G3ZVC ssb transceiver. One new kit shown which could prove popular was the *Electronics Today International* 144MHz power amplifier (see below). Other new items of interest included a crystal-controlled toneburst generator, a high-stability version of the Catronics DFM5 frequency meter and a kit for the *Wireless World* Teletext decoder.

The firm is the UK agent for *VHF Communications* and the stand featured an impressive display of equipment built from designs in that magazine.

The **Amateur Radio Mobile Society** exhibited various equipment suitable for mobile operation, together with its newsletter and other information about the society's activities.

AMSAT (UK) had a superb model of Oscar 7 on display, built by F6DBG and F1DRG, and a continuously-running slide and tape show gave details of amateur satellite operation.

Axial Products exhibited its range of vhf and uhf aerials, as well as a selection of semiconductor devices and other components. One interesting offering was a novel combined toneburst generator and time-out warning device. This incorporates a crystal-controlled tone oscillator with a 50ms delay so that the carrier has time to open the repeater squelch before the tone is sent, thus allowing consistent access with a short 250ms tone.

Also on display was ammonium persulphate etching fluid which is much faster than the ferric chloride commonly used for this purpose.

As usual, **B. Bamber** had an enormous choice of ex-equipment components, hardware and Pye rt spares. Of particular interest were some variable-voltage stabilized PSUs giving 0–24V at 500mA and a large range of ex-equipment panel meters.

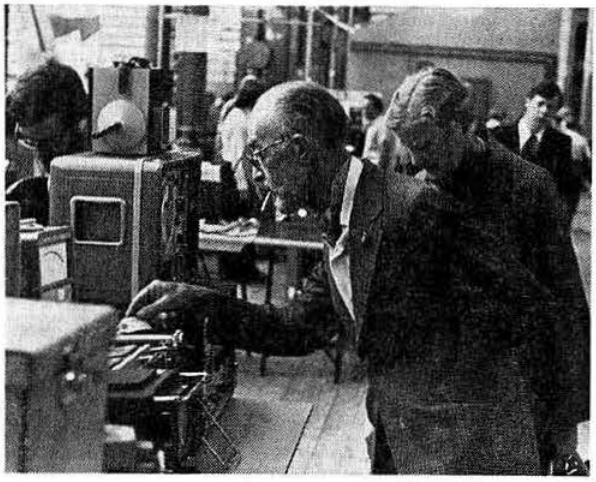
The **British Amateur Radio Teleprinter Group** showed various working items of typical rtty equipment, including an auto-transmitter. The new and completely revised edition of the group's publication *RTTY the easy way* was also on view. This includes complete constructional details of a terminal unit suitable for both beginners and established rtty operators, and some special components for this design were available on the stand.

BBC Ceefax gave a convincing display of this colourful new tv information system, which has almost completed the experimental stage before going into full service. Ceefax "pages" can be received on an ordinary tv receiver equipped with a special decoder, and give all kinds of information, from news headlines and weather forecasts to sports results and financial news. BBC1 and BBC2 each have their own 100-page magazine, so there is plenty of material to choose from. Three pages were devoted to Radcomex 76 for the duration of the exhibition.

One problem at the moment is that the decoder required is rather expensive to buy ready made. However, kits are already available (and shown elsewhere in the exhibition), and in any case the price is expected to fall dramatically as soon as special-purpose ICs are produced.

BBC Radio London set up a stand but unfortunately were unable to participate in the exhibition due to an internal dispute.

One of the pleasant surprises in an exhibition like this is to discover the extent of the range of goods offered by many well-known firms. Certainly this was true of the **J. Birkett** stand. The range of new components, often branded full-specification devices, was impressive and there were several "snips" to be found (eg an RCA



"How much is that?"

CA3089E for £1!). Also shown was a useful range of crystal filters and ex-equipment crystals, as well as new multimeters and other small test gear.

S. J. Branson showed several items of test equipment. There was also a good selection of waveguide components, including travelling wave tube amplifiers. The stand also featured a rather formidable-looking remotely-controlled antenna tuning system which attracted a good deal of interest.

Burns SCS was showing its well-established line of test equipment, together with a selection of semiconductor devices and other components. The company is an agent for Motorola business radios, and the MX300 Series hand-portables were among those shown.

"Time" was the main theme of the **Bywood** stand, and its horological exhibits ranged from wooden pendulum clock kits to the latest digital clock designs.

Lurking under one of the tables was the prototype of Videtty, a tty-compatible keyboard and vdu based on the National Semiconductors SC/MP microprocessor chip. The display was shown on a 625-line tv receiver equipped with a uhf modulator. Although the device is primarily intended for use as a microcomputer terminal it should also be of interest in the rtty field. Production samples are expected to be available later this year.

The **C & C Electronics** stand featured the firm's wide range of crystals for popular vhf transceivers and also for use as frequency standards. There were bargains to be found among a selection of crystals apparently manufactured for the old band plans (we beat a hasty retreat!).

One of the highspots of the exhibition, in more senses than one, was the **Clarbrook Engineering** stand. All day the telescopic tubular masts were seen going up and down, and adults as well as children were having fun operating the winches and foot pumps.

The centrepiece of the display was the trailer-mounted version of the Hilomast, which was being shown for the first time, but there were other examples that were wall-mounted and base-mounted in order to show the convenience and versatility of the Hilomast system.

Cobham Engraving was producing personalized callsign badges "on the spot" from its wide and attractive range. One of the most popular is a rectangular badge with white lettering on a choice of coloured backgrounds which features the BARTG, RAEN or RSGB emblem.

Sharing the stand was **Fulcrum Engineering** which was showing a cassette player, storage system and lamp combined in one compact unit.

The display of **CSE Electronics** included two interesting RCA pa modules and associated PCBs. Model R17M18 is a 144MHz amplifier with an output of 18W from only 100–150mW drive, while the R44M10 module can deliver 10W at 432MHz for the same drive. The modules are only a few inches long and would seem to have several applications in the design of compact amateur equipment.

M. N. Corbett exhibited a selection of ex-equipment boards and components, together with a range of coaxial cable and some substantial aluminium enclosures. Also shown was the G. Packer QRA locator/distance tabulation which is available individually computed for any given location.

C. P. Developments had a varied display, including used equipment, new and ex-equipment components, and fast pcb etching fluid. Mention must be made of a 12V 5A regulated power supply which was shown. These are offered as completely built and tested units at £9.50 and carry one year's guarantee.

Datong Electronics demonstrated its famous rf clipper and the more recent frequency-agile filter and repeater timer.

What is possibly the ultimate in add-on units was also shown for the first time in prototype form: the cryptically named Up-Converter. This remarkable device converts any amateur band receiver covering 28–29MHz or 144–145MHz into a 60kHz–30MHz general coverage receiver without, it is claimed, any loss of performance. In this way all the sophisticated and expensive features of the main receiver can be utilized over a much wider frequency range. Operation is simple: all that is required is to connect the unit in series with the aerial lead to the main receiver and select the required 1MHz tuning range with a front-panel switch. The Up-Converter should be available later this year at a price "less than a low-cost general-coverage receiver".

The range of products exhibited by **Doram** showed an increasing involvement in the amateur radio field. Prominent on the stand were a new range of vhf aerials for mobile use, crystals for the 144MHz band and the Microwave Modules range which is now stocked. The firm is expanding in other directions as well—the first of a new range of 25 kits was on display. This was a high-quality Band 2 fm tuner; other kits include a bench power supply and an af generator.

Electronic Digital Clocks had some attractive examples of these on display, together with some bargain component packs.

"Electronics Today International" showed several items built from designs featured in that magazine. These included an electronic music synthesizer and electronic clocks, but one item of special interest was a 45W amplifier for the 144MHz band (described in the September issue of *ETI*). This is designed for use with mobile transceivers having a power output of around 10W fm. The circuit uses a single 2N6084 transistor, and tx/rx switching is carried out using diodes and coaxial lines thus avoiding the need for an expensive coaxial changeover relay.

The **F. R. Galka** stand was packed with oscilloscopes, signal generators and other test equipment. The selection was good and the items looked clean and serviceable.

Garex was showing its well-known range of spares for commercial radiotelephones, together with some test and rt equipment. Also shown was the new Fourmobile 70MHz mobile transceiver. This 15W a.m./fm rig is basically similar to the Twomobile, being fully transistorized except for the driver and pa, and based on the same popular rt components for ease of servicing and ready availability of spares. In the event of the 70MHz band allocation being lost the equipment is easily modified for another vhf band.

Another item of interest was an a.m. to fm receiver conversion kit for the Pye Cambridge or Vanguard which uses an ic discriminator and involves only minor modifications to the existing circuit.

Greenweld Electronics had available a wide choice of test equipment, receivers, transmitters and radiotelephones, as well as some ex-equipment components.

HBR Electronics exhibited a solid-state vdu which, it is claimed, solves that age-old problem of rtty reception: the bulky and noisy mechanical printer unit. The new unit, which can be set to any one of four standard speeds, displays messages on an external 625-line tv receiver fitted with a uhf modulator. If a permanent record is required, all that is necessary is to record the received audio tones on an ordinary domestic tape recorder for playback later.

Another noteworthy item was an sstv message generator. Up to 256 characters can be stored by this unit, arranged in eight pages, and there is a choice of 64 different characters. The majority of components required are available as a kit which comprises a built and tested logic board, a keyboard pcb and diodes for the keyboard matrix.

As usual, **J MG Electronics** had plenty to offer the bargain hunter. This included roller coasters, atu components, heavy-duty transformers, test equipment and rack after rack of small components and hardware. As with several other stands, many of the items offered were of the type that is almost impossible to obtain brand new, at least on the amateur market.

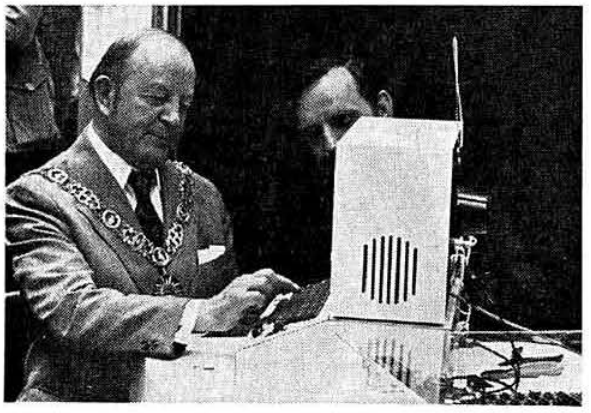
The range of add-on units for vhf and uhf transceivers exhibited

by **Modular Electronics** attracted a lot of interest. These included a new 25W linear amplifier especially designed for the ICOM IC202, and a new 432MHz preamplifier. The stand also contained a good selection of vhf and uhf components at attractive prices (eg 2N6084 for £11.25!).

"Practical Wireless" was exhibiting several built examples of its designs, including a capacitance meter, general-coverage receiver, digital frequency meter, wobbulator, morse code filter and a hf crystal converter. One focal point of the stand was a demonstration of the Videowriter featured in the August issue. This is an electronic typewriter which presents an alphanumeric display on a 625-line tv receiver fitted with a uhf modulator.

Another attraction was the special event station GB3PW which was operated from the stand by the magazine's editor, Lionel Howes, G3AYA.

Sharing the stand was *Practical Television*, and its display included a Teletext decoder built from a design published in that magazine.



The Mayor of Haringey, Coun. Vic Butler, tries out the Videowriter on the "Practical Wireless" stand, watched by Roy Limb, G8FLA, Chief Executive of Haringey

The **Radio Amateur Invalid and Bedfast Club** had a display of information about its activities. Also shown were a band edge marker and an rf field indicator designed and built for blind radio amateurs by Alan Dryborough, G8HEV, and now available through the club.

Radiotronics offered a varied assortment of plugs, hardware, some test equipment and components. There were also some useful mains filters. One of the best-selling lines for obvious reasons was real leather cases for hand-portable transceivers at 15p each!

As usual the **RSGB** stand had a large display of books and Society requisites, and members of the HQ staff and certain committees were on hand to deal with queries.

Dan Tilcock was showing an extensive range of tools, including several spanner sets, together with some used equipment.

The **UK FM Group (London)** was displaying information about its activities, including copies of its newsletter and the booklet *GB3LO—what you hear and why*.

There were bargains in instrument cases and boxes to be found on the **West Hyde Developments** stand, as well as a range of tools and other hardware.

Talk-in and demonstration stations

The talk-in service was operated by a rota of 30 members of Grafton Radio Society and Southgate Radio Club, under the guidance of Michael Fadil, G4CCA. The Society is grateful to all of them for their magnificent efforts. Equipment used was as follows:

Band (MHz)	Callsign	Mode	Equipment	Aerial
1·8	GB3RS	ssb	FT101	Dipole
3·5	GB3RS	ssb	SB102, SB200	Dipole
144	GB2VHF	ssb	FT221	Collinear
144	GB2VHF	fm	IC22A	Collinear
144	GB2VHF	fm	TS700	Collinear
144	GB2VHF	fm	KP202	

The equipment was in the main loaned by club members and the aerials were erected with the assistance of a BBC rigger.

Several standard routes were drawn up and displayed in front of the operators. The progress of incoming mobile stations was noted on special cards bearing the time and location when first contacted, together with other relevant details.

A small number of complaints were overheard to the effect that the talk-in service had "monopolized" channels, but against this criticism it should be noted that a gratifying number of amateurs took the trouble after reaching the exhibition to personally thank the operators.

The demonstration station GB2AP was also operated by members of the Grafton and Southgate clubs. Equipment comprised a complete Drake-line station kindly loaned for the event by Radio Shack Ltd, and well over 200 contacts in 40 countries were made over the three-day period.

Credits

The Society extends its thanks to all the individuals and groups who worked so hard to make the exhibition a success and to the many traders who supported it.

Particular mention must be made of the help received from Phil Thorogood, G4KD, who placed his vast exhibition expertise at the Society's disposal; members of committees who were in attendance, and members of headquarters staff whose sterling efforts before and during the exhibition contributed greatly to its success.

Future plans

Following the success of Radcomex 76, it has been decided to hold an International Radio Communication Exhibition and Convention at Alexandra Palace on 6-8 May 1977.

The convention will cover hf, vhf and microwaves, with lecture streams on all three subjects on the Saturday, and it will be followed in the evening by a dinner and dance.

Correspondence

Several members have written to the Society about Radcomex 76, and it is hoped that those who were disappointed by the absence of certain traders will appreciate from the above report that this was entirely due to actions over which the Society had no control.

As we go to press, the following statement has been received from the ARRA

Statement issued by the Amateur Radio Retailers Association, Sunday 8 August 1976

The members of the Amateur Radio Retailers Association wish to express their regret to the visitors to the Alexandra Palace Exhibition who were disappointed at the absence of many major traders.

We feel it is necessary to present some explanation and this follows.

Early in 1976, a circular letter was sent out by the RSGB to all the major dealers in the UK. This letter asked each dealer if he was available to put on a stand at a proposed exhibition at the Alexandra Palace. Most of the leading suppliers of amateur equipment replied to the effect that, for a variety of reasons, they could not attend.

Some of the factors influencing their decision are as follows:

By the time a prospective exhibitor has paid for his stand materials, fees to the organizers, staff accommodation and transport costs, he has spent a great deal of money. The majority of the members of the Amateur Radio Retailers Association had already committed their 1976 budget to the existing Leicester exhibition and it was simply not possible to afford two major shows in this particular year.

It was inadvisable to time the Alexandra Show at the peak holiday period, when many families are out of this country, dealers' staff are reduced in number and interest in amateur radio is at its lowest ebb.

The members of the Amateur Radio Retailers Association have always supported the aims of the Radio Society of Great Britain and will continue to do so in the future.

YOUR SOCIETY

DURING the past three years the Radio Society of Great Britain, the national society in the UK for radio amateurs, has gained more than 5,000 new members, many of whom have little idea of the Society's activities, apart from receiving Radio Communication, *possibly entering contests and using the QSL Bureau. This article is intended to give these members and many others a brief insight into the Society and its organization.*

What is the function of the RSGB?

There is a great deal more to the Society than producing a monthly journal, running contests and a QSL service—although even these do not just happen. Considerable thought, work and backroom activities are needed to keep the journal going month after month, year after year, and the same is true of contests and many other activities.

The Society's most important role is to co-ordinate the requirements of radio amateurs so that it can represent fully their interests when negotiating with national and international authorities. It would be unrealistic to imagine that any licensing authority would be willing or even able to deal with each licence holder in isolation, and the Society must therefore be capable of collating all the different facets of the hobby for the common good.

The organization of the Society for these purposes is achieved through the devoted service of a large number of voluntary workers, the majority of whom are elected to office by the members themselves, with the backing of an efficient full-time headquarters staff.

What kind of headquarters is necessary?

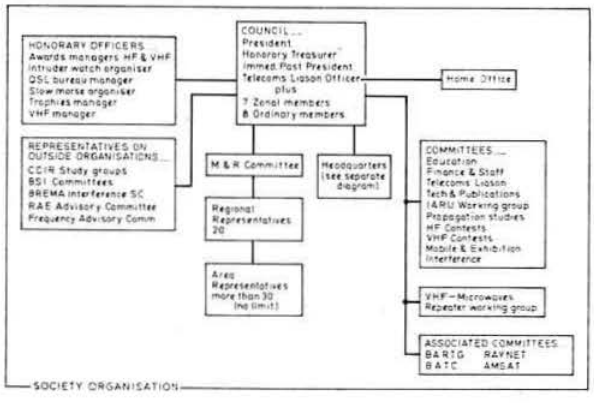
The size of the organization necessarily depends on the number and extent of the services it provides. Much of the work is undertaken by paid staff, while additional specialist knowledge is provided by members competent in various fields of activity. The Society's paid staff deals with membership subscriptions and records together with all the queries raised by members on a vast variety of subjects. It also handles members' purchases from the Society of books and other goods which it produces.

A duty of any national society in a specialist subject is the dissemination of knowledge and the Society does this by the publication of a monthly journal, supported by technical books, maps and other items. The production of a journal and books requires authors and editors, quite apart from printing, organization and money invested, and in order that the technical content is factual and reliable all material must be checked by experts in the particular subjects covered.

Although a number of good reasons can be advanced for setting up the administrative centre in the provinces, investigation has shown that the advantages of operating the Society from London are overwhelming. Present population statistics show that in Greater London there is a population of 7·379 million, in Birmingham 1·013 million, Glasgow 0·894 million, Liverpool 0·603 million, Manchester and Salford 0·672 million, and Leeds and Bradford 0·796 million.

The Society's present organization

The Society is governed by a Council consisting of eight ordinary members elected by national ballot, and seven zonal members who are elected by members resident in their respective zones.



The President of the Society is assisted by the Executive Vice-President, the Immediate Past-President, the Honorary Treasurer and the Telecommunications Liaison Officer. He is elected by the Council and is usually a Council member who has served in this capacity for several years. Occasionally a distinguished person in the radio science or other field is elected as President; such persons have benefited the Society in the past and will continue to do so in the increasingly complex negotiations with the authorities which frequently take place.

The Honorary Treasurer, who is elected by Council. is usually a professional accountant and a member of the Society.

The Telecommunications Liaison Officer is elected by Council to maintain a continuous contact at various levels with our administration on all matters affecting amateur licences in the UK on behalf of all amateurs.

In addition to the elected members, the Secretary of Council is the General Manager/Secretary. He is responsible for convening meetings and preparing the agenda, recording the proceedings and carrying out Council's decisions.

The Editor attends Council meetings to collate material which is to be published in *Radio Communication* and advise on editorial matters.

How does a member become a Council member?

Any corporate member, licensed or otherwise, may become a member of Council, provided he has been a member of the Society for at least three years and is properly nominated by 10 corporate members. Elections are held every year to fill the vacancies that occur, and notice of these elections is published in *Radio Communication*.

Successful candidates are usually those who have become well known to the membership generally, either for their work for the Society, service to clubs or for some other activity (such as contributing to *Radio Communication*) which has attracted members' attention. Recognition usually takes some time to achieve but this should not prevent any prospective candidate from seeking election.

Election as an ordinary member will require a much larger vote than for a zonal member, since in the latter case only residents of the particular zone are eligible; the percentage of the total vote in either case is usually similar.

The period of office is three years, which may be followed by a second period of three years if the member is re-elected. After this there is a compulsory break of one year before a further nomination for election can be accepted. Council members are not permitted by law to receive any payment by reason of their office, nor may they be paid for their contributions to the Society's publications while they are in office.

Ordinary members of Council usually serve on a number of Society committees, while zonal members are automatically members of the Membership & Representation Committee and being responsible for a zone are expected to keep close contact with their Regional and Area Representatives and all activities in their respective zones.

The number of Council meetings held in any particular year is decided at the January Council meeting, although the President may call special meetings whenever business demands such action.

Regional and Area Representatives

In order to maintain close contact with the membership the country is divided into 20 regions, each of which has its own representative. A Regional Representative must be nominated by five corporate members in his region and a ballot is held if there is more than one nomination in any region. The period of office of an RR is three years and there are no restrictions on re-election.

An important responsibility of Regional Representatives is to keep contact with their Area Representatives and with all the affiliated clubs and societies in their regions and to provide regular information about local activities for publication under "Club News" in *Radio Communication*.

Most regions cover wide areas of the country and to provide more intimate contact within smaller areas, Area Representatives are elected. As with Regional Representatives, Area Representatives must be nominated by five corporate members and a ballot held where necessary.

Standing committees

As it is impossible for Council to handle in detail all the subjects it has to deal with, it has a number of standing subject committees, membership of which is approved by Council at its first meeting of the year. Each committee elects its own chairman and secretary, and agenda and minutes are prepared by the individual committees and circulated to Council and committee members by headquarters. Important decisions from the committees that call for Council approval are referred to Council as recommendations.

For a committee to have a reasonably balanced opinion it is necessary to have a membership of eight or ten persons who are prepared to devote significant personal time and effort to the particular work of the committee.

The numerical strength required for this work, leaving aside the affiliated specialist groups, is between 112 and 140. However, several Council members are members on more than one committee and this reduces the number of persons required to around 90.

The present standing committees have developed over many years to deal with various matters as they arise and new committees are set up when needed. The committees are responsible to Council for the following matters:

Finance & Staff. This committee is responsible for the supervision of all Society finances and the preparation of the annual accounts. It is also concerned with the appointment and salaries of senior headquarters staff and with the financing of publications.

Membership & Representation. All zonal Council members are automatically members of this committee, which is concerned with membership and the Society's scheme of Regional Representation.

Technical & Publications. Matters of a technical nature are considered by this committee. It is also responsible for the planning of all the Society's publications, and reviews technical articles submitted for publication in *Radio Communication*.

Telecommunications Liaison. All matters concerning the amateur service in relation to the licensing authority are referred to this committee for consideration and action.

IARU Working Group. All material and decisions arising from the UK for consideration by the International Amateur Radio Union are handled by this committee, which is also responsible for recommending Society delegates to IARU conferences.

Education. This committee is concerned with educational matters of interest to the membership. These include special lectures at the Science Museum and elsewhere and the provision of material to assist candidates for the Radio Amateur Examination. Certain members of the committee also sit on the City and Guilds Advisory Panel.

Educational Visits Scheme Working Group. This is a joint working group formed from the M & R and Education committees and is concerned with the establishment and operation of a scheme of systematic lecturing by experienced amateurs in technical colleges and schools.

VHF. This committee deals with matters of interest to members operating in the amateur bands above 30MHz, such as band planning, beacons and other vhf and uhf services.

Two sub-committees of this committee deal with microwave and repeaters respectively.

Propagation Studies. All propagation studies are the primary interest of this committee which investigates unusual forms of communication by aurora or sporadic-E. It is also concerned with the establishment and supervision of a world-wide chain of 28MHz beacons.

Contests Committees. Two separate committees deal with hf and vhf contests respectively. These draw up the contest rules, adjudicate the results, issue the appropriate awards and certificates for the winning stations, and submit details for publication in *Radio Communication*.

Mobile & Exhibition. The function of this committee is to organize any Society rally, convention or exhibition, and provide bookstalls at other rallies, conventions and exhibitions.

Interference. All matters concerning interference from or to amateur stations are referred to this committee which assists members generally in overcoming interference problems. It also maintains contact with the authorities on interference matters.

Raynet. This committee organizes and controls the Radio Amateur Emergency Network. Regular meetings of controllers from the active areas are held at headquarters, and routine exercises are organized from time to time to test efficiency. The whole scheme is operated as a single unit.

Affiliated organizations: British Amateur Television Club and British Amateur Radio Teletype Group. These specialist groups, catering for amateur television and radio teletype, maintain close liaison with the Society by having representation on one or more of the Society's standing committees.

The Society takes considerable care in the choice of persons asked to serve on its committees. They are usually those who have established their position in one field or another, and in specialist subjects they may be sought for their professional qualifications. Such persons can make notable contributions to the Society's work and standing. Not all the most suitable persons live within reasonable distance of the meeting places and in these cases they are sometimes made corresponding members. When the majority of members of a committee live, say, in the Midlands or the North, meetings are held wherever convenient to reduce the travelling time and cost.

Honorary officers

In addition to Council and committee members, there are also those who devote their efforts to many other Society services. The QSL Bureau is operated by a manager and 24 sub-managers who sort and mail QSL cards. The awards managers, hf and vhf, sort claims and arrange delivery of the prized certificates.

Handling of the Society's trophies is undertaken by the trophies manager.

The slow morse practice transmissions organizer is responsible for the functioning of this service which is manned by a devoted band of enthusiasts.

Beacons are much more than just black boxes of fixed transmitters connected to aerials in backyards. Beacon transmitters are usually located in favourable sites on hills, and may be at a BBC or IBA transmitter site, and licences to share their masts are negotiated with the relevant authority. Maintenance of equipment is often a time-consuming job and it is only by the dedication of the beacon-keepers that these useful signals continue with little interruption.

The Intruder Watch, which also depends on a dedicated group of members, is led by the Intruder Watch organizer and observes, traces and reports commercial transmissions or their harmonics in the amateur bands, and has gained the respect of national and international authorities.

Still other members of the Society find time from their occupational and private commitments to attend professional committee meetings of BSI, CCIR Study Groups, BREMA, the Frequency Advisory Committee and the City and Guilds Radio Amateur Examination Advisory Committee.

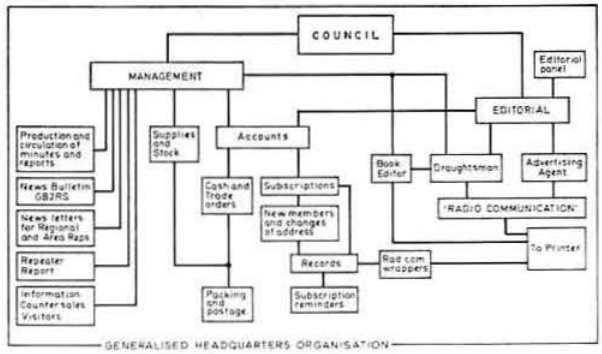
Headquarters organization

The establishment is in two fundamental sections, management and editorial, both of which are responsible to Council for direction.

Amateur radio being a hobby of so many different facets, the Society's headquarters organization has to serve the members in many different ways. The amount of work involved is not always apparent so a few facts and figures may go some way towards an appreciation of its extent.

The Society has almost 20,000 members, all of whom will communicate with headquarters, directly or indirectly, at least once a year regarding subscriptions, ie an average of 400 communications a week. During the past two years new members have joined the Society at a rate of 2,000 a year, added to which some 2,500 to 3,000 members change their address every year, resulting in some 100 additions and amendments to records each week. A considerable number of members will also write or telephone on a wide variety of subjects.

In addition at least half the membership will order a publication or



GENERALISED HEADQUARTERS ORGANISATION

other item during the course of a year and these goods are also sold directly to non-members. The Society also receives a significant number of orders from trade outlets in the UK and overseas. To handle this stream of orders, the packing and despatch of goods efficiently and economically is a continuous process, and the ordering and maintenance of stocks requires constant supervision if would-be purchasers are not to be disappointed. Publications from the USA, although ordered in good time, are often delayed by surface mail and customs clearance and the prices of these books have to be changed frequently to keep in line with the exchange rates.

In evaluating these activities two facts which may be useful as yardsticks are the size of the postage and telephone bills shown in the annual accounts. In the case of telephone costs, it can be taken that for every call we make, we receive at least three from members.

Many people—members and non-members—visit headquarters and are always welcome, not only residents of the London area but people visiting or passing through the capital from the UK and overseas. This demonstrates the importance of headquarters being as near to the centre of national communications as possible.

Management

The overall administrative responsibility is vested in the General Manager/Secretary who has, with his staff, to deal with all Society affairs except editorial.

All incoming mail is sorted into appropriate sub-divisions and passed to the relevant section for action as soon as possible after the office opens at 9.15am, Monday to Friday. All money received is totalled by the accounts section and banked the same day. Subscription payments are listed and passed to the subscriptions records section, as are changes of address and particulars of new members whose applications for membership have been approved by Council.

Cash and trade orders for publications are dealt with by a separate section and are turned round as fast as possible; postal collection of letters and packets being made each day. All mail is normally sent second class unless specially directed—the GB2RS News Bulletin is sent first-class to ensure its arrival on time for the newsreaders.

The General Manager's secretary produces a vast quantity of minutes, agenda and other material to service the Council and Committees. The weekly GB2RS News Bulletin, the quarterly Regional and Area Representatives' Newsletter and the bi-monthly Repeater Report are regularly duplicated and despatched. Some idea of the amount of work done may be judged by the single fact that this work consumes approximately 100,000 sheets of duplicating paper per year! This is of course apart from printed matter, log sheets and the like which are always available either by post or over the counter.

Editorial

The preparation of *Radio Communication* involves very much more detailed and continuous work than is generally realized.

Technical articles received are considered by the Technical & Publications Committee and, when necessary, submitted to acknowledged specialists in the particular subjects dealt with for opinion and recommendations. These are passed to the authors and after any necessary action has been taken by them the articles are accepted for publication.

All other material for publication—regular features, contest and club news, and members' advertisements—are dealt with on receipt so that no delay in publication occurs.

Once accepted for publication, the "copy" has to be edited, and re-written and typed when necessary, while diagrams are redrawn by the Society's draughtsman. The text goes to the printer for typesetting, and diagrams and photographs are sent for block-making. From this material the pages are made up by the editorial staff.

In a parallel operation, the Society's Advertising Representative deals with all trade advertising in a similar manner. It should be noted that all advertising costs are recovered from the income received from advertisers.

All the various processes involved are subject to a very tight printers' schedule so that every issue of the journal goes to press on time and can then be despatched in advance of the publication date.

A recent innovation has been the appointment of a member of the editorial staff as Book Editor to work on the Society's books. Apart from the *RSGB Amateur Radio Call Book*, preparation of which is a continuing process throughout the year, editorial work on books had previously been undertaken by spare-time volunteers outside headquarters. The Book Editor also prepares the script for the GB2RS News Bulletin each week.

This brief outline of the functions of headquarters should enable members to appreciate the extent of the work undertaken on their behalf.

RSGB QSL BUREAU SUB-MANAGERS

(At 1 September 1976)

G2:	J. W. Russell, G2ZR, 55 Holcombe Close, Bathampton, Bath BA2 6UP.
G3 and G4 two-letter calls, G5 calls and GC calls:	E. G. Allen, G3DRN, 30 Bodnant Gardens, London SW20 0UD.
G6 two and three-letter calls; G8 calls:	Mr & Mrs A. J. Mathews, G6QM, 62 Ashlands Road, Hesters Way, Cheltenham GL51 0DE.
G3AAA-DZZ:	C. A. Bradbury, BRS1066, 13 Salisbury Avenue Cheltenham GL51 5BT.
G3EAA-HZZ:	S. L. Newport, G4DEV, 101 Elibank Road, Eltham, London SE9 1QJ.
G3IAA-KZZ:	G. L. V. Butler, G2BUL, 130 Coulsdon Road, Old Coulsdon, Surrey CR3 2LE.
G3LAA-NZZ:	C. A. P. Henderson, G8KNW, 76c The Avenue, Beckenham, Kent BR3 2ES.
G3OAA-PZZ:	J. H. Brazzill, G3WP, 43 Forest Drive, Chelmsford, Essex CM1 2TT.
G3RAA-RZZ:	D. Dell, G3PQF, 6 Rye Close, Farnborough, Hants GU14 9LU.
G3SAA-TZZ:	E. G. Allen, G3DRN, 30 Bodnant Gardens, London SW20 0UD.
G3UAA-VZZ:	M. Newton, G3UKW, 2 Marlowe Court, Garforth, Leeds, LS25 1PR.
G3WAA-XZZ:	F. G. Rylands, G2VF, 39 Parkside Avenue, Millbrook, Southampton, Hants SO1 9AF.
G3YAA-ZZZ:	H. R. Boutle, G2CLP, 14 Queen's Drive, Bedford.
G4AAA-AZZ:	C. Johnson, BRS31379, 118 Harvest Road, Smethwick, Warley B67 6NG.
G4BAA-BZZ:	R. F. Rawlings, G3WBV, 74 The Lindens, Fieldway, New Addington, Surrey CRO 9EL.
G4CAA-CZZ:	T. Cheesley, G4CHP, 2 Willows Close, Upper Tasburgh, Norwich NR15 1NE.
G4DAA-DZZ:	D. Buckley, G3VLX, 16 Wood Ride, Petts Wood, Orpington, Kent BR5 1PX.
G4EAA-EZZ:	P. C. Barry, BRS22730, 32 Rutland Avenue, Sidcup, Kent DA15 9DZ
G4FAA-FZZ:	E. Gibbins, 23 Derry Downs, Orpington, Kent BR5 4DT.
GB:	C. Turner, G8NL, 56 Sunny Bower, Tottington, Bury, Lancs BL8 3HL.
GD:	W. P. Waid, GD3GQX, 1 Mount William, Summer Hill, Douglas, Isle of Man.
GI:	R. R. Parsons, GI3HXV, 45 Erinvale Avenue, Belfast BT10 0FP.
GM:	D. R. Macadie, GM6MD, 11 Marchmont Road, Ayr KA7 2SB.
GW:	J. L. Reid, GW3ANU, 28 Waterston Road, Cardiff CF4 2SS.
BRS and A numbers:	D. Bourne, G4CYW, "Roughways", Chub Tor, Yelverton, Devon PL20 6HY.

Nominations for election to the 1977 RSGB Council

The Articles of Association require that not later than 10 September in each year the Council will send to each member entitled to vote a list of those Council members who retire by rotation or for any other reason on the succeeding 31 December. The list must indicate those members who are willing to accept nomination for re-election and the list must also indicate whether the vacancies are to be filled by election of an ordinary member or on a zonal basis.

The following members retire at the end of this year:

Ordinary members

Mr R. J. Baker, G3USB, (by rotation) who does not wish to be nominated.

Mr P. Balestrini, G3BPT, (by rotation) who will accept nomination for re-election.

Mr D. Byrne, G3KPO, (by rotation) who does not wish to be nominated.

Mr R. F. Stevens, G2BVN, (by rotation) who will accept nomination for re-election.

Zonal members

Mr R. W. Fisher, G3PWJ, Zone B, (by rotation) who will accept nomination for re-election.

Mr W. F. McGonigle, GI3GXP, Zone F, (by rotation) who will accept nomination for re-election.

Mr A. W. Smith, GM3AEL, Zone G, (by rotation) who does not wish to be nominated.

Zone A vacancy

Nominations are also required to fill the vacancy in Zone A caused by the retirement on health grounds of Mr J. R. Petty, G4JW.

Not later than 10 October next any 10 corporate members may nominate any qualified member to fill one of the above vacancies, by delivering in one closed envelope to the secretary of RSGB, their respective nominations in writing together with the written consent of such member to accept office if elected. Each such nominator shall be entitled to nominate only one member for election.

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council proceedings

A brief report of the Council meeting held on 6 July 1976

Present: Dr E. J. Allaway (*President, in the Chair*), Messrs D. J. Andrews, P. Balestrini, J. O. Brown, Dr D. S. Evans, Messrs R. W. Fisher, W. F. McGonigle, C. H. Parsons, D. M. Pratt, W. A. Scarr, A. W. Smith, G. M. C. Stone, C. J. Thomas (*members of Council*); G. R. Jessop (*general manager*), A. W. Hutchinson (*editor*), D. A. Evans (*minutes secretary*).

Apologies for absence were received from Messrs D. Thomas, R. Baker, D. Byrne and R. F. Stevens.

The President said that he had received a letter from Mr J. Petty, who, due to illness, very much regretted that he would have to resign from Council. The President said that he would write to him and offer Council's sincere thanks for his past efforts on behalf of the Society.

Welsh beacon

Mr Parsons reported that the Welsh beacon appeared to have operated satisfactorily on test. The callsign of the beacon would be GB3SGW in line with the agreed policy between the Society and the Home Office for beacon stations to use three-letter callsigns for beacons and two-letter callsigns for repeaters.

Citizens Band

Mr Jessop reported that he had heard there was a Citizens Band Association in existence, based in Cheltenham, and he stressed the importance of Council taking a considered view of the matter in order to agree a Society policy.

Considerable discussion on the subject took place, and it was agreed that the Telecommunications Liaison Committee should look into the subject in great detail and prepare a paper for circulation to Council members.

Data processor

Mr Jessop reported that the IBM32 would be installed on schedule by the end of July. Mr Brown commented that the price of an IBM32 had just been raised by 15 per cent but this would not apply to our machine as the order had been placed some time ago.

Financial report

The interim figures for the first nine months of the financial year 1975–6 were circulated by the Honorary Treasurer. Mr Brown summarized the figures by saying that in the first nine months the deficit was about £1,000 less than had been anticipated. He said that it looked as if the financial figures for the last three months of the financial year 1975/76 would, in fact, show some improvement, which was most encouraging news.

General manager's report

Dr Evans said that he was still worried about the turnover in staff at HQ, and Mr Jessop gave the reasons for this, which had been caused by various factors.

Membership & Representation

No membership totals were available due to staff holidays during which a considerable backlog of new members and changes of address had built up. However, these have now been dealt with. It was resolved:

(i) to accept reduced subscriptions from 19 members;
(ii) to waive the subscriptions of two members;
(iii) to grant life membership to Mr J. R. Shewan, G3UZB;
(iv) to grant affiliation to the BBC Westerglen Ariel Radio Club, the Carrickfergus & District YMCA Radio Club, the De Aston Radio Club, Market Rasen, and the Perry Common School Amateur Radio Society, Birmingham;
(v) to approve the appointments of the following Area Representatives: Messrs J. T. Barnes, GI3USS (Belfast & District); L. Critchley, G3EEL (Peterborough); J. M. Horrocks, G8FTP (NW Manchester); A. B. Langfield, G3IOA (NE Manchester); F. LeCocq, BRS34159 (Jersey); J. E. Martin, GC3YIZ (Guernsey); R. Stubbs, BRS14793 (Rhyl & District).

WARC 79

The booklet, *The Amateur Service*, which had been prepared by the Telecommunications Liaison Officer, had been circulated to Council members. In addition, 20 copies had been sent to the Home Office, members of the Telecommunications Liaison Committee, IARU Working Group and Regional Representatives.

Mr Thomas proposed a vote of thanks to Mr Stevens and, in addition, to Dr Evans for their work on the document. Dr Evans said that he was surprised that a complete system and structure for preparing these documents for submission to the Home Office by groups responsible for different activities had not been established by the Society.

Comprehensive licence

A draft of the proposed licence which the Home Office would issue, probably next year, which would combine all forms of operation within one comprehensive licence, had been circulated. (*See "Radio Communication", July 1976, p491 for details*).

County Emergency Planning Officers

Mr Balestrini said that in the past it had been agreed that RAEN could attend county shows etc on a standby basis, but that last year it was considered that County Emergency Planning Officers should have the authority to call out RAEN if necessary. Following discussions with the Home Office it had been agreed that County Emergency Planning Officers would be included in the new amateur licence.

VHF Manager

The President said that there had been some difficulties with regard

to the post of VHF Manager, due to the fact that Mr Stone was at present working in Belgium.

Mr Stone said that he was on detachment in Brussels until the end of the year, but now came home every weekend and felt that he could carry on as VHF Manager but primarily looking after international affairs. He suggested that the chairman of the VHF Committee be appointed to act as a co-ordinator for UK matters. Mr Stone then withdrew from the meeting while the matter was discussed. After considerable discussion it was agreed by a majority decision that Mr Stone continue as VHF Manager and that while he was abroad the chairman of the VHF Committee act as deputy vhf manager.

Committee minutes

Council accepted the minutes of the following committee meetings: VHF (10/4/76, 2/6/76), Membership & Representation (8/4/76), Repeater Working Group (24/4/76, 15/5/76), IARU Working Group (29/4/76), Education (1/5/76), Mobile & Exhibition (8/6/76), VHF Contests (22/5/76), Finance & Staff (17/6/76).

Mr Scarr reported that the meeting of the M & R Committee in Nottingham arranged by Mr Fisher had not had a quorum. The committee now had only seven members and was not large enough to have reserves. He suggested that, in future, meetings of the committee take place in London on the same dates as Council meetings.

Council agreed that the next meeting of the M & R Committee would take place at RSGB HQ following the next Council meeting on 7 September.

Presentation to the Patron

Dr Allaway said that he and Mr Jessop had been received by HRH the Prince Philip, Duke of Edinburgh, KG, at Buckingham Palace on 24 June 1976. A leather-bound copy of the *VHF/UHF Manual* had been presented to Prince Philip.

obituaries

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

Colonel R. W. Bailey, TD, MEng, G2QB

Bill Bailey died on 6 August. Licensed from the early 'twenties, he remained an enthusiastic cw operator and in 1965-66 was president of the First-class Operators' Club. Many amateurs, young and old, owe their enjoyment of the hobby to his help and encouragement.

Mr A. S. F. Berry, G2BDP

Arthur Berry died on 13 June. He was president of Guildford & DRS, a founder member of RAOTA, and was well-known in the old "District Seiku" days. After the second world war he worked the hf bands and helped younger members attain their morse requirement. Later he mainly worked 2m and took part in a local 2m net until a few months before his death.

Mr W. Bigley, G2AUA

Walter Bigley died on 14 June aged 67. He was a founder member of the Wellingborough R&TVS in 1936, and since 1958 was an active member of the Shefford ARS. An avid constructor, he was active on the hf and vhf bands.

Mr C. Robertson, G3ERY

C. Robertson died on 11 July. He was a founder member of Maidstone YMCA ARC and, although not active recently, worked all lf and hf bands for many years.

Mr M. P. St E. Roche, G3YJS

M. P. Roche, who died recently, was a founder member of the Maidstone 80m net and was active until his death.

The Society has also been informed of the deaths of:

Mr A. Bryan, G2CAJ. **Mr K. Hardman, G8ICM.**

your opinion

The Editor
Radio Communication

Sir—I read in the June issue of *Radio Communication* many letters replying to the article in the May issue, "A case for a data processor". Although I am not a member of the RSGB I can tell you of ARI's experience with data processing.

In the ARI (Associanione Radiotecnica Italiana) we have 12,000 members and we have been using an IBM system 3 (mark 6) processor since 1974. Prior to 1974 we used a variety of systems including punched cards, which were found unsuitable, also data processing centres and time shared machines. Our IBM system 3 is leased from IBM as we found that we get the best results from an "in house" processing system. We are very satisfied with the results, but we have decided that the system 3 is too slow and we are purchasing an IBM32 (155 line/min printer, 14k processor and 13meg disk). The new IBM32 will arrive in November 1976 and will be usad for incoming subscriptions as from 1977. The cost of purchasing the IBM32 is cheaper than leasing the system 3.

ARI also uses its data processor to sort QSL cards by asking first if the incoming card is for a member of ARI or not, and then automatically giving the address to which the cards are to be sent. (I do not believe RSGB will use its processor for this purpose).

Please publish this letter in your magazine for your members who are not in favour of the purchase to read. We are very interested to hear that RSGB is also purchasing an IBM32.

The present subscription to ARI is about £6 per annum and we have seven staff at our HQ in Milan.

Sergio Pesce, I1ZCT
General Secretary, ARI

The Editor
Radio Communication

Sir—No doubt a few eyebrows were raised in RSGB HQ over Mr Bryant's suggestion last month that the RSGB should be responsible for Citizens Band.

I would point out that if the US Government finds it impossible to enforce the laws of CB operation, then Mr Bryant in his self-appointed role as leader of the "free" wireless campaign, or any other group for that matter, will be hard pressed to do any better.

The idea of controlling the growth of CB equipment is a farce, since most of the major British manufacturers just cannot wait to get into what would become (with the aid of the ad-men and sales gimmicks) a very profitable market. It is no coincidence that the re-emergence of the call for CB comes at what must be the saturation point of the colour tv and hi-fi markets.

Commercialization means mass production and an inherent lowering of standards. The last two "booms" left us with timebase hash and afi—must we add cbi to the list? No amount of technical legislation on the equipment can compensate for inconsiderate and uneducated operators. It is a sad fact that those who beat the CB drum most loudly would be the first to benefit in the success of another glorified COMMERCIAL CON.

D. J. Reynolds, G3ZPF

The Editor
Radio Communication

Sir—Your issue for August 1976 carries on page 606 a reference to the design standards to be applied to towers and masts in this country. Similar references are made in an advertisement on page 575. While applauding the initiative to improve the quality, and more particularly the safety of structures used by amateurs, I think a word of correction is necessary because the references as written down are misleading.

The document which lays down the wind forces which structures to be used in the UK should be designed to resist, is British Standard Code of Practice CP3 Chapter V Part II (1972), *Basic Data for the Design of Buildings: Wind Loading*. By applying this standard, which is not difficult to interpret, it is possible to calculate the wind forces which will fall upon the structure.

That Code does not, however, in any way define the way in which the structure itself should be designed to withstand these forces. There is no British Standard which specifically covers this aspect

for masts and towers although a draft Standard is in course of preparation.

Traditionally, therefore, designers have resorted to BS449 (1959) *The Use of Structural Steel in Building*. This standard lays down the permissible stresses which can be allowed in the various members of a steel framed structure under various conditions of applied loading and is principally aimed at steel framed buildings where the predominant load is deadload due to weight. It therefore allows in Clause 13 an increase of 25 per cent in the permissible stress, when this is due to wind loading which is usually small relative to the deadload, for a building. It can also be used to calculate the allowable stresses in masts and towers, but in such cases it is necessary to ignore the relaxation permitted by Clause 13 since the wind load is the major source of loading on the structure.

I think it important to realize this difference in purpose between the two Codes and also to be sure that when designed against BS449 permitted stresses, Clause 13 has been specifically excluded.

R. C. Hills, BSc(Eng), CEng, FIEE, FIERE, G3HRH
Chief Engineer (Transmitters)
Independent Broadcasting Authority

The Editor
Radio Communication

Sir—Isn't it about time to call a truce?

First, we have a battle of modes; then whether or not repeaters are used becomes a bone of contention, and now we are showing our ignorance by bickering about changes in contest rules.

This section is headed "Your Opinion" and should, of course, be where members air their views, but, gentlemen, let us allow each other to have these views and not lower ourselves to the level of personal attack.

In some of our activities we seem to have reached the stage where we are making change for the sake of change. Many of our longest-lasting activities (some contests in particular) are those that have changed least over the years. Re-organization, if not wanted by the majority, is a wonderful way of creating the illusion of progress whilst causing confusion and demoralization.

Many of us will remember the days when good manners and the willingness to listen and try to understand the views of others, was the cornerstone of our hobby. The present trends whereby, for the majority, our operating ability is determined by the depth of our pocket and our activities governed by a vocal minority, if allowed to continue will spoil the enjoyment of amateur radio as, what I believe it still is, a hobby.

Let me appeal to the minority who are in a position to organize our hobby, whether elected or not, to, please, consider the views of those who write, rather than condemn them should they not agree with their own.

M. Pharaoh, G3LCH

The Editor
Radio Communication

Sir—I was pleased to read the lettter from Mr A. P. Ashton, G3XAP, regarding my comments on 160m signals in the January *Radio Communication*. In offering Mr Ashton my congratulations on his WAC with 9W, I have absolutely no doubt that he is in fact "on the same side of the fence" as I am, and irrespective of how good a signal he might have at my location (if I could manage to remain awake to 2am to listen to it!) I am sure that it would in no way qualify for the other league which triggered off my original remarks in the first place.

The "selective operation" which he describes does not explain in any way the phenomenon which I discussed. It is, however, a method of operation which it is the prerogative of Mr Ashton to use if he wishes, and his comments on this, while diverging somewhat from the mainstream of the argument, help to show what a wide range of interests our great hobby caters for. For example, like him, I have an anti-social streak, but this in my case is evidenced by a refusal to be involved in interminable and repetitive local "nets"; whereas, unlike him, having built up a circle of very good friends on the air, I certainly find no anti-climax in an enjoyable two-way cw natter with any of them on mutual interests. Any inability on my part to become involved in activity (which I WOULD find interesting) around 2am is caused by the hard necessity of an alarm clock in my ear at 6.30am!

Mr Ashton said he thought perhaps "everyone was waiting for someone else to speak". After my letter appeared, several people took the trouble to write to me personally, outlining their own experiences in this area, and in QSO several others also mentioned it, the main theme being that "it was about time that someone raised the subject". I also received a very strong "groundwave" from another quarter (where anonymity had better be preserved) inferring that of course many people operated over the power limits on top band, and that in any case the authorities turned a blind eye to it! I am at a loss to understand what challenge or satisfaction anyone with this mentality obtains from his "hobby", and I think that at this time when the future of amateur allocations may well hang in the balance such selfish attitudes and behaviour by an untypical minority does nothing to help our cause.

Regarding my "lack of conviction", one should not make direct accusations without facts. And I obviously had not the facts; but my S-meter produces very interesting comparisons which still persist in spite of any amount of correspondence, and which cannot be explained away simply by variations in conditions, or even by operating in the "selective operation" mode.

My thanks to Mr Ashton for his interest. I would like to say to him that if he drops his guard sometime, and gives me the pleasure of a contact on 160m, it will certainly not turn out to be an anti-climax as far as I am concerned.

T. Hall, GM3HBT

The Editor
Radio Communication

Sir—When visiting some of the rallies this year I found that the talk-in stations were using 145·50MHz as their main operating frequency. This is surely the fm calling channel and should be left open for this purpose.

So what frequency should the talk-ins use? I would suggest 145·00MHz, a frequency which many stations can operate on already and which is still regularly used in many areas for fm and a.m. contacts—yes, some people still use the a.m. mode, so why leave them out in the cold?

Although some stations may have to purchase crystals for 145·00MHz, I feel that this "no-man's-land" frequency, since thankfully it is not used for a repeater, would be a useful addition to their station. Let us have 145·00MHz as a standard frequency for talk-ins and leave the fm simplex channels clear for normal use.

B. C. Ackroyd, G8GOV (supported by other fm stations G8HCK, G8FBX, G8IXW and G8ILW who agree in principle)

The Editor
Radio Communication

Sir—I have been asked by the chairman of the Lusaka All Time DX and Mosquito Swatter Portable Association, Mr Brian "Kafwifwi" Otter, 9J2BO, if mention could be made of his visit to the "First Day of Leicester". He assures me that all ex-9J2s will be gratified to hear this, will know to what it refers, and will be overjoyed to meet him in person.

He further assures me that he will not sing or drink fortified beverage, unless a glass of the same is placed in his hand. . . .

He will be assisted at Leicester by myself, the corresponding secretary of the above-mentioned association.

B. Clark, 9J2CL

The Editor
Radio Communication

Sir—I understand that my callsign is in regular use through GB3LO as G4EGQ/M. I wish to point out that I do not operate any equipment that is capable of working via the repeaters. The call is *not* being confused with G8EGQ/M (Thanet station). My present callsign is not listed in the current *Call Book*—I appear as G8DRS.

G8ECX/M tells me that when travelling through London recently and operating via GB3LO he was advised to close down as he did not sound like the "real" G8ECX.

I realize that the "pirate" problem is a difficult one, particularly with a repeater in London, but publicity will help others to recognize the pirates and take necessary action (or ignore).

P. J. Pennington, G4EGQ

The Editor
Radio Communication

Sir—With the recent increase in fm mobile operation and the repeater development, many of us are faced with the requirement to put up an additional vertically polarized aerial, preferably rotatable and with useful gain. Some of the smaller rotators may be unhappy with the extra load, apart from the expense and trouble.

Is there now any reason to retain the two polarizations? Can we not now agree on all-purpose vertical aerials as standard on 2MHz? Are horizontal aerials really necessary or better for any mode or propagation?

T. G. Ward, G2FKO

The sstv scene

by R. F. G. THURLOW, G3WW*

THE 1st Albatross SSTV Contest on 4/5 September 1976 is being sponsored by BATC and AEC (Advance Electronic srl), San Lazzaro, Italy.

For the third year in succession Ron Johnson, G3GRJ, was awarded first prize in the electronics section of the May 1976 London Telecommunications Region Post Office Employees' Hobbies Exhibition with his home-built WB9LVI-design slow-to-fast-scan converter, "freezing" pictures on a 9in tv screen. G3MNQ has completed his version of this converter for the UK 625-lines 50Hz standard.

From W2DD's "In Focus" sstv column in *CQ* April 1976, it is learnt that between 15 and 20 versions of this converter have been built using pc boards supplied by W3GKW, who with W3LY has expanded the original design to provide fast-to-slow-scan facilities with frame grab etc. Rick Vidmar, W9LXM, has used a surplus microdata core memory plane part No 20002208, and the core drivers and readout amplifiers are all included on a 8 by 12½in board for his converter, while Jim Rodgers, W4ATK, uses 2120RAMS. Norris Sapp, W8LFA, is building both the W0LMD and WB9LVI converters.

The same source gives details of an sstv reporting system devised by K6IIS for and used by the US Navy Marine Corps' MARS sstv speciality network for some time: R stands for readability and S for signal strength, as in common use, with V for video quality as follows:

V5 = Closed-circuit-quality pictures.
V4 = Good pictures with multi-path.
V3 = Good pictures with interference.
V2 = Readable pictures with multi-path and interference.
V1 = Mostly unreadable, loses sync, pictures interrupted.

While there appear to be only three or four home-brew storage tube converters in the whole of USA, in February 1976 Robot Research Inc of San Diego reported the despatch of some 60 of their Model 300 converters, with more orders to be filled. At least four of these 300s are now known to be in use in the UK, and G3GGJ and G3WW have seen one in action at an SWL's QTH. This storage tube converter certainly performed as claimed and as described by G2BAR and owners in W-land. It is interesting to find the WB9LVIs and Robot 300s being used about 50/50, and that in the USA, as in the UK, the former cost about one third of the 300. Reducing the cost even further, Dave Raven, G3TKR, of Shipley, built his WB9LVI with home-made boards and no edge connectors and made an extremely neat job of it.

At an informal gathering of keen sstvers on the night before the Dayton 1976 Hamvention the latest sstv advancements and gadgets, including VE3DVV's light-pen eraser and upside-down pictures were demonstrated. The only details of the formal sstv forum so far received are a cassette recording of WB9LVI's talk on micro processing with his converter and W9NTP's improved colour scan converter.

Mike Cook, G8HBR, of Manchester, demonstrated his sstv message generator and an rtty video display unit as H.B.R. Electronics at the RSGB Radio Communication Exhibition at the end of July. He claims that his sstv message generator (kit available, less psu and case) with keyboard is a new concept in design; instead of switches it uses a double-sided pcb. The back is filled with a diode matrix and the front touched with a probe to type in a message. There are four pages in each memory. Photographs of the generator and the captions produced show a worthwhile addition to sstv operating aides. Did you "see" them on the Sunday morning sstv 3·5MHz net? North and South America did on 14,230kHz.

256-lines video transmissions continue to attract attention. G4BLL with a 256-lines modified Venus Monitor and tape had the first two-way 256-lines 144MHz QSO with a GM. He was GM3KJF using a modified W0LMD keyboard; both found 256-lines video less affected by QSB and QRM than 128 lines. An enterprising W amateur has modified the Robot Model 80A camera for 256 lines.

HB0WQ/P in Liechtenstein, 5B4AH and HC1BU have been active on 14MHz sstv. These stations enabled G3IAD to increase his countries worked on sstv score to 103, with 98 confirmed. Activity is awaited from ZP5 and AP2, but summer short skip on the band has produced sstv signals from most of Europe—as well as the broad commercial teletype signal on the world-accepted sstv frequency of 14,230KHz!

New sstv equipped stations still continue to appear on the bands worldwide, mostly with homebuilt monitors, and tapes to start with. In addition to MK Products kit monitor, the W6MXV design continues to be very popular, along with the DL2RZ fast-to-slow scan camera converter board/kit.

W1VRK reports even Robot have gone *digital* with their new Model 400 128-lines-only scan converter using RAMs. Existing Model 70 series monitors and 80 camera will be discontinued except for export.

*2 Church Street, Wimblington, March, Cambs.

raynet

S.W. Law, G3PAZ *

Those who visited Radcomex 76 will have noted the activity on the Raynet section of the RSGB stand. The large pile of hastily-printed updated information sheets melted at a most satisfactory rate as the diy electronic flasher winked its green signal to interested observers. Little did the crowd realize the staffing problem which arose due to a sudden business commitment of our chairman, but a great job was done by the hastily co-opted G3LRE who gave freely of his time to help out. Thanks, Andy!

G3PAZ and Grace Jeffery (Surrey group) found the work thus greatly eased on the Saturday, while on the Sunday G3BPT and xyl Jane were able to be present and with four on the stand the work went along apace. New members were enrolled, and we are sure that our registrations secretary was pleased with the number of forms she was able to collect during her visit. Many sales were made to members, who found ample stocks of stickers, badges, manuals etc available. The visitors' book was well filled and showed a pleasing number of callsigns from outside the UK, all denoting interested enquiries.

We were delighted to have the opportunity to apologize personally to the Strathclyde controller for the unfortunate slip made in the July column when reporting the paper read at the Glasgow Symposium. Terry Darke is, of course, liaison officer for the area and not a controller as reported. GM3VTB, Victor T. Budas, is the man to contact for membership of Strathclyde group.

Group news

A Hertfordshire group has been formed with controller Jim Sleight, G3OJI (QTHR), who will be glad to hear from prospective members. Groups are forming in both North and NW London, controllers designate being B. C. Bond, G3ZKE, and H. E. G. Watts, G8GBT (both QTHR) respectively. Interested parties please note. The inaugural meeting of the newly-formed SE London Raynet Group was held on 25 May with 15 members. Applications are invited to SE London controller G4AVV (QTHR), from whom copies of the constitution are available for an sae.

A report from the County of Stafford Group informs us that under controller G4CFR there will now be re-formed N Staffs (formerly Stoke), NE Staffs (formerly Burton-on-Trent) and S Staffs (formerly Cannock) groups each with an appropriate controller under G4CFR. The county has been zoned to fit in with the police coverage of local authorities. G3AQW is acting for N Staffs; others are pending confirmation from HQ. Liaison with user services is excellent. Press and local radio station coverage has been organized and we wish every success to this energetic set of groups.

70cm is on the way

Following the allocation of RB0, the channel of 433·00MHz should now be used for Raynet simplex operation pending the commissioning of the repeaters previously reported.

Raynet Committee

It has been decided that members in fringe areas between two groups who wish to belong to both must declare his/her priority for callout to one of the controllers.

The membership as of April was reported as 71 new and 97 re-registered. The number will have risen since Radcomex 76.

Controllers may apply for sheets of nine of the new vehicle identity discs for distribution to responsible group members. These will fit the standard licence holder and are 72p per sheet post paid from the supplies officer (c/o G3BPT, QTHR). The chairman will be on leave and not available during the first three weeks of October.

*130 Alexandra Road, Croydon, Surrey CR0 6EW.

contest news

June 1976 Microwave Contest results

Conditions on the Saturday were generally execrable, but improved to average on Sunday. Power outputs on 10GHz varied from 100mW to 1mW, and several of the entrants could qualify for the 1,000miles/W award! Aerials used were mainly dishes, usually between 1 and 2ft in diameter, but one station used a 22dB horn. On 5·7GHz power was again in the milliwatt range, with dishes up to 3ft in diameter. Power on 3·4GHz was higher—up to 1W—and up to 5W on 2·3GHz, one station using a 16-el loop quad. The 1·3GHz band represents the transition between the (currently) low-power "plumbing" bands and the upper limit of traditional-style vhf/uhf techniques. This was reflected in the power outputs, which ranged from 4W to 100W p.e.p. Aerials too were either multi-element beams—up to 34-el—or dishes up to 4ft in diameter, the majority of stations using beams.

Congratulations to the winners and runners-up in each band. The lone Scottish entry reported eight GMs out on 10GHz—how many other stations failed to put in entries? *P.W.W.*

Posn	Callsign	Score	QTH	QSOs	Best dx	Km
			1,296MHz			
1	G3ZEZ/P	812	ZL09	13	G3LQR	116
2	G3JXN	763	ZL39	17	G3LQR	145
3	G4ASR/P	410	ZL13	7	G4BEL	126
4	G4DDC/P	390	ZL18	7	G8BFX	85
5	G5DF	275	ZL45	7	G6XM	65
6	G3TQF	124	ZM24	2	G4BEL	99
7	G8BQH	104	ZL37	5	G8IDZ/P	45
8	G3FYX	71	YL38	2	G6XM	55
			2,304MHz			
1	G(W)8ADP/P	223	YL25/49	4	G3EEZ/P	86
2	G3EEZ/P	158	YM48	2	GW8ADP/P	86
3	G3BNL/P	140	YL10	2	GW8ADP/P	78
4	G4DDC/P	87½	ZL18	3	G8IDZ/P	72
5	G3FYX	52	YL38	3	GW8ADP/P	45
6	G3ZEZ/P	26	ZL09	1	G4DDC/P	26
			3,456MHz			
1	GW8ADP/P	153	YL25	2	G3EEZ/P	86
2	G3BNL/P	150	YL10	2	GW8ADP/P	78
3	G3EEZ/P	118	YM48	2	GW8ADP/P	86
			5,760MHz			
1	GW8ADP/P	163	YL25	2	G3EEZ/P	86
2	G3EEZ/P	158	YM48	2	GW8ADP/P	86
3	G3BNL/P	150	YL10	2	GW8ADP/P	78
			10GHz			
1	G3KSU/P	385	ZK34	6	G4BRS/P	85
2	G(W)4BRS/P	327	ZL53/YL25	4	G3VPF/P	115
3	GM3DXJ/P	279	YP10	3	GM4BVD/P, GM4DQJ/P	116
4	G3BNL/P	228	YL10	3	GW4BRS/P	78
5	G8BCO/P	102	Hants	4	G3KSU/P	70
6	G5HD/P	95	YK10	2	G3KSU/P	75
7	GW8ADP/P	77	YL25	1	G3BNL/P	77
8	G3EEZ/P	72	YM48	1	G3BNL/P	72
9	G3TDX/P	36	NHM	1	G3TQF/P	36
	G3TQF/P	36	ZM24	1	G3TDX/P	36
11	G3ZEZ/P	9	ZL09	1	G4BGP/P	9
	G4BGP/P	9	HFD	1	G3ZEZ/P	9
			24GHz			
1	G3BNL/P	72	YL10	1	G3EEZ/P	72
	G3EEZ/P	72	YM48	1	G3BNL/P	72

Coventry DF Qualifying Event results

On 11 July 16 teams assembled opposite Ryton Wood, four and a half miles SE of Coventry, for the start of the fourth of this year's RSGB df qualifying events.

Station A, G3TFA/P, was located just N of Bubbenhall, approximately half a mile from the start. Station B, G2ASF/P, manned by G4DSF and G8KYH, was hidden near Cathiron canal bridge, approximately seven miles NE of the start. Brian Mahoney, with his local knowledge, made a calculated guess and located Station B five minutes before the second transmission. The next six competitors, who located Station B within a few minutes of each other, were approximately half an hour behind Brian. All 16 competitors successfully located both transmitters.

After tea at Coventry ARS HQ the organizers detailed the strategy behind the contest from their point of view and thanked competitors for their support.

Posn	Name	Club	Time of arrival Station A	Station B
1	B. Mahoney	Rugby	1445½	1355
2	M. Hawkins	Chelmsford	1510½	1427½
3	T. Gage	Oxford	1516	1441
4	P. Williams	Slade	1529	1427
5	D. Newman	Rugby	1533	1431
6	P. Tyler	Oxford	1533½	1452
7	C. Plummer	Coventry	1541½	1426½
8	A. Simmons	Oxford	1542	1428
9	B. Bristow	Oxford	1445	1544
10	J. Drakeley	Slade	1548	1426
11	A. Butcher	Chelmsford	1501	1559
12	I. Butson	Chelmsford	1500	1616
13	J. McBurney	South Manchester	1507	1616½
14	G. Foster	Stratford on Avon	1620	1545
15	B. Pechey	Chelmsford	1626	1516
16	D. Holland	South Manchester	1502	1627

Subject to confirmation, Brian Mahoney and Trevor Gage qualify for the National Final.

144MHz CW Contest rules

2000-0100gmt, 6-7 November

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

The following general rules, published in the January issue of *Radio Communication*, will apply: 1, 2, 3, 4b, 5a, 6b, 7a, 8b, 9a, 10a, 11-22.

432MHz Cumulative Contest rules

2030-2230gmt, 11, 19 and 27 October, 4, 12, 20 and 28 November

All entries and checklogs to: VHF Contests Committee, c/o Mr L. Hawkyard, G5HD, 100 Shirley High Street, Southampton, Hampshire.

The following general rules, published in the January issue of *Radio Communication*, will apply: 1, 2, 3, 4b, 5a, 6a, 7a, 8b, 9a, 10b, 11-22.

432MHz Open Contest—amendment

In the results table of this contest published in the July issue, the callsign for position 13 should have read G3SBV, not G3SVY.

1976 Region 1 (RSGB) VHF Contest results

Section	Ht Mult	4m × 1·5	2m	70cm × 4	Total	Region 1 QSOs 4	2	70
1. Multi-op								
N Liverpool	2/2/1·8	578	1,700	1,015	3,293	12	49	18
Isle of Man	1	452	1,760		2,212	8	44	
Liverpool	1·8	531	1,199	346	2,076	7	38	12
S Manchester	1·8		1,449	558	2,007		48	17
Ainsdale	2	438	828	100	1,366	9	32	3
Wirral	1		1,012	130	1,142		46	7
G3SLH/A	1·4		886		886		41	
2. Single-op								
G4CZP	2		2,600		2,600		38	
GD2HDZ	1·4	271	627	428	1,326	6	19	9
G8GTP	1·4		718	255	973		43	11
G8BCG	1		475	472	947		39	22
G8GLS	1·8		770		770		32	
G8FDL	1·2		482	127	609		35	7
3. Outside								
G4ESK	1·6		384		384		16	
G4DLB/P	1		353		353		19	
G8BKR	1·6		317		317		10	
GM6UW/P	1	88	225		313	4	13	
G3LCH	1·8		248		248		6	

Contests calendar

12 September DF Final High Wycombe
2-3 October UHF/SHF (Rules in May issue)
9-10 October 21/28MHz (Rules in May issue)
16-17 October 7MHz Phone (Rules in July issue)
24 October 70MHz Fixed (Rules in August issue)
11, 19, 27 October, 4, 12, 20, 28 November 432MHz Cumulative (Rules in September issue)
6-7 November 144MHz CW (Rules in September issue)
6-7 November 7MHz CW (Rules in July issue)
13-14 November Second 1·8MHz
5 December 144MHz Fixed

NATIONAL FIELD DAY 1976 RESULTS

NFD Trophy and Scottish NFD Trophy
Glenrothes & D ARC — 2,577 points

Gravesend Trophy
Channel Contest Group — 2,412 points

Bristol Trophy
Racal Amateur Radio Group — 1,993 points

Frank Hoosen (G3YF) Memorial Trophy
Mansfield Radio Society — 1,147 points

Leading scores on individual bands

1·8MHz	Conway Valley ARS	468 points
3·5MHz	Farnborough & D RS	921 points
7MHz	Ariel RG (BBC)	624 points
14MHz	Mansfield RS	1,147 points
21MHz	Kingsway Technical College ARC	367 points
28MHz	Glenrothes & D ARC	396 points

Overseas station giving most points to entrants
Lusaka Field Day Entry 9J2L/P — 572 points

"A great contest", "Congrats on the new rules", "Very fb fd", "Best set of rules ever", are but a selection of the many enthusiastic comments received with the logs for the 1976 NFD. A lot more comments than usual were in fact submitted, and although not all of them referred to the rules there were approximately 4 to 1 in favour of the new-style contest. Support for NFD had been falling over the years, but we are pleased to record that this time there was a 14 per cent increase in the number of entries—surely another indication of the popularity of the new rules.

The use of licensed power enabled groups to compete with the European portables on more equal terms and as a result the scoring rates in general are up on previous years, with the leading groups working at peak rates of over 40 contacts/hour. Several of the overseas check logs reported a noticeable increase in the signal strengths of the G portables compared with other years.

Propagation on the higher frequency bands was poor for long-distance working, but the excellent short-skip conditions which prevailed more than compensated for the lack of dx. The more northerly stations could take full advantage of their ability to work easily into Europe and their total score benefited appropriately. Low static levels made the lf bands a pleasure to use, but unfortunately 160m still suffered from a lack of activity, and although most groups were equipped for the band they spent little time working it in spite of the benefit to be gained from the multiplier.

Open section

The Glenrothes & D ARC "A" station (GM3YOR/P) is the overall leader in this year's contest and the club takes both the NFD Trophy and the Scottish NFD Trophy for a fine and well-deserved win which it has been working towards for several years. The station consisted of an FT101B with dipoles for 160m, 80m and 40m, a TH3 Mk3 beam, plus a 15m quad, and was operated by GM3OLK and GM3YOR who between them keyed 740 QSOs.

The Channel Contest Group (G4DAA/P), operated by G3FXB, G3MXJ and G4BUE in second place with 2,412 points from 715 contacts receive the Gravesend Trophy. G4DAA/P was located in West Sussex and used a Heathkit SB301/SB401 combination with a Yaesu FR400 as a second receiver. Inverted-V dipoles were used on 160m, 80m and 40m, with a triband quad at 60ft for 20m, 15m and 10m.

The East Barnet Amateur Radio Contest Club (G5FA/P) in third position made 659 QSOs with a Drake T4XB/R4B set-up on 160m and a Tentec Triton on 80–10m operated by G3KTZ, G3RPB, G3RTE, G3UGK, G3XTJ and G3YDX. An extensive aerial farm included a quad, a V-beam, a G5RV, a vertical and a ZL special.

Restricted section

The leading group, and winner of the Bristol Trophy, is the Racal ARG who made 559 QSOs. G3RAC/P was located near Salisbury and was operated by G3KLH, G3PGM, and G3PSH using an FT101B and a 208ft centre-fed aerial.

In second place is the Reigate ATS (G3NKS/P) whose operators G3KAX, G3NKS, G3XIG and G4BXN made 505 QSOs. This station consisted of an FT401 with 132ft centre-fed aerial at 30ft and a Z-match.

The Swansea ARS (GW5ZL/P) takes the third slot. The equipment used was an FT101B on 160m and an FTdx500 on 80–10m with an inverted-V aerial. The operators were GW3GLY, GW3INW, GW3MOP, GW3OAY and GW4CWQ who made 519 QSOs.

There were several requests for the restricted section aerials to be listed with the tabulated results, but unfortunately this is not really a practicable proposition if only because groups often describe their aerials in vague or even ambiguous terms. However, in the 10 leading stations there were three flat-top centre-fed aerials with open-wire or ribbon feeders, two inverted-V aerials, two trapped dipoles, a sloping-V, an 80m loop, and a long wire of unspecified length. Other aerial types which featured were G5RVs, Zepps, an inverted trapped-V beam, a Windom, trapped verticals, and a "14AVQ vertical with 100ft of feeder, strapped 160m".

Scottish NFD Trophy

As noted earlier, the Glenrothes & D ARC "A" station wins the Scottish NFD Trophy. The runner-up is the West of Scotland ARS (GM4AGG/P) operated by GM3KCY, GM3YCB and GM4ASY. The Hamsters (GM3UWX/P) again take third place.

1·8MHz

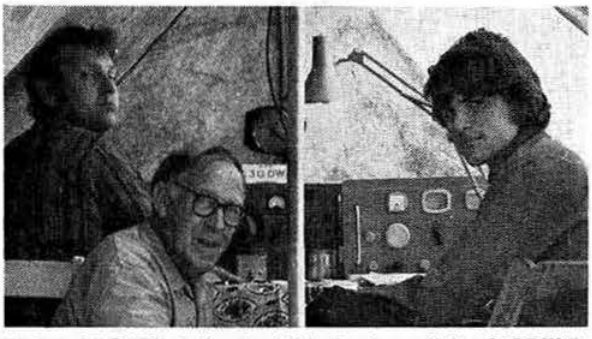
This year's band leader is the battery-powered entry of the Conway Valley ARS (GW6TM/P) with 468 points from 96 contacts. GW3CW, GW3JI, GW3GRY and GW3RQV were the operators, and they used an FT277B plus an outboard 2E26 pa unit with a $\lambda/2$ dipole. Close behind is the East Barnet ARCC (G5FA/P) whose 91 QSOs on this band were made by G3KTZ and G3RPB with the aid of a double-size G5RV aerial.

Although 84 groups were active on 1·8MHz, many of them appeared for only a short spell, whereas the leaders spent about four hours on the band. Peak QSO rates were achieved between 2200 and 0100, but there was also plenty to work from 2100 onwards and up to 0200. Several groups suggested that a multiplier of three be used next year in order to encourage more activity on this band; however, the adjudicators feel that the present multiplier of two is adequate as it should enable groups to add at least 300–400 points to their total score in less than four hours.

3·5MHz

Comments such as "The bread and butter band", and "Old faithful 80m—as dependable as ever", sum up this band nicely. No 12-point contacts were made, but there was always something to work and with the low static levels this year the band was perhaps even more reliable than usual.

The two leading groups concentrated their activities on 3·5MHz, and the Farnborough & D RS operating G3RRA/P made 921 points



Torbay ARS "B" station (restricted) using callsign G3GDW/P. Left to right: G4ELZ, G3GDW and G4EDG

OPEN SECTION

Posn	Group	Callsign	1·8MHz	3·5MHz	7MHz	14MHz	21MHz	28MHz	Total
1	Glenrothes & D ARC—"A"	GM3YOR/P	278	251	565	822	265	396	2,577
2	Channel Contest Group	G4DAA/P	374	476	525	498	149	392	2,412
3	East Barnet ARCC	G5FA/P	464	512	494	458	213	146	2,287
4	Ariel RG (BBC Club)	G3BBC/P	370	453	624	493	140	178	2,258
5	West of Scotland ARS	GM4AGG/P	412	234	397	886	270	0	2,199
6	Verulam ARC	G3VER/P	296	652	517	401	161	62	2,089
7	Torbay ARS—"A"	G3NJA/P	166	564	358	511	52	332	1,983
8	Cornish RAC	G4CRC/P	394	160	322	502	230	268	1,876
9	Horsham ARC	G3TNO/P	286	545	485	327	129	68	1,840
10	Surrey RCC (Croydon RSGB Group)	G6LX/P	286	266	390	436	218	222	1,818
11	Guildford & D RS—"A"	G6GS/P	374	418	611	381	6	0	1,790
12	Chelmsford ARS	G3WSN/P	328	420	342	426	147	124	1,787
13	Stockport RS—"A"	G6UQ/P	354	353	344	502	121	88	1,762
14	White Rose RS	G3XEP/P	342	515	335	500	53	8	1,753
15	Bracknell ARC	G4BRA/P	378	278	304	250	180	358	1,748
16	Cray Valley RS	G3RCV/P	284	351	384	505	132	48	1,704
17	Medway RC Group	G3ZYV/P	302	358	308	362	192	176	1,698
18	Hereford ARS	G3YDD/P	276	269	301	538	188	110	1,682
19	Addiscombe ARC	G4ALE/P	370	351	315	432	91	112	1,671
20	Wirral ARS	G3NWR/P	400	245	165	738	84	0	1,632
21	Bromsgrove & D ARC	G3VGG/P	214	283	242	617	127	140	1,623
22	Leyland Hundred ARG—"Saxons"	G3GGS/P	336	208	392	428	145	42	1,551
23	Leicester Poly ARS	G3SDC/P	330	405	502	299	0	0	1,536
24	ARC of Nottingham	G6CW/P	244	276	270	328	241	132	1,491
25	Leicester RS	G3LRS/P	408	266	415	328	70	0	1,487
26	BSC (Port Talbot) ARC	GW3EOP/P	308	248	317	543	70	0	1,486
27	Maidstone YMCA ARS	G3TRF/P	304	355	426	275	60	0	1,420
28	Conway Valley ARS	GW6TM/P	468	163	223	397	159	0	1,410
29	Crystal Palace & D RC	G3VCP/P	224	161	373	398	177	74	1,407
30	The Hamsters	GM3UWX/P	216	262	413	328	179	0	1,398
31	Kingsway Tech Coll ARC—Dundee	GM4AAF/P	240	153	185	187	367	260	1,392
32	Edgware & D RS	G3ASR/P	308	340	361	311	63	0	1,383
33	Chiltern ARC	G3CAR/P	234	424	223	199	80	216	1,376
34	Hull & D ARS	G3AMW/P	292	384	155	368	166	0	1,365
35	Clifton ARS	G3GHN/P	0	210	571	214	189	168	1,352
36	Catterick Garrison ARC	G3CIO/P	346	367	184	289	145	8	1,339
37	Scarborough ARS	G4BP/P	216	169	271	414	151	12	1,233
38	Grimsby ARS	G3CNX/P	306	205	177	318	222	0	1,228
39	Liverpool & D ARS	G3AHD/P	366	283	166	281	37	90	1,223
40	Government Communications ARC	G3SSO/P	180	303	168	415	149	0	1,215
41	Greenock & D ARC	GM3ZRC/P	0	148	158	608	246	0	1,160
42	Mansfield RS	G3GQC/P	0	0	0	1,147	0	0	1,147
43	Ilford	G3XRT/P	336	422	347	0	0	0	1,105
44	Ayr ARG	GM3WIL/P	202	113	338	364	65	0	1,082
45	Bangor & D ARS	GI3XRQ/P	42	5	85	666	208	50	1,056
46	Havering & D ARC	G3TTB/P	94	366	382	196	7	0	1,045
47	Blackwood & D ARS	GW6GW/P	0	454	171	306	64	0	995
48	Farnborough & D RS	G3RRA/P	0	921	0	0	0	0	921
49	Ainsdale RC	G4EID/P	182	184	153	220	180	0	919
50	Maidenhead & D ARC	G3WKX/P	0	911	0	0	0	0	911
51	Telford & D ARS	G3ZME/P	0	0	0	904	0	0	904
52	Hartlepool & Easington ARC	G3IDV/P	184	216	147	187	91	28	853
53	Cheltenham ARS	G5BK/P	0	106	37	575	115	10	843
54	Assoc of Sheffield ARCs	G4DMX/P	0	301	0	400	95	8	804
55	Salisbury R & ES	G3FKF/P	60	108	606	0	0	0	774
56	Basingstoke ARC	G3TCR/P	12	368	259	17	0	0	656
57	Kingston & D ARS	G3KIN/P	380	0	0	168	0	0	548
58	West Kent ARS	G3WKS/P	0	121	317	56	4	18	516
59	Guildford & DRS—"B"	G3TLM/P	0	166	3	39	16	10	234

from 354 contacts—an all-time record score for 3·5MHz. Members of the team were G3MKG, G3RRA, G3SVL, G3TMQ and G3VAA, using an FT101B to a delta loop at 50ft. Although the Maidenhead & D ARC (G3WKX/P) made 22 more contacts, their final score was 10 less: they used an FT401 and an inverted-V dipole at 60ft.

A few USA and Caribbean calls appear in the logs, but points on this band are mostly made from contacts with G and EU portables. The higher power may have helped to penetrate the Continental QRM, but the Clifton Battery Wireless Group operating G3JKY/P managed 135 contacts on 80m with 6W, which may prove something.

7MHz

The Ariel Radio Group (G3BBC/P) repeat their 1975 success on this band although the score was not as high as last year. The group's operators were G3KKQ and G3POI and they keyed 183 QSOs using an HW101 and two dipoles at right angles.

Runner-up on 40m is the Guildford & D RS (G6GS/P) with 611 points. The station consisted of a KW Vespa and a homebrew receiver working full break-in, with an inverted-V trapped dipole. The operators were G3IAF, G3KMO, G3SYM and G3ZDD.

Several groups started off on this band with fair scoring rates, but most did not appear until around 0200 by which time the bc station QRM had abated and the band was in fine shape. VK, ZL and ZS were worked by a few entrants and there were quite a few QSOs with W1-4 and 8-9 call areas. However, as usual, most of the points came from contacts with the large number of European stations active on 40m during the contest.

14MHz

Conditions left much to be desired as far as dx was concerned, and although a number of W/K stations did appear in the logs the majority of the QSOs were with EU. Those stations sufficiently far removed from the Continent were able to take full advantage of the short-skip and thus build up considerable scores.

The band leader and winner of the Frank Hoosen (G3YF) Memorial Trophy is the single-band entry of the Mansfield RS (G3GQC/P) with an all-time record 14MHz score of 1,147 points from 409 contacts. The equipment used was a Heathkit SB102, and the aerials were a homebrew 4-el full-sized Yagi (built by G3EQF) at 32ft, and a 41ft vertical. The operators were G3DBZ, G3EQF, G3GRL, G3JUY, G3KDQ, G3XWZ, G4AAH and G4DFZ.

Second place is taken by another single-band entry, that of the Telford & D ARS (G3ZME/P). Operators G3MWQ, G3UKV, G4AUY, G4AXZ and G8AX employed an FT101 and a TA32.

21MHz

In view of the poor dx conditions over the weekend, it was fortunate that there was plenty of short-skip into Europe otherwise this band would have been very unproductive. As it was, contacts with EU portable stations provided a lot of the points while the few dx contacts which were made included those with VE2, VS5, W1–4, 3D6, 9G0 and 9J2.

The Kingsway Technical College ARC, Dundee, (GM4AAF/P) takes the band honours from 111 QSOs made by operators

RESTRICTED SECTION

Posn	Group	Callsign	1·8MHz	3·5MHz	7MHz	14MHz	21MHz	28MHz	Total
1	Racal AR Group	G3RAC/P	402	527	479	380	177	28	1,993
2	Reigate ATS—"A"	G3NKS/P	318	410	382	408	104	70	1,692
3	Swansea ARS	GW5ZL/P	304	216	420	475	126	8	1,549
4	Cannock Chase ARS & Blake School RC	G3UBG/P	154	382	311	481	179	34	1,541
5	St Albans Contest Group	G4BOU/P	314	489	339	279	71	0	1,492
6	Norfolk	G4ARN/P	154	220	369	607	100	28	1,478
7	Oxford & D ARS	G8IB/P	284	259	269	515	92	0	1,419
8	Sunderland ARS	G3RDI/P	220	366	318	450	61	0	1,415
9	Blackpool & Fylde ARS	G8GG/P	206	255	124	480	280	32	1,377
10	Chippenham & D ARC	G3VRE/P	6	521	346	410	87	6	1,376
11	Gloucester ARS	G3MA/P	446	218	282	322	41	0	1,309
12	Bristol Contest Group	G6YB/P	224	329	280	310	68	60	1,271
13	Sutton & Cheam RS	G2DMR/P	364	346	273	129	75	66	1,253
14	East Kent RS	G3LTY/P	388	339	338	127	0	0	1,192
15	RC of Worksop	G3RCW/P	272	307	355	122	130	0	1,186
16	Harlow & D ARS	G6UT/P	114	661	237	117	55	0	1,184
17	Thames Valley ARTS	G3TVS/P	434	276	250	100	73	34	1,167
18	Reading ARC	G3ULT/P	152	452	447	100	0	0	1,151
19	Glenrothes & D ARC—"B"	GM3OLK/P	264	210	331	145	109	70	1,129
20	Colchester RA	G4CRA/P	408	340	307	41	29	0	1,125
21	Stockport RS—"B"	G3ZOD/P	178	423	491	21	0	0	1,113
22	Hinkley Point (Bridgwater)	G4EBU/P	0	324	98	617	64	0	1,103
23	Garendon School RC	G3MKX/P	114	249	38	445	232	16	1,094
24	Stroud & D ARS	G3EKD/P	214	394	302	149	0	0	1,059
25	Crawley ARC	G3TR/P	236	294	199	223	86	0	1,038
26	Coulsdon ATS	G3ZMF/P	208	199	93	212	138	178	1,028
27	Bury RS	G3BRS/P	354	630	0	0	0	0	984
28	Reigate ATS—"B"	G3REI/P	144	270	263	256	49	0	982
29	Caterham RG	G4APL/P	0	308	274	194	115	16	907
30	First Contest Group	GW4FCG/P	0	236	172	452	28	0	888
31	Southdown ARS	G3WQK/P	0	407	0	457	0	0	864
32	Echelford ARS	G3UES/P	6	371	120	203	151	0	851
33	Torbay ARS—"B"	G3GDW/P	238	162	179	12	161	96	848
34	Eccles & D RS	G3GXI/P	0	230	387	224	0	0	841
35	Weston-super-Mare RS	G6LQ/P	82	295	312	10	0	0	699
36	Woodmansterne	G3KTA/P	84	260	123	201	13	0	681
37	Newbury & D ARS	G3WOI/P	214	234	0	109	27	88	672
38	Leyland Hundred ARG—"Danes"	G3WYY/P	64	430	60	0	0	6	560
39	Preston ARS	G3KUE/P	198	205	47	62	17	0	529
40	Mid-Lanark ARS	GM3PXK/P	0	29	109	228	135	4	505
41	Clifton Battery WG	G3JKY/P	92	382	0	0	0	0	474
42	Shefford & D ARS	G3FJE/P	78	223	8	90	5	8	412
43	Dundee	GM3NHQ/P	0	0	171	210	0	0	381
44	Echelford CG	G4DPP/P	0	0	4	69	78	0	151

The top five on each band

Posn	1·8MHz	3·5MHz	7MHz	14MHz	21MHz	28MHz
1	GW6TM/P	G3RRA/P	G3BBC/P	G3GQC/P	GM4AAF/P	GM3YOR/P
2	G5FA/P	G3WKX/P	G6GS/P	G3ZME/P	G8GG/P	G4DAA/P
3	G3MA/P	G6UT/P	G3FKF/P	GM4AGG/P	GM4AGG/P	G4BRA/P
4	G3TVS/P	G3VER/P	G3GHN/P	GM3YOR/P	GM3YOR/P	G3NJA/P
5	GM4AGG/P	G3BRS/P	GM3YOR/P	G3NWR/P	GM3ZRC/P	G4CRC/P

Overseas check logs

Posn	Callsign	Points to G stations	Posn	Callsign	Points to G stations
1	9J2L/P	572	11	OK2PAW	135
2	9H1EL	518	12	OK2PGU	88
3	9G0ARS	420	13	G3OLB/W2	80
4	9H1CH	418	14	OZ1EE	66
5	OK3KAP	326	15	OK3CAU	64
6	HB9R/P	296	16	OK2BBJ	63
7	ZS6NFD/P	228	17	ZE3JO	52
8	OK1DKW	172	18	OL0CFI	48
9	OK2BUV	164	19	OK3YCA	32
10	OK2SPS/P	159	20	W1OPJ	15

British Isles check logs

Received with thanks from: G2MI, G3AWR, G3GUV, G6GH/P, G6NK, G6RC/P.

GM3VEY, GM3ZXE, GM4AGS, GM4BAG and GM4BIP using a KW2000A and a 3-el mini-beam.

The runner-up is the Blackpool & Fylde ARS (G8GG/P) with 280 points. A Trio TS520 transceiver was operated by G3CCC, G5ND and G8GG, and the aerial was a 276ft inverted-V.

With the predominate short-skip propagation, it is not surprising that four out of the five top logs on 21MHz are from GM.

28MHz

While the more southerly stations had to make the most of the occasional short, patchy openings to Europe and had to exploit the possibilities of extended ground-wave working, the Glenrothes & D ARC "A" station (GM3YOR/P) was fortunate in being far enough from Europe to obtain a proper band opening. With one period of operation, between 0856 and 1054, they made 71 contacts worth 396 points to gain the band leader's award. The Channel Contest Group (G4DAA/P), with nine more contacts in their log, scored 392 points. GM3YOR/P used a TH3 at 35ft, and G4DAA/P had a 2-el quad at 60ft.

Conditions were generally poor and the Open Section had a considerable advantage in being able to monitor the band with their second receivers. Very little dx was worked—the only calls appearing in the logs being 4X4FU, 9J2L/P and a few UA9s. The new multiplier for this band was a welcome innovation.

Overseas check logs

The overseas station contributing most points to entrants was the Lusaka Field Day Entry (9J2L/P) with 572 points. An FT101 was used feeding a V-beam with 562ft legs. One G contact was made on 7MHz, 13 on 14MHz, 29 on 21MHz and 7 on 28MHz. In second position is Jeff Morris (9H1EL) who gave away 518 points on 28, 21 and 14MHz using his FT501 and TH3 beam at 75ft.

Very many thanks to all who sent in check logs.

Comments from competitors

A "big improvement"—*Ariel RG.*
"Enjoyed the new style contest"—*Verulam ARC*
"Best NFD for years"—*Horsham ARC.*
"Signals very clear and no problems encountered from high-power levels used"—*Chelmsford ARS.*
"Congratulations on taking the decision to up-date rules"—*Stockport RS.*
"Restricted section is a good idea"—*Bracknell ARC.*
"The best band was the Salvation Army"—*Medway Contest Group at the Kent County Showground.*
"Realistic rules for these modern times"—*Hereford ARS.*
"We would like to return to more restrictions"—*Bromsgrove & D ARC.*
"Where have the Commonwealth stations gone?"—*Leicester RS.*
"Please arrange for a 10° drop in temperature next year"—*Maidstone YMCA ARS.*
"Very bad thing using high power... worst thing that's ever happened to ham radio"—*Havering & D ARC.*
"Operating standards up on last year"—*Farnborough & D RS.*
"Any fd with antennas at 60ft is ridiculous"—*Racal ARG.*
"Rules not so bad after all!"—*Sunderland ARS.*

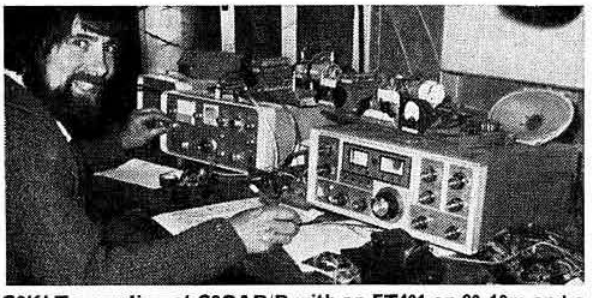
Thames Valley ARTS operators and supporters with the club's "secret weapon" in the foreground—a multi-band, pretuned antenna matching unit specially built and aligned by G3JEQ and G3XZV

"Why not put VHF NFD and HF NFD on the same day?"—*Sutton & Cheam RS.*
"Only one operator!"—*Harlow & D ARS.*
"Too many people send the cumbrous 'QSL' instead of 'R' "—*Hinkley Point.*
"In this age of black boxes, one would hardly set up an emergency station with a homebrew 10W rig"—*Bury RS.*
"The new rules let small groups like us compete on equal terms"—*First Contest Group.*
"Do away with 14, 21 and 28MHz bands"—*Weston-super-Mare RS.*
"Opportunity to use full licensed power made the choice of equipment much easier"—*Woodmansterne.*
"NFD is now just another high-power contest"—*Shefford & D ARS.*

Inspections
More than 60 groups were visited by representatives of the HF Contests Committee, and the committee is extremely grateful to all those who acted on its behalf.

Comments from the HF Contests Committee
We are pleased (if not relieved!) that the new rules have been, in the main, received with such acclaim. Although some may believe otherwise, the HF Contests Committee does not instigate major changes to contest rules without a great deal of discussion and analysis of recent entries. NFD is no exception to this procedure. The feeling that the old NFD power rule was slowly becoming outdated had existed within the committee for some time, but the right moment had to be chosen for the change to licensed power. As it happened, the contest went through a "medium power" stage when, although the 10W input limit had been dropped, the 13·5W pa anode dissipation limit still existed. An analysis of the 1975 NFD entries revealed that 85 stations used commercial equipment mostly capable of running 150W in the unmodified state, that many groups had found high peak emission valves which would run 100W plus yet still meet the 13·5W anode limit, and that only six groups relied solely on battery power. There was also evidence that some groups had not entered NFD because their members had been unwilling to modify their equipment to meet the special requirements of the NFD rules. Double-station entries had again fallen last year, and thus it seemed to the HF Contests Committee that 1976 was the year in which the NFD rules should be overhauled, and in order to gain approval for the new rules the committee sought and obtained Council's endorsement before proceeding into print.

May we remind the diehard QRP groups that the 80m Field Day is still a low-power contest. However, with just a touch of cynicism we note that in spite of the vociferous "homebrew" lobby, many of the supporters of this 80m event use commercial gear. While not belittling the pleasures of QRP operation, it does seem to us that in this day and age most people just do not have the time nor the inclination to construct a special low-power rig for use in contests once or twice a year. In some ways, we wish we were wrong.



G3KLT operating at G3CAR/P with an FT401 on 80–10m and a KW2000 on 160m. Between them is the home-brew automatic message generator (four messages) designed by G3OUV

The future
Next year, NFD will again be held over the second weekend in June. This will not be in order to avoid the Continental Whitsun holiday for the benefit of our friends in Europe as happened this year, but to avoid our own Spring Bank Holiday weekend which in 1977 will be the first weekend in June. We hope to revert to the first weekend in June in 1978!

Although the rules for 1977 have yet to be discussed by the committee, it would seem that few changes will be made except perhaps for the equipment rule which in the light of experience left a little to be desired. The intention was that only one operating position should be permitted, as the use of multi-operating positions gives a distinct advantage when changing bands to those groups with plenty of equipment at their disposal.

As mentioned last year, another possibility in the long term is the harmonization of FD rules throughout Europe so that national results could be amalgamated. Preliminary discussions with DARC have indicated that, apart from the scoring systems, a set of European NFD rules could be produced without too much difficulty. It has been proposed that a working group should be set up within IARU Region 1 to discuss FD co-operation and it is expected that the Society will take part with the aim of submitting proposals to the next IARU Region 1 Conference in 1978.

Final
There were over 38,000 QSOs recorded in the logs, and the adjudicators were able to cross-check a sizeable percentage of them. The logs seemed a little neater this year, but quite a few groups lost points due to bad log-keeping—confusing U and V; O and D; L and C were often to blame—the remedy here is neater handwriting! Several groups lost points because of "unmarked duplicates for which points had been claimed", and a penalty of four times the claimed score was deducted in each case. One highly-placed club would have been even higher had it carried out a thorough check for duplicates.

And so we look forward to the 1977 NFD with the promise of better hf conditions, and with the comment from the Dundee RSGB Group which sums up many people's feeling about NFD, "No matter what the rules are, we will be out again next year."

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 25 September for the November issue.

REGION 1—RR B. O'Brien, G2AMV, "Tanglewood", Anthony's Way, Heswall, Wirral, Merseyside L60 0BP.

Ainsdale (AARC)—9, 23 Sept, 7, 21 Oct, 4 Nov. 8.15pm. Ainsdale Scout Headquarters. Further details from G2CUZ.

Blackburn (East Lancs ARC)—7 Oct ("TV and broadcast interference" by G2BTO), 4 Nov (Home constructed equipment night with prizes for junior and senior classes). 7.30pm. YMCA, Blackburn. Visitors are welcome. Sec G4CGT.

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

Bolton (B&DARS)—Third Wednesday in each month, 8pm. Clarence Hotel, Bradshawgate. Sec G4AQB.

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 first Tuesday in month. YMCA, Chester. Full details from GW8DMR.

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. B. Porter, 11 Cranmore Avenue, Crosby, Liverpool L23 0QD.

Liverpool University (UoLARS)—Details of meetings from J. M. Pagett, G8IAV, c/o The Students Union.

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

Manchester (South Manchester RC)—10 Sept (Surplus equipment sale), 17 Sept ("Audio processing" by T. Winter, G4AOK), 24 Sept (VHF NFD contest review), 1 Oct ("Contest operating" by J. McBurney, G4AUR), 8 Oct (Club quiz), 15 Oct ("Stability of oscillations" by K. Johnson), 22 Oct ("The unknown forest", RAC-Lombard Rally film), 29 Oct ("Modulation and multiplex" by R. P. Smith, G3SVW), 12 Nov (Annual dinner). 8pm. Sale Moor Community Centre, Norris Road, Sale, Cheshire. Members meet informally and take part in activities from the club shack, Greeba, Shady Lane, Baguley, Manchester 23, on Mondays at about 8pm. Hon sec G8GDM.

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 G8GOS.

North Western Repeater Group—Third Thursday of each month, 8pm. "Grey Mare", Blackburn. Meetings open to all interested. Full details from G8HQW.

Preston (PARS)—9, 23 Sept, 7, 21 Oct, 4 Nov. Morse practice 7.30pm, main 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)—13 Sept (AGM). Wirral Mercury Motor Inn, Backford Cross, nr Chester (at junction of A5117 and A41). 11 Oct (Projects meeting, open to all members). 8pm. The Legh Arms, Knutsford. Nets on Monday, 9.30pm, on 145·600MHz, and Sunday, 11.35am, 3·615MHz. Details from G3LEQ, tel Knutsford 4040.

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.

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 next year. Enquiries to J. R. Morris, Dept of Physics, University of Lancaster.

Liverpool Luncheon Club—members wishing to attend should contact G3VQT or G2AMV.

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)—8 Sept (Talk by the RSGB). 13 Oct (Surplus sale), 10 Nov (Film show), 8 Dec (Christmas meeting). 7.30pm. Pie Hall, Denby Dale. Visitors always welcome. 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.

Hull (H&DARS)—Fridays, 7.30pm. Dorchester Hotel, Beverley Road, Hull. No further details received. Hon sec G8IED.

Leeds (White Rose RS)—Wednesdays, 7.30pm (lectures start 8pm). Club night details are being arranged for the autumn. Two special stations will soon be on the air—GB2LC, celebrating 350 years of the Leeds Charter, and GB2LS, in connection with JOTA. The Region 2 RR would like to welcome to his team the new area representative, Miss C. Wade, G4CUY. Hon sec G4DZI.

University of Leeds (LUUARS)—Tuesdays, 8pm. Union Annexe (second floor), Woodhouse Lane. All new students welcome. G3LUU is active on the hf bands and hopes to obtain G8LUU for the uhf and vhf bands before the term starts. Hon sec G4CNG, QTHR or at "E" block, Lupton Flats, Alma Road, Leeds 6 during term.

Otley (Radio & Electronics Society)—"The Three Horseshoes", Bridge Street, Otley. Hon sec J. H. Marchbank, 116 Brooklands Lane, Menston, Ilkley, West Yorks LS29 6PJ.

Scarborough (SARS)—Fridays, 7.30pm. Scarborough Technical College, Corby Road, Scarborough. The special exhibition station put on for the Scarborough Scouts during their "Fair of the century" was a great success. PRO Charles Whitaker introduced the Mayor and Mayoress of Scarborough to several members of the club, and Les North, G3RTN, and Cyril Ginders, G3XHA, explained the station layout. Recent licensees G4EDR and G4EEV displayed their prowess on the key.

Sheffield (SU & PRS)—Thursdays during term time, 5.30pm. "The Phoenix", Charles Street. Details from A. Marvin, G8CZO, 74 Kirkstone Road, Sheffield S6 2PP.

York (YARS)—29 Oct (Annual dinner at the Abbey Park Hotel, York). Fridays, 7.30pm (except for the third Friday in the month). United Services Clubroom, 61 Micklegate, York. Visitors are always welcome; a recent one was Carlos, grandson of EA8JJ. The special exhibition station put on at the Great Yorkshire Show, GB2GYS, was a great success and the organizers have invited the club to repeat the exercise next year. The next special exhibition station, possibly G3HWW/A, will be held on 11 September on behalf of local Scouts at their HQ, Snowball Plantation, nr York. Operation will be on 80m. Hon sec G3WVO.

REGION 3—RR H. S. Pinchin, G3VPE, 61 Cole Bank Road, Hall Green, Birmingham B28 8EZ.

Birmingham (Midland ARS)—21 Sept ("Test and measuring equipment" by Clive Burton, G4ELO), 19 Oct (AGM). 8pm. Room 110, University Of Aston, Gosta Green, Birmingham. G3ZKQ.
Birmingham (Slade R&SS)—3, 17 Sept, 1, 15, 29 Oct. 8pm. The Committee Room, Church House, Erdington, Birmingham. G8GRC.
Birmingham (South Birmingham RS)—1 Sept, 6 Oct (Surplus sale), 3 Nov (AGM). 8pm. Hampstead House, Fairfax Road, West Heath, Birmingham B31 3QY. G8BHE.
Birmingham (Birmingham University RS)—2 Oct (Freshers' conference-new members welcome). Every Tuesday during term, 7.30pm. Students' Union. G3IUB. Sec G4CKK.
Bromsgrove (B&DARC)—10 Sept (Brain of the club quiz), 8 Oct (Surplus sale), 16-17 Oct (JOTA). 8pm. Avoncroft Art Centre, Bromsgrove. G8JTK.
Coventry (CARS)—3 Sept (Night on the air), 10 Sept (DF hunt), 17 Sept (Night on the air), 24 Sept (Open meeting), 1 Oct (AGM), 8 Oct ("Oscar VII"), 15 Oct (JOTA preparation), 16-17 Oct (JOTA), 22 Oct ("Repeaters"), 29 Oct ("RSGB" by the President, G3FKM), 5 Nov (Sausage and mash supper). 8pm. Baden Powell House, 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.
Dudley (DARC)—Second and fourth Tuesdays in each month. 7.45pm. Central Library, Dudley. G4BFT.
Hereford (HARS)—First and third Fridays in each month. 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)—Fortnightly, commencing 9 Sept. Swan Hotel. G4ESK/G8FBL.
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)—21 Sept (Surplus sale), 1 Oct (Social outing), 19 Oct (AGM). 7.30pm. The Manor House, High Street, Solihull. G4AXW.
Stoke-on-Trent (S-on-TARS)—Thursdays, 7.30pm. 2A Racecourse Road, Oakhill, Stoke-on-Trent. G4CWN.
Stoke-on-Trent (North Staffs ARS)—Mondays, 7.30pm. Lectures, natter-nites, hf and vhf stations. Harold Clowes Community Centre, Bentilee, Stoke-on-Trent. G8KVM.
Stourbridge (S&DARS)—First Tuesday in each month (Informals, 9pm at "Shrubbery Cottage" public house, Heath Lane, Stourbridge). Third Monday in each month, 7.45pm. Longlands School, Brook Street, Stourbridge. G4CLX.
Sutton Coldfield (SCRS)—Second and last Mondays in each month, 7.30pm. Central Youth HQ, Clifton Road, Sutton Coldfield. Sec Norman Sanderson, 130 Willmott Road, Sutton Coldfield B75 5NW.
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)—6 Sept ("Short wave listening" by Bill Millerchip), 13 Sept (Natter-nite), 20 Sept (Night on the air), 4 Oct (AGM), 11 Oct (Natter nite), 18 Oct (Visit by Willenhall ARS), 1 Nov ("The Wrekin beacon" by G8CMU). 8pm. Neachells Cottage, Danescourt Road, Stockwell End, Tettenhall, Wolverhampton WV9 9PH. G8BSR.
Worcester (W&DARC)—6 Sept ("Modern communications receivers" by Keith Ballinger, G8BBP), 18, 27 Sept (AGM), 4, 16 Oct, 1 Nov. 8pm. The Old Pheasant, New Street, Worcester. G4BXS.

REGION 4—RR T. Darn, G3FGY, Sandham Lane, Ripley, Derbys.

Derby (D&DARS)—8 Sept ("History of the licence" by G2CVV), 15 Sept (Last df practice night), 22 Sept (Cheese and wine), 29 Sept ("Recording" by D. Weets), 6 Oct (Surplus sale), 13 Oct (To be announced), 20 Oct ("Engineering practice, parts 3 and 4"; "The shifting continents, part 1"—all on videotape film), 27 Oct (To be announced). 7.30pm. Club HQ, 119 Green Lane, Derby. Morse instruction classes are to be arranged for the winter months; come on club nights for further information. The club is again preparing the tombola for the RAIBC at the Leicester Exhibition on 28-30 Oct. G2CVV.
Derby (NHCAARG)—Fridays, 7.30pm. Nunsfield House, Boulton Lane, Alvaston, Derby. G4CTZ.
Leicester (LRS)—Monday evenings. Gilroes Estate Cottage, Groby Road, Leicester. Morse practice 8-8.30pm. G3TQF.
Mansfield (MARS)—First Friday in each month, 7.30pm. The New Inn, Westgate, Mansfield. G3XWZ.
Melton Mowbray (MMARS)—Details from G3NVK.
Nottingham (ARCoN)—Thursdays, 7.30pm. Sherwood Community Centre, Mansfield Road, Nottingham.

If you are stuck for a speaker or lecturer for your winter programme contact G3FGY, who will do his best to help.

REGION 5—RR P. F. Chilcott, G4BBA, 258 Coneygree Road, Peterborough PE2 8LR.

Bedford (B&DARC)—Thursdays, 8pm. United Services Club, The Broadway. Sec G8FMG.
Cambridge (C&DARC)—Fridays, 7.30pm. Corporation Yard, Victoria Road. Sec G3YRZ.
Cambridge University (CUWS)—Tuesdays during term. G6UW active on hf and vhf. See us at the Societies Fair on 5-6 Oct. Sec G4EAG, St Catherine's College.
Corby (CTCARG)—Mondays, 7.30pm. Corby Technical College. Clubhouse and GB3CI in college grounds. Visitors welcome.
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)—23 Sept ("1,000m to 10GHz" by Jack Hum, G5UM), 28 Oct (AGM). Thursdays, 8pm. Spencer Dallington Community Centre, Tintern Avenue, Gladstone Road. Sec G8GHZ.
Peterborough (GPARC)—23 Sept (Construction display), 28 Oct ("Fax explained" by G4BBA). 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, off Lincoln Road. Sec G3EEL.
Shefford (S&DARS)—Thursdays, 8pm. Church Hall. Sec G3TAZ.

REGION 6—RR D. C. Andrews, G4CWB, 63 Bulmershe Rd, 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)—First and third Mondays in each month (other Mondays morse evenings). Cooper's Hill Centre, near railway station. Sec G3YMC.
Burnham Beeches (BBRC)—First Monday in each month, 8pm. Hedgerley Scout HQ. Further details from sec, tel Farnham Common 2609.
Maidenhead (M&DARC)—21 Sept ("A Visit to Bad Godesburg" by Eric Palmer, G3FVC), 7 Oct ("Transmitters for the beginner" by Bill Omer, G3DOJ). First Thursday and third Tuesday in each month, 7.30pm. British Red Cross Hall, The Crescent, Maidenhead. Sec G4ALG.
Milton Keynes (MK&DRS)—Second Monday in each month, 8pm. Lovatt Hall, Silver Street, Newport Pagnell. Details from sec G8JYW, YMCA, 4 Cheyne Walk, Northampton.
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 G8PX.

Reading (RARC)—First and third Tuesdays in each month, 8pm. "White Horse", Emmer Green, Caversham, Reading. Details from sec G4CCC.

Now that programmes are being planned for the winter months, let the RR have all the details from club secretaries in Region 6.

REGION 7—Contributed by R. S. Hewes, G3TDR, 24 Brightside Avenue, Laleham, Staines, Middx.

Addiscombe (AARC)—Tuesdays, 9pm. "Spread Eagle", Portland Road, South Norwood. Sec G4CZB.
Ashford, Middlesex (Echelford ARS)—13 September (Mini lectures), 30 September (Amateur tv demonstration), 11 October (Film show), 28 October (Surplus equipment sale). 7.30 for 8pm. St Martin's Court, Kingston Crescent, Ashford, Middlesex. 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 Headquarters (opposite Rickman Hill), Chipstead Valley Road, Coulsdon. Third Monday in each month, 8pm. 1st Purley Scout Headquarters, Purley Park Road, Purley. Sec G8KMJ, tel 01-657 2548.
Cray Valley (CVRS)—16 September (To be announced), 30 September (Natter-nite), 21 October (To be announced), 28 October (Natter-nite). 8pm. Eltham United Reformed Church Hall, 1 Court Road, London SE9. Sec G3YWO.
Croydon (Surrey Radio Contact Club)—7 September, 5 October (Being arranged). 7.30 for 8pm. "The Ship Inn", 47 High Street, Croydon, Surrey. Sec G3FWR, tel 01-657 3258.
Crystal Palace (CP&DRC)—18 September (Talk by G8GKQ), 16 October ("Bedrooms I have been in" by G3IIR). 8pm. Emmanuel Church Hall, Barry Road, London SE22. Sec G4AVV, tel 01-653 4340.
Guildford (G&DRS)—Fridays, 8pm. Model Engineering Headquarters, Stoke Park, Guildford. Sec G4BHQ.
Kingston (K&DARS)—8 Sept ("Raynet"), 13 Oct ("LIMs and levitation-linear induction motors", talk and demonstration by Dr H. R. Bolton of Imperial College). 8pm. Tolworth Scout Hut, 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)—First Tuesday in each month (natter-nite), 8.30pm. "Marquis of Granby", Hooley Lane, Redhill. Third Tuesday in each month (lecture night), 8pm. Constitutional Centre, Warwick Road, Redhill. Sec G3XSZ, tel Reigate 43130.
Sutton & Cheam (SCRS)—September, October (Meeting dates to be confirmed). 7.30pm. Sutton College of Liberal Arts, Cheam Road, Sutton. Sec G4BOX.
Thames Ditton (Thames Valley ARTS)—7 September, 5 October (To be announced). 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 01-664 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.
Canterbury (East Kent RS)—7 Oct (AGM and constructional contest). Room 2, Westgate Hall, Canterbury. Sec G8GHH.
Crawley (CARC)—United Reform Church Hall, Ifield, Crawley. Details from G3MGL.
Dartford (DHDFC)—10 Sept (Club night), 12 Sept (DF final, High Wycombe), 26 Sept (Loughton hunt). Hon sec G4CVC.
Dover (South-East Kent YMCAARC)—First and third Wednesdays in each month. Details of future events from G8KSD.
Eastbourne (Southdown ARS)—6 Sept (Lecture, details from G3ZQB), 25-26 Sept (Return visit to the Radio Club de Normandie), 4 Oct (Another mammoth junk sale). PRO G3LFZ.
Horsham (HARC)—First Wednesday in each month. Civil Defence HQ, Moons Lane, Brighton Road, Horsham. Details of events from G3NPF.
Kent Repeater Group—Details of the group from G3XDV.
Maidstone (MYMCAARS)—First and third Fridays devoted to the beginner. "Y" Sports Centre, Maidstone.
Medway (MARTS)—Fridays, 7.30pm. Aurora Hotel, Gillingham. Details from G8APB.
Tunbridge Wells (West Kent ARS)—Details from G8LMV, 2 Court Rd, Tunbridge Wells.
Worthing (W&DARC)—Adult Education Centre, Union Place, Worthing. Details from G3LQI.

REGION 9—RR H. W. Leonard, G4UZ, 4 Start Bay Park, Strete, Dartmouth TQ6 ORY.

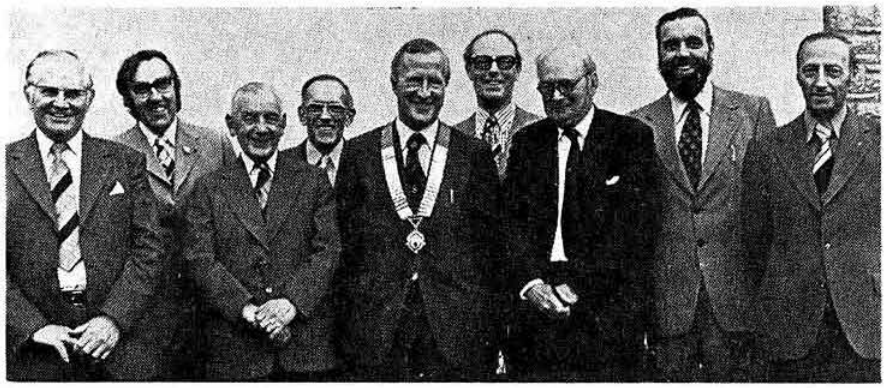
Camborne (Cornish RAC)—7 Oct ("SWR and all that" by G3CZZ), 4 Nov (Sale of surplus equipment). 7.30pm. SWEB Clubroom, Pool, Camborne. Cornish net every Sunday at 1000gmt on 3·685MHz. Visitors always welcome. Details from G3NKE, tel Camborne 2419.
Exeter (EARS)—The club is still in existence but has lost its meeting place. Details from Jack 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 and fourth Wednesdays in each month. Meetings held alternately at G4CG and G2FKO. Details from G4CG.
Plymouth (PRC)—7 Sept (Sale of surplus equipment). First and third Tuesdays in each month, 7.30pm. Virginia House, Bretonside, Plymouth. Visitors most welcome. Chairman now G3UVS and sec G4EJO.
Saltash (S&DARC)—First and third Fridays in each month, 7.30pm. Burraton Toc-H Hall, Saltash. Sec G4DHA, tel Saltash 3219.
Torbay (TARS)—25 Sept ("Radio components" by STC), 30 Oct ("TARS slides" by G3LHJ). Fridays, with special meeting on the last Saturday in each month, 7.30pm. Rear of 94 Belgrave Road, Torquay. Torbay net every day except Sunday at 0930gmt on 3·758MHz. Visitors always welcome. G3UIQ.

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)—Third Tuesday 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 Centre, Brynglas Road, Newport, Gwent. Details from sec GW3YKZ.
Pembroke (PRSGBG)—29 Sept (AGM). 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 GW3ACF.
Rhondda (RARS)—Every other Thursday, 7.20pm. Transport Employee's Club, Porth. Details from GW3PHH.
Sully (S&DSWC)—Tuesdays, 7pm. Sully Bowls & Social Club, 59 South Road, Sully. Details from 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. Students who may be enrolling at the university are invited to contact sec D. Atkinson, G8DRE.
Conway Valley (CVARC)—Second Thursday in each month. The Quaries, Llandulas, Colwyn Bay. Newcomers and visitors welcome.
Rhyl (R&DARC)—Second Tuesday in each month. Lecture room, Ambulance Station, Coast Road, Rhyl. Newcomers and visitors welcome.



A meeting of Northern Ireland representatives attended by Dr E. J. Allaway, G3FKM, RSGB President, and G. R. Jessop, G6JP, general manager, took place at Holywood, Co Down, recently. Seen here are (l to r) Messrs W. F. McGonigle, GI3GXP, NI Council member; T. Barnes, GI3USS; S. Foster, GI3GAL; L. Lyske, GI3CDF; Dr Allaway; Messrs E. McNally, GI3SXG; G. R. Jessop; H. J. Campbell, GI8FOK; and R. Parsons, GI3HXV

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. Sec Robert Officer, 23 Sherbrook Place, Dundee.

Inverness (Queen's Own Cameron Highlanders Memorial Youth Club, Radio Section)—No information available. Sec W. M. Begg, 68 Tomnahurich Street, Inverness.

Lerwick (RC)—Wednesdays, Annsbrae House, Lerwick. Sec GM3HTH.

REGION 13—RR Rev S. J. Smith, GM4DNM, St Ninian's, 6 Derran Drive, Cardenden, Fife KY5 OJG.

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)—Second and fourth Thursdays in each month. Adult Education Centre, Riddles Court, High Street. Details from sec GM8BGF.

Edinburgh (Pioneer Club)—Tuesdays, 7.30pm. Church Hall, Ravenscroft Place, Gilmerton. Further details from GM4BWT.

Glenrothes (G&DARC)—6 Sept (AGM), 3 Oct (Films-"How does the radio work?" and "For better-for worse"). First Sunday in each month and Wednesdays, 7.30pm. Old Nursery Buildings, Leslie, Fife. Sec GM3YOR.

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)—3 Sept (AGM). 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)—15 Sept (AGM). 8pm. 90 Belmont Road, Belfast. Come along and let us hear your ideas for the winter programme. For further details contact GI8FOK.

Mid-Ulster RSGB Group—5 Sept (AGM). All visitors very welcome. 3pm. At QTH of G14BAC. Hon sec M. Anderson, GI3WWY, 32 Knockview Drive, Tandragee, Craigavon, Co Armagh.

North Ulster (NURSGBG)—19 Sept (Mobile rally, castle grounds, Antrim). Further details of this and other group activities from 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 B. G. Tew, G3WFF, 334 Gloucester Avenue, Chelmsford.

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)—Twice weekly, 7.30pm. YMCA, Park Road, Lowestoft. Details from G4AJO.

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.

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)—6 October ("SSB boxes and others"), 3 November (AGM). First Wednesday in each month, 8pm. Chineham House, Popley, Basingstoke. Sec Mrs J. Payne (xyl of G3ZRM), tel Aldershot 26108.

Bournemouth (Wessex ARG)—First Tuesday in each month. 5 Oct (AGM). 7.30pm. Portman Hotel, Ashley Road, Boscombe. Sec G8BBN.

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)—8 September (Ron Ham), 27 October ("The professional communication rx" by G3NCN), 24 November (AGM). Second and fourth Wednesdays in each month, 7.30pm. Railway Enthusiasts' Club, Access Road, off Hawley Lane, Farnborough. Sec G4FEA.

Guernsey (GRES)—Tuesdays, 8pm. The Lodge, La Corbinerie Oberlands, St Martin's, 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, 1030am, and Fridays, 8pm. Le Hocq Tower, St Clement, Jersey. Sec Mary McTaggart, 19 Parade Road, St Helier.
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. The club celebrates its 21st birthday in September and a reunion is planned. Ex-members are asked to contact 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)—First Tuesday in each month, 7.30pm. Lecture Hall, S Dorset Technical College, Newstead Road, Weymouth. G3WAO.
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)—This club is to be congratulated on its efforts in connection with the GB2USA project; there were over 1,000 QSOs. 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 605 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)—Thursdays, 7.30pm. Old Wheatsheaf Yard, Morpeth. Sec G4AVO, 19 Park Road, Lynemouth, Morpeth.
Newcastle (Tyne & Wear Repeater Group)—The AGM attracted members from as far apart as Berwick and Middlesbrough. The new committee is as follows: chairman, G8BGU; sec, G3URE; treasurer, G8IRK; committee members, G3WNR, G4BFU, G3AKG. The repeater is now a fact but negotiations for a suitable site are still in progress. Fortnightly, alternating with the Lumley RC. For details contact sec.
South Shields (SSD&RS)—Fridays, 7.30pm. Trinity House. Old and new members welcome. Sec G8BQF, 67 Lauderdale Avenue, Kings Estate, Wallsend.
Sunderland (SARS)—First and third Tuesdays in each month. Leisure Centre, Stockton St, Sunderland. Sec G4DQA.
Tyneside (TRC)—Mondays, 8pm-9.30pm. The Community Centre, Vine Street, Wallsend. Sec F. Addison, 3 Wilton Close, Whitley Bay, Tyne & Wear.

REGION 19—RR D. S. Smith, G4DAX, 151 Hamperhill Lane, Oxhey, Watford, Herts.

Acton, Brentford & Chiswick (ABCRC)—21 Sept (Members' holiday activity reports), 19 Oct ("Computer hardware and software"). 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)—8 Sept ("Firm control of smaller 'sprogs' " by G3OJI), 15 Sept (CW practice and club station), 22 Sept (Open discussion), 29 Sept ("Simply sound" by G4DCP and G8KYF). 7pm for 8pm. Rosedale Sports Centre, Andrews Lane, Cheshunt, Herts.
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)—The group has re-formed and a new constitution has been drawn up. 19 Sept (Business meeting), 17 Oct (Interference forum), 21 Nov ("Test equipment and its uses"), 19 Dec (AGM and junk sale). 3pm. Wanstead House, The Green, Wanstead, London E11. Sec G4CJQ, tel 01-524 3169. The group intends to record for future members a "History of the East London RSGB Group", before we all pass to that final QTH in the sky. All past and present members are asked if they can loan or record details of the group's past activities—for example old photographs of past members, letters, recordings and memorable QSOs, details of field days and scores, arguments entered into by the big guns past and present—anything you think would be of interest in compiling a history. Fred Judd, G2BCX, has undertaken the task and all details should be sent to him at 174 Maybank Road, Woodford, London E18. All material will be treated with care and returned after a short period.
Edgware (E&DRS)—9 Sept (Informal, including erection of new club station aerial), 23 Sept ("Morse code decoder and display system" by G4CRJ and G4CRG), 26 Sept (DF hunt), 14, 28 Oct (To be announced). 8pm. Watling Community Association, 145 Orange Hill Road, Edgware.
Harrow (RSH)—10 Sept ("Digital electronics" by G4AVF), 17 Sept (Club project and practical), 24 Sept ("Synchronous cw" by G3YQV), 1 Oct (Film show). 8pm. Sea Cadets HQ, Woodlands Road, Harrow. Sec G3KDL, tel 01-902 2570.
Havering (H&DARC)—Wednesdays, 8pm. British Legion Club, Western Road, Romford.
Holloway (Grafton RS)—Fridays, 7.30pm. Archway School Annex, Whittington School, Highgate Hill, N19. Details from John Hitchins, 46 Granville Road, Finchley N12. Tel 01-346 2744.
Ilford RSGB Group—Thursdays, 8pm. 50 Mortlake Road, Ilford, Essex.
Islington (Sherbourne RC)—Closed for summer break until 6 Sept. RAE and cw classes begin again in Sept.
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, N21. Sec G4AEZ, tel 01-336 7166.
St Albans (Verulam ARC)—23 Sept ("Antennas and atus" by G3JKB), 28 Oct ("28MHz propagation; the new Luxemburg effect" by G6JJ). 7.30pm. Market Hall, St Albans. Informal meetings on second Thursday in each month, Salisbury Hall, London Colney. Winter informals from 14 Oct at RAF Association HQ, Victoria Street, St Albans. Both 8pm.
Stevenage (S&DARS)—First and third Thursday 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)—Mondays, 8.30pm. Church of the Ascension, Claude Avenue, Oldfield Park, Bath. Further information from John Noden, Flat 4, 30 Paragon, Bath BA1 5LY.
Bristol (BRSGBG)—11 Oct (Film show), 25 Oct ("Digital and linear ics" by G8BXJ and G8FNR). 7pm. Becket Hall, St Thomas Street, Bristol 1. 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)—Thursdays, 7.30pm. Morse classes each Friday, 7.30pm. RAE class by G3MYM, if required. The Youth Centre, 31 The Park, Yeovil. Sec G3NOF.

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

2m solid state 5W fm tx, takes 8MHz HC6U xtals, £27.50. KW2000B, ac psu, £180. CMOS toneburst board, adjustable output and frequency, £3. 2m mosfet preamp, less than 3dB noise figure, 18dB gain, £3.50. 2m mosfet converter, 28-30MHz i.f., £10. G4EBI, QTHR. Tel 01-231 0879.

Heath HW7, £20. G3DCN, QTHR. Tel Hemel Hempstead 56196.

70cm base tx F450T, £25. Xtal boards, 6ch tx/rx for 10Bs and 25Ts, £5.50. SAE details. G8HNN, 55 Vauxhall Street, Worcester WR3 8PA.

Sommerkamp FR100B rx, 10-160m, handbook, 100-400Hz filter, £95. Trio JR500S rx, 10-80m, handbook, no mods, £55. Yaesu FP400 spkr and cabinet, as new in maker's carton, £8. Heath Mohican rx, £40. All good cond, ono. Buyer collects. Tel 01-648 5895 daytime.

HW32A plus mic, exc cond, £50. BC221 with charts and mains psu, £15. R220, 70·26 rx, £5. Eddystone 840A plus stand, £25. Pair new boxed TT21s, £4. G3PSH, QTHR. Tel Thatcham 62289.

Heath HR10B amateur band rx with HRA-10-1 100kHz xtal, calibrator, £65 ono. Heath HW7 QRP tx/rx, as new, with power lead, handbook, 50Ω load, £40. Shaw, 16 Deansfield, Four Spires, Cricklade, Wilts.

TS700, as new, has gained FMD Senior in under a year from average site working barefoot to 8-el. Offers around £290. Will deliver within 50 miles of Swindon. Tel 0793 762995.

FT2FB 144·480, 144·600, S0, S20, S21, 22, 23, 24, R5, 6, 7, £100. GW3YTJ, QTHR. Tel 0663 63578.

1,800W mod transformer, 12,000Ω C.T. each 375mA-4,500Ω each 900mA, ideal for QRO a.m. station. Any offers considered. G8DJF, QTHR. Tel 0494 30043 after 7pm.

RCA ET4336 400W cw tx. GCRE FS/10 FSK converter. Swop Marconi 365A key for good bug. See my classified ad. GW3OYN.

Liner 2, 144·10-144·33MHz, with preamp, good cond, £115. Vanguard 25AMT with all control gear and xtals for 145·8, £15. Both ono. Buyer collects or pays carr. GM8HSY, QTHR. Tel Falkirk 23860.

Mullard E805 oscilloscope, 5mV/cm|2Hz-2MHz, |spare tube, £20 ono. Buyer collects. 150mA twin meter assemblies, 1,500Ω calibrated as stereo VU meters, £2.50 each. G3BLP, QTHR. Tel Dunstable 602137.

FV50B, vfo for FL50B tx, £25. G2ABD, QTHR. Tel 074781 509.

KW Atlanta tx/rx, psu, spkr, manual, little used, £160. G4CNB. Tel 0621-782388.

FT200, FP200, all xtals for 10m, £190. Trio MC50 table mic, £12. Jaybeam portable mast, £5. 2m 4-el Yagi, £3. G8ILL, QTHR.

Exley Hambling 00 gauge coaches, Rivarossi diesel loco, £15. 35mm cameras, Zeiss Contina, £10. Praktica Nova SLR, recent overhaul, £25. Wharfedale Walnut SFB3 sand-filled 3-spkr panel units, require overhaul, £15. Inspect, collect, carr extra. G3FQH, QTHR.

Heathkit Marauder HX10 tx, immac cond, £175 ono. H2170 rx, good cond, £90 ono. BC348Q, internal power-pack, spkr output, S-meter, £10. Cossor 339A scope, new parts fitted, £8. *Wanted:* Atlas 210. G3NAS, QTHR. Tel 53718.

Trio TR7200G, S0, S20, S21, S22, R3, R4, R5, R6, R7, £160 ono. Telford TC9 a.m./fm, £55. G8HTR. Tel Hingham 371 evenings.

H/B 4CX250B 200W pa, plus spares, psu, £65. Racal TRA109C a.m./usb/lsb hf tx/rx with manual, £25. MMC 144LO converter, £8. 2m 10-el beam, £7. Buyer collects. G8FAT, QTHR. Tel 01-954 2311 ext 300 office hours.

Jaybeam 5XY/2m, plus phasing harness, new, £10. Commercial ac/dc converter, 6/9/12V, 1A max output, Gem model, £9. G8AEV 2m Mk2 converter, 28-30MHz, £8. All carr paid. Tel Worcester 354679.

Heathkit dc power supply HP13B, transistorized, £50 ono. G4EIP. Tel Lincoln 65675.

Scope, professional Solartron CT380, dc 13MHz, mint cond, £80. Leak 30W mono amp, requires preamp, £12. MM 2m converter, 28-30, £12. MM 70cm converter, 14-16, £13. G8KDC, QTHR. Tel Orpington 22443.

HW17A mosfet preamp, fm adaptor, manuals, 12V inverter, £45. Lafayette HE30 Codar preselector, £35. Tel 01-949 4920.

Comp working Heathkit station. DX100, SB10 ssb converter, RA1, xtal calibrator, h/b Q-mult, leads, spare valves inc 2X 6146 (new), manuals, covers 160-10m, cw/a.m./ssb/dsb/dsbsc, £100 ono. *Wanted:* SB102 with psu and manual. G4EAQ, QTHR. Tel 051-327 5989.

PTC2012 a.m. Handi-ranger low-band, xtals 70·26MHz, £18. PTC3302V 50W 4m a.m. tx, £18. Emsac 4m converter, 4·1-4·7MHz i.f., £5. Microwave Modules 2m converter, 4-6MHz i.f., £12. Marconi TF643B wavemeter, 20-300MHz, £20. Mint Eddystone EC10, £60. G3TQY, QTHR. Tel Loxwood 752933.

Quad QC11 control unit, £5. 15W amp with psu, £5. Faulty TCS12 rx, £5. Small scope with 3in tube, slight fault, £7. Portable generator, 875W 115V with 300W auto transformer, £20. Lots of junk. G4ADN, QTHR. Tel Bolton 55051.

Europa, with coaxial relay and preamp, £50. HA202 40W fm amp, £35. Waddell, G4DIO, QTHR. Tel Wolverhampton 733185 or 733722.

Heathkit HW7 QRP tx/rx, exc cond, with manual, leads, etc, £30 inc carr. Mono commercial audio amp, 10W, bass and treble controls, various inputs, £8 inc carr. G4BVH, QTHR. Tel 0273 504634.

Eddystone EC10 Mk2, £75. Ten-tec KR5 keyer, £20. FT101 Mk1, £300. SB220, £300. 4CX250B twin base, £15. Microwave Modules 2m and 4m converters with LO o/ps, £15 each. Buyer inspects and collects. G4AOS, QTHR. Tel 061-766 3013.

Solid State Modules Sentinel 4m converter, 4-6MHz i.f., £11. Sentinel 2m preamp, £6. Pye Vanguard on 2m, £10. Marconi sig gen, £12. New vhf spark plug suppressors, £1. All plus carr. G8EBM, 15 Wheeldon Way, Hulland Ward, Derbyshire. Tel Hulland Ward 530.

EC10 Mk2, mint, £90. HW7 QRP tx/rx fb rig, £35. Bauer paddle, £4. All unmarked, unmoded gear. Carr extra. G3HQH, QTHR. Tel 0663 44087 after 8pm.

FT75, FP75, FV50C, need considerable attention hence low price, £50. KW E-zee match, £12. KW swr bridge, £7. Buyer collects Midlands. Cpl Short, E Troop, 13 Sig Regt, BFPO 40.

Heathkit digital multimeter IM102, perf cond, recently calibrated by manufacturer, accurate measurement on ac/dc volts, currents and resistance, genuine reason for sale, send sae for full specifications. Cpl D. W. Wright, Regt Wing, Parsons Barracks, Cod Donnington, Telford, Salop.

Versatower SP60, four months old. Hy-gain TH3 Mk3 SNR beam with BN86 balun, two months old. TR44 rotator. 120ft of RG8U HD coaxial and rotor cable. All as new with original packaging. Collins S-line, fully comp station in immac cond, with full documentation. 75S3B rx, 32S3 tx, 516F2 psu, 30L1 linear, 312B4 station control, desk mic, dummy load, aerial switch, full set of cables. Offers invited. Tel 0602 54047.

G3ZVC tx/rx kit, inc all parts, XF9B filter, etc, £50. Trio vfo 5D, £25. Bantex magnetic mount ¼ wave whip, £8. G4DAW, 479 Wellingborough Road, Northampton. Tel 714821 anytime.

KW E-zee match, £15. 103 swr power meter, £10. Heath 50Ω load, £10. Test set AP71774 inc Klystron CV116, BC221 innards, brass key circa 1917, many meters, rf inc. Two 5FP7 tubes, new. G3VUF, QTHR. Tel Morpeth 2790.

Heathkit tx/rx, almost new. SSB and 400Hz cw filters. HP23B psu. SB600 spkr, exceptional mint cond, £258. HW100 tx/rx, HP23A SB600 spkr, nice cond, exc performance, £165. G3WY, QTHR. Tel Evesham 45497.

FT101B, £350. FV101B, £40. SP101B, £10. QM transverter, 200W p.e.p., £70. IC22A, 13ch inc Raynet, £120. *Radio and tv servicing*, 10 vols, 1965-76, all mint cond, no offers, £40. MM converter, 70cm 14-16 i.f., £10. 10XY/2m, unboxed, £15. 18AVT/WB, £40. G8FCA, QTHR. Tel Hitchin 50519.

QM70 28/432 transverter for Liner 2 with parts for modification of latter unused, £70 ono. TMK model 500 multimeter, £8. QQV06/40A, £2.50. QQV03/20A, £2. Sinclair S60 stereo preamp, £1.50. *Wanted: Ham Radio* December 1975. G8JHE, QTHR. Tel 063872 545.

FT2FB tx/rx fitted with 12ch, £120 ono. YD844 mic, £11. G3ZXF, QTHR.

Mags, many years RSGB and *SW* mags unwanted, free upon collection. G3WNM, QTHR.

RSGB "Bulletins", bound vols 32 to 39 incl 1956 to 1963. *RadComs*, loose, vols 1 to 12 incl 1964 to 1975, November 65, January 71 and January 75 missing. *Short Wave Magazine*, bound vols 15 to 21 incl 1957 to 1964 loose, vols 22 to 32 inclusive, 1964 to 1975, January 66 missing, for sale in one lot only to the highest bidder. Offers to G3LGN, QTHR.

AR88D fitted product detector and S-meter with manual, £35. 9 Bracken Hill, Osbaldwick, York. Tel York 55624.

FT200 and psu, 12 months, new cond, £190. No offers. KW Vanguard tx, 80-10, and Trio 9R59DS rx, 12 months, vgc, £55. G4EJD, 125 Armshead Road, Werrington, Stoke-on-Trent ST9 OEL. Tel Ash Bank 3458.

Star ST700 tx, 100W, 80-10, ssb/cw, 240V. Hallicrafters SX111, 80-10, 240V. Heath bridge HM15. Diamond DP KB105 vert, all with hand books, £150 the lot. Offers for split considered. Free BC221 with comp lot. G3URG, QTHR.

Farfisa VIP345 electronic organ, single manual and pedal board, home use only, £275 ono. G3UZI, QTHR. Tel Horsham 66327.

PF1 pocketphone txs and rxs. 3 sets, not mod, incl 9V and 18V nicads, not checked. Txs, £9 each. Rxs, £11 each. Batteries, £2 each. Pair comp with batteries, £22. Batteries not sold separately. G3JKF, QTHR. Tel 0293 28080.

KW202 matching spkr, mint, £150. KW204, exc cond, £155. Datong rf clipper, £32. G2DAF tx, £20. Pye base station, low band tuned for 4m, £5. Class D wavemeter, £3. G3ZHJ, QTHR.

Eddystone 680X rx, mounting blocks, matching spkr, late model, £70. Hallicrafters HT40 tx, 80-10m, cw/a.m., £12. Sterling telephone one valve set, with Dinkie horn spkr, early Edison Bell twin xtal set, all vgc, all carr extra. G3ZCD, QTHR. Tel 78066.

Antenna specialists 2m ½λ whip type ASP677, as new, £10.75 inc p/p. G3PLL, QTHR. Tel Cottesmore 513.

ARRL Handbooks, 1961, 66, 68 and 71, £1 each. *RadCom*, 1969-1973, £2 per year plus postage. AN/UPM-1 vhf/uhf SG/WM scope, original calibration charts, £50 or offer. Buyer collects. *Wanted:* Trio TR7200. G8AXC/G6AGC/T, QTHR.

Heathkit HW100, plus psu, KW E-zee match and KW swr meter, £140 ono. 7E teleprinter mains motor, £16. Airmec vvm, 200MHz plus dc and "R" ranges, £7. DFM 300MHz 6 digits, h/b, £50 ono. G3SJR, QTHR. Tel Stevenage 51297.

Perf JR599, plus spkr, £150 ono. Trans FL50B, £60 ono. Both with manuals. G3JDN, 2 Castle Drive, Reigate, Surrey. Tel Reigate 40646.

Galaxy Mk2, 5 bands, 400W p.e.p., good cond, £150. KW2000E, few hours use, as new, £285. Must sell, moving house. G3ZLN. Tel Ipswich 55200.

Xtals B7G 100kHz, FT243 6606·667, 7025, 7106·667, 7125, 7506·667, 7525, 7625, 7675, 7700, 10X 5100, 7150, 10245, HC6U 10610, 10660, 10675, 10685, 10689, 10694, 10695, 10·700, 10705, 10706, 10711, 10715, 10725, 10740, 10790, £1 each freepost. G3LHA, QTHR. Tel Coventry 414333.

TC7 tunable i.f., £37. 70cm 12XY incl harness, £14. Untested Cossor Commando LB, £7. 2m a.m. tx and psu, £8. Nuvistor 2m converter, 28-30MHz i.f. and psu, £7. Buyer collects. Wish to exchange TR2200 for KP202 or similar. G3VOM. Tel 061-794 6659.

40W 2m tx. Ex-Pye Vanguard mains power supply. Solid state fm modulator, xtal controlled, fitted with automatic COMS toneburst, £35 ono. Buyer collects. G8IMR, QTHR.

2m SSM converter, 28-30MHz, £10. 38·666MHz HC6U xtal, £2. VHF components, unused valves, capacitors, etc. SAE for low-priced list. G8HBW. Tel Aldridge 54166.

Yaesu FT200 tx/rx, psu, six months use, perf, carr by Securicor free, £195. Turner, 18 Melfort Road, Newport. Gwent GW4 EPR.

Partridge 425-0-425 200mA, three lts, unused, £5. Two Gardners ULOP AS7013, £5 each. Two Goodmans Audiom 100 ls, 15Ω, £7.50 each. M75 ED, perf, £6. Fantavox stereo booster, £3. G3KRH, QTHR. Tel 01-455 5039.

Transformers, Woden 240V in 1,250/1,000-0-1,000/1,250 at 300mA, £8. Woden 240V in, 2-0-2 at 6A, £1.50. Woden 240V in, 2·5-0-2·5 at 8A, £2. Add 10% carr. G3MA, QTHR.

19 set, plus phones, atu, control box, wkg, £10. R1155, not wkg, £7. Cossor 1035 scope, wkg, £25. Valves, assorted, 10p each. *Practical Wireless* 1967-69, 10p each. Tel Hastings 427754.

Airmec sig gen type 201, 30kHz-30MHz, £35. Wireless sets No 88, type A, four switched xtal positions with xtals. Phones, mic, whip aerial, £3. G3GFI, 10 Harrowby Road, Banbury, Oxon. Tel 52035.

18AVT/WB, good cond, £30 ono. Heavy morse key with cover, £3. Douglas Calder, GM4ESW, 111 Muirside Avenue, Kirkintilloch, Glasgow G66 3PP. Tel 041-776 5495.

Liner 2, with preamp, mobile mount, manual, £110. Exchange for good rx or tx/rx. GM8JFE, QTHR. Tel Hawick 3441.

Superb Trio TL911 KW amp, comp with spare valves, only £135. Hygain wide spaced 10m beam, £25. G3NAC. Tel 0954 60584.

RF sig gen, Tech TE20D, 120kHz-500MHz in six bands, exc cond, £15. *Wanted:* BC221-M operating and service manual. Smith, 8 The Parkway, Canvey Island, Essex. Tel Canvey Island 3805 after 6.30pm.

Front end metal work for 13cm WA2VTR converter, £2. 46E 70cm MB, £5. Buyer collects. 24V 50Ω coaxial relay with F&E plugs, £2. Carr extra. G4BYV, QTHR.

Racal RA117, with ssb adaptor, case, manuals, spare valves, exc cond, fantastic reception on piece of wet string, £425. Many part exchange test equipment. G4DDM, QTHR. Tel 049481 4483.

Heathkit HW17A 2m tx/rx, with fm attachment. Exchange for 2m portable or offers. G3XBP. Tel Marlow 3186.

IC210 vfo 2m tx/rx, with xtals 145·00, 145·50, 145·55, 600kHz upshift, 600kHz downshift, toneburst, preamp, original box, instructions. Liner 2, little used, original box and instructions. Sensible offers please. G8IFC, QTHR. Tel 0992 28144.

BC221-AJ, accurate and perf with charts and stabilized psu, £20 plus carr. 134 clean issues *QST*, July 1964-October 1975. 141 issues *Rad Com*, July 1963-June 1976. Sensible offers. Plus carr. GD3TIU, QTHR. Tel 062485 442.

4CX250B uhf ptfe base with incorporated chimney, superior quality, £5 each. As new Londex type coaxial relays with plugs, £6. Cambridge AM10B, £9. New xtals, HC6U 8·000MHz (S0 and S20 in FT221), 9·000MHz, £1.50 each. 18 HC18U xtals, 67·8MHz-76·3MHz in 500kHz steps, £2 the lot. All carr extra. G8ENI, QTHR. Tel Cheslyn Hay 415374.

Liner 2, £95. KW77 rx, £50. Tel York 29864 after 6pm.

Good QTH with Versatower, 350ft asl, 4 bedroom chalet bungalow, 200 by 50ft plot, open aspect, greenhouse, gardens and lawns, oil fuel CH, det double garage, adjacent M1/A6/A1, mainline railway, St Pancras 1hr, £24,500 ono. G3KSH, QTHR. Tel 05257 2164.

Comp Drake station. R4C 10-160m, NB, 500Hz filter, T4XC 10-160m, AC4 psu, L4B linear, W4 wattmeter, all as new and little used, comp with manuals. Hughes, 67 Penlan Crescent, Uplands, Swansea.

Telequipment D31R scope, 6MHz double beam, one beam not wkg, with manual, £18. Cossor 3339 scope, wkg, with circuit, £5. Valve rf/i.f. oscillator, 0·1-100MHz, £2.50. All plus carr or buyer collects. G3SVL, QTHR. Tel Camberley 64330.

Trio TS700, 2m all mode, mains/12V tx/rx, immac 1975 model in maker's packing, few hours use only, in exchange for similar cond TS520 or FT101B. G3GGL, QTHR. Tel Bewdley 403372.

KW77 amateur bands rx, £50. Weir 28/144MHz converter, £12. 2m 6 over 6 aerial, £5. TMK in circuit transistor tester, £12. *Wanted:* Af/rf sig gen and elements for Bird wattmeter. G4CXL, QTHR. Tel Weybridge 43267.

Versatower 40 with plate for CDR AR22 rotator and all fittings but less ground post. No reasonable offer refused. GM8APH, 72 Polwarth Terrace, Edinburgh. Tel 031-337 3701.

No realistic offer refused. Perf cond/function. TR7200G. Liner 2 preamp. Brand new LA106. Apollo 240V 800W 50Hz 4-stroke gen, 5hrs. Custom cased ERC. 35mm Edixa Prismat outfit. F2·8 Travenar. 450mm Soligor telephoto (2), × 2 tele adaptors. *Wanted:* FDK multi. FT2 auto. FT220. GW8EHR, Brynsworth, Dandorlan, Burryport, Dyfed.

KW2000, with ac power supply, G-line, vgc, £115. G3OLW, QTHR. Tel Tewkesbury 295081.

Exchange Microwave Modules MMTH32 70cm ssb transverter, together with Jaybeam MBM48/70 46-el Multibeam (the pair cost £110) for 2m ssb gear with cash adjustment as necessary, or good communications rx. G3CGQ, QTHR. Tel 0582 25519.

AM25B Vanguard, comp, £25. AM10D Cambridge, £25. Both on 70·26. 12V 12A dc power supply, £15. GI3YDH, QTHR. Tel Belfast 643913.

HW202 tx/rx, fitted for 145/145·5 with HWA-202-1 psu, mint cond, must sell as going sideband, cost £170, will accept £110 ono. Jewell, G8JOH, 158 Uppingham Road, Leicester LE5 0QG.

Liner 2, mic, manual, BLY36 in final, Belcom psu, £140 ono. G8FWJ. Tel 01-253 0329.

Solid state realistic DX150A communication rx, fet rf, gen cov, vgc, only £40. Pye Vanguard AM25B, converted to 144MHz fm, toneburst, mic, controls, and xtals, vgc, £12. Urgent shack clearance hence very low prices. Tel Oakham 55114 for details.

KW2000B tx/rx, 10-160m, E-zee match, dummy load 50Ω, all immac cond, £220, £15, £7 respectively. FL2500 2kW linear, as new, spare set of valves, £130. 2-el Minibeam B24, £15. G4DJZ, QTHR. Tel Peterborough 69622.

CR150, Japanese, 550/1,600kHz 1·6-30MHz in four bands, bandspread, bfo/anl/tone/send/receive switch, S-meter, telescopic aerial or external, 240/250 ac, vgc, £25. G8VG, QTHR. Tel 0322 26464.

Trio 9R59DS, spkr, handbook, £45. Trio TR2200, xtals 144·48, 144·72, 145·32, nicads, £60. PCR rx, power pack, £15. Cambridge AM10 boot mount, control box, cable, wkg on 145·05, £30. Buyer collects. G3YUI, QTHR. Tel Luton 58668 after 6pm.

Radiovisor burglar alarm, pulsed infra red, £15. Fan motor. 85p. U27 valve, 80p. CV345, £2. Quantity of winding wire, Multiple cable, Litz, trimmers, coils. All unused items. Please enquire. Plus postage. *Wanted:* Oscilloscope. W. H. Joyce, 41 Rochdale Road, London E17 8JF. Tel 01-539 5421.

KW500 linear, £35. HW30, £15. Both good wkg order. Cambridge Ranger, needs attn, £4. Buyers collect. G3ECU, QTHR. Tel Earldoms 258.

Storno Viscount hiband, comp, manual, xtals 145·50, £20. Pye boot Ranger, comp, £8. Garrard 9V tape deck with case, amp, etc, £8. H/B inverter unit, two inverters, relay switched on, one chassis gives 265V and 180/400V from 12V dc, prof finish, £18 ono. G8DXD, QTHR.

R1475, with psu, good cond, £35. Marconi 4m 50W tx, a.m./cw, £10. Marconi HD57A ssb driver, 1·6-24MHz, 100kHz filter, psu, handbook, 5W output, £35. Pye 19in colour monitor type 7100 with handbooks. Offers. G3PGN, QTHR. Tel 0277 822891.

Trio JR500S amateur bands rx, with model RS1 Global spkr, exc cond, £90. G3TLI, QTHR. Tel 04012 3205.

Xtals, 40MHz, £1. 35·331, £1. 36·1, £1. 465kHz, £1. QQV06-40, £1. 2C39A, £1.50. Pair KT66s, equiv, £1.50 each. Power supply 750V 200mA plus 350V smoothed, £3. Buyer collects. *Radio Communication Handbook,* £2.50. Tx, a.m., 6146 output, modulator, five xtals, £15. Buyer collects. 9ft by 1¼in aluminium masts, £1 each. Carr extra. G8CJO, QTHR. Tel 0272 772435.

Trio JR310 rx, 160-10m, a.m./ssb/cw, fitted 10AZ cw mech filter, vgc, manual, spkr, £75. Pye Cambridge AM10DV, cw, new xtals 145·0MHz and ⅝ mobile whip, £25 ono. G3KTA, QTHR. Tel Burgh Heath 58758 evenings.

Trio 9R59DS stabilizer, handbook, exc cond, £46. Joystick vfa and LZ match. Artificial earth, £25. Buyer collects. G4AJM, QTHR.

Trio 7200G, with preamp and 8ch, £115. VFO 30G for above and 2200GX, £50. Telford TC9 tx with vfo, £75. 2FM70 tripler/converter, 70cm/2m, £45. G8KDC, QTHR. Tel Orpington 22443.

Mosley 2-el 10/15/20, 2000W p.e.p., unused, £40. Buyer collects. Shure 444 Jap 4 pin plug, £14. Carr extra. Tel 01-679 3215 after 7pm.

Collins TCS6 tx, £8. Pye uhf tx/rx, £20. Pye vhf base tx, £12. Volumes *RadCom, Short Wave Magazine* 1960-70, 50p volume. G3HVI, QTHR. Tel Blythe Bridge 3349.

Heathkit GR78 rx, few scratches on case, otherwise ok, £55. Prefer buyer collect or carr at cost. G8AVA, QTHR. Tel Basildon 555292.

SEI QC1246AA ssb xtal filter, with carrier xtals, £18 (£29 new). No 10 calibrator, £4. Top band a.m./cw, full break-in, needs psu, £6. 7W per channel stereo amp, £5. All plus carr or buyer collects. G3SVL, QTHR. Tel Camberley 64330.

Cossor model 2000 dual beam oscilloscope, good wkg order, average physical cond, £40 ono. Woden potted mains transformer, 2·5/0/2·5V 10A, 350/0/350V 500mA, will give 900V dc at 750mA p.e.p., suitable for linear, £3. Tel 09074 3134.

JR310 rx, xtal calibrator, full 10m coverage, handbook, etc, £70. G2DAF ssb tx, 160-10m, 180W p.e.p., ac psu, circuits, etc, £40. Buyers collect. G3OGP. Tel 01-398 3953.

KW trap dipole, 97ft feeder, virtually as new, sudden change of QTH prohibits re-erection, £10.50 plus postage. G6RF, 9 Mews Court, Menheniot, Liskeard, Cornwall. Tel Liskeard 45459.

Trio JR310, with mechanical filter, £50. Kelley, 245 Kenton Road, Harrow. Tel 01-907 5218.

First class station. Drake TR4, Drake MN4 match, HQ1 Minibeam, CR44 rotator, Heathkit SB610 monitor, all one careful owner. Reasonable offers considered. G3YYI, QTHR.

KW2000E, perf, as new, £285. DC psu, £36. Microwave Modules MMC432/144 converter, £16. MMV432 varactor tripler, £15. Green 2m tx, £20. Yaesu YD844 desk mic, £12. Heath GD-IU gdo, £12. G4AFY, QTHR. Tel Kidderminster 63358.

Eddystone 940C, mint cond. Offers. R. Lindsay-Smith, c/o 29 Neal Street, London WC2H 9PR.

KW2000B, £200. Codar fixed/mobile, T28/AT5 ac/dc power supplies, control unit, £45. BC221, own charts, spare xtal, £10. Many *Bulletins* and *SWMs.* Prefer buyer collects. G4LA. Tel Hexham 2734.

IC22A, as new and boxed, fitted 10ch, ic toneburst, adjustable one-minute timeout warning tone, £158, or in part exchange for TS700 or FT221. G3XFB, QTHR. Tel Brewood 850033.

Heathkit 10-102 scope, brand new, £80. Hi-mound morse key on marble plinth, £10. IC22A mobile mount, £2.50. 20m 8-way rotator cable, £2. 1971-75 inclusive *Radio Communication,* inc binders. Offers. Post extra all items. Phipps, G4DIC, QTHR. Tel Hinckley 36811.

Yaesu FT224 mobile, 2m, many extra channels, new, boxed, £135. FR101 deluxe digital, new, boxed, £375. HF 2kW linear commercial unit, £165. BC221 frequency meter, £20. Exchanges considered. Taylor, 5 Luther Road, Winton, Bournemouth. Tel 50400.

G5DF moving QTH has two 30ft steel lattice towers, each in 15ft sections, 15in triangular section, at £35 per tower. Lots of other good buys, power packs, xfmrs, etc. Buyers collect. G5DF, QTHR. Tel Reading 27876.

60ft triangular lattice tower, in six 10ft sections. Offers. Two 20ft alloy poles, £5. *Wanted:* Eight 15ft bamboos and "X" brackets to build 2-el quad. G4DDS, QTHR. Tel Doncaster 884651 after 6pm.

R1155 rx, converted 250V, £10. Mast, tubular steel base section, tilt over lattice and 16ft by 2in alloy pole, total height 28ft, £22. Solartron CT316 oscilloscope, no case, £17. G8JDE, QTHR. Tel Sambrook 375.

Comp 2m station. TS700 and 5-el slot. Offers. MM 5W a.m. tx and mic. MM tunable rx with spkr. Offers. G4BLV, QTHR. Tel Bishops Waltham 2469.

WANTED

Trio TS520, must be mint. G3PLP, QTHR. Tel 021-744 3187.

Xtals, 8,250kHz, FT243 or similar, must be active. Heathkit scope 10-12U or OS2, with probes if possible. G3KRH, QTHR. Tel 01-455 5039.

Copy of February 1975 "QST". Contact RSGB HQ.

IC22, C828, TR7200G or similar fm box wanted by schoolboy trying to get on the air. Beam/rotator or omnidirectional aerial. J. M. Buckley, G8KYP, Dovers Green, Shenley, Herts. Tel Potters Bar 42217 evenings.

Yaesu FT101B, must be in good cond. G3BPE, QTHR.

Versatower, prefer 40ft but consider 60ft post mounting. G4DMN, Heronsgate, Manorial Road, Parkgate, Wirral L64 6QW. Tel 051-336 2386.

Pye Bantam high band or similar, prefer with manual. High band Cambridge. G8AUN, 87 Aylsham Road, Norwich NR3 2HW. Tel Norwich 42253.

Yaesu FLDX400, cond and price to G8JWI, QTHR. Tel Hertford 53580.

Philips EL1953/00 video head for EL3400 vtr, and EL1953/special for LDL1251 vtr. G8CMO. Tel 0264 2747 after 6pm.

Will exchange new unworn gents' Rolex Oyster Perpetual, model 1603, stainless steel, guaranteed, for newish Liner 2 II or similar 2m ssb tx/rx or Trio TV502 tx/rx, unmod. D. M. Moodie, GM8KJO, Farkhill Farm, Bankfoot, Perthshire PH1 4BY. All letters answered.

Vibroplex key or similar. Details to Budden, G8JH, QTHR. Tel Buckfastleigh 2586.

Muirhead D649 weather chart recorder. D700 photo fax machine. Morris, 3 Astley Road, Bradshaw, nr Bolton, Lancs. Tel Bolton 52384.

HW32A or HW12A, mobile aerial, or h/b portable mobile 80/20m tx/rx. Will collect. Doyle, 4 Wricklemarsh Road, London SE3 0NF. Tel 01-856 7478.

Amateur ssb rx, must be reasonable. GM3UWO, QTHR.

CR300 circuit diagrams, manual or any information, loan or purchase. G8WN, QTHR.

Old wirelesses wanted by collector/enthusiast, especially BTH spkrs, amps, radios, Philips pre-war, GEC before 1932, Murphy up to model 30, Pye up to 1934. Books, etc, before 1931. Valves, etc. C. Sawyer, 210 Gordon Avenue, Camberley, Surrey. Tel 0276 29460.

Hudson FM208 high band, any state, any amount. GC3HKV, QTHR. Tel 0481 47278 between 6-7pm.

Info or circuit on Storno hi-band CQM/13C/12T, all expenses met. G3PTB, QTHR.

Operating instructions for Taylor valve tester, model 45A. Manual for Redifon GR334 Mk2 tx/rx, buy or borrow, all costs met. I. Newbold, G8KSZ, 66 Crantock Road, Perry Barr, Birmingham B42 1RP.

2m Jaybeam omni-vee aerial. G8GVE, QTHR. Tel Welwyn Garden 22112.

Base connections and data for Mullard crt type MM13-10. 11th or 13th edition *Editors and Engineers Handbook*. A. Cooper, 1 Cottage Crescent, Camelon, Falkirk, Stirlingshire.
Westminster W15AM h/b. PA board, knobs, set for spares, why? FT75 /m rig. Heathkit HD1250 gdo. IG102 /rf-IU TE20D sig gen. G4AFY, QTHR. Tel Kidderminster 63358.
Heathkit RA1 rx in perf cond, professionally made or checked, state price. Penberthy, 162 Hills Road, Cambridge CB2 2PB.
Linear amp, KW1000, KW600, FL2000, FL2100, SB200. GW4DJW, QTHR. Tel 035-287 877.
Paddington—local digs required by radio amateur starting St Mary's Medical School, from October. Kai Chandler, 2 Argentan Close, Abingdon, Oxon. Tel 0865 20707.

Mobile rallies calendar

19 September	North Ulster RSGB Group Mobile Rally, Castle Grounds, Antrim. Commencing 12 noon. Talk-in on 2 and 4m. Facilities for families at nearby Antrim Forum. Details from GI8AYZ, QTHR.
19 September	Peterborough Mobile Rally, Walton Secondary Modern School, Mountsteven Avenue, Peterborough. Talk-in on 160 and 2m. Details from G3EEL.
26 September	Harlow & D ARS Rally. Venue as last year. Details from G3WUX, G8JXU, G3YDI, QTHR.
1977	
12 June	Longleat Mobile Rally. Details nearer the date.
7 August	RSGB National Mobile Rally, Woburn Abbey.

Looking ahead

18 September—British Amateur Television Club Convention, University of Leeds.
25 September —Scottish VHF Convention, Dundee University.
26 September—Welsh Amateur Radio Convention, Oakdale Community College, Blackwood, Gwent.
16-17 October—JOTA 1976. JOTA Scout camp and radio teach-in at HMS *Mercury*.
28-30 October—ARRA Exhibition, Granby Halls, Leicester.
3 December—RSGB AGM, Royal Society of Arts, John Adam Street, London WC2.
24 April 1977—NRSA Convention, Belle Vue, Manchester.
6-8 May 1977—RSGB International Radio Communication Exhibition and Convention, Alexandra Palace, London.
17-18 September—NW Amateur Radio Convention, University of Lancaster.

Cray Valley RS 8th SWL Contest rules

1. From 1800gmt 25 September to 1800gmt 26 September. Up to 18 hours logging may be done during this period, and the rest period must be clearly shown. Multi-operator stations may log during the entire contest.
2. The contest is open to anyone in the world and there will be two sections (phone and cw) each containing two categories (single-operator and multi-operator). The second category is open to two or more listeners or to clubs, and more than one receiver can be used.
3. The 1·8, 3·5, 7, 14, 21 and 28MHz bands may be used.
4. Stations may be logged using any mode.
5. The practice of logging a series of contacts made by one station is deprecated. Log entries must not include the same callsign in the "Station worked" column more than 20 times on each band.
6. The object of the contest is to log as many stations in as many countries as possible. Scores should be compiled as follows: one point for each station heard on each band *multiplied* by the number of different countries heard on each band added together. A list of countries heard must be furnished and a separate log must be submitted for each band. In addition a bonus of up to 100 points will be awarded for neatness. Illegible logs will not be accepted.
7. The call areas of the USA, Canada and Australia will each count as a separate country; ie W1234567890 VO1 VO2 VE12345678 and VK12345678. All other countries will be determined by the official RSGB Countries List.
8. No CQ or QRZ or similar call will be allowed to count for points. AM or MM stations are not to be included in entries.
9. Log sheets are available from Roger Smith. It is desirable that entrants use official log sheets, but entries on home-made log sheets will be accepted as long as the following information is given: Date, time (gmt), band, station heard, station being worked, reports at SWLs QTH. Points may only be claimed for stations actually heard and the callsign must be shown in full. If points are claimed for both stations the callsign of each must appear in the "station heard" column.
10. Entries should be addressed to the contest manager, Mr R. J. M. Smith, 42 Woodchurch Close, Sidcup, Kent DA14 6QH, England, to arrive *not later* than 1 November 1976.
11. Certificates of Merit will be awarded at the discretion of the committee of the Cray Valley Radio Society, and their decision will be final.

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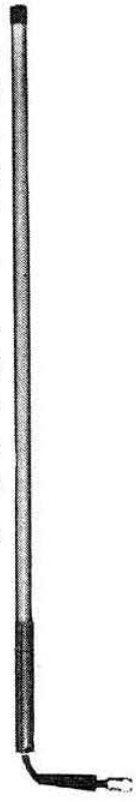

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YORKSHIRE:
The Amateur Radio Shop
13 Chapel Hill, Huddersfield.
Tel. Huddersfield (0484) 20774
Nick Sheard, G8KLY, Leeds
Tel. Leeds (0532) 535143

SCOTLAND:
Ian Mckechnie, GM8DOX,
41 Westerlea Drive,
Bridge of Allan,
Stirlingshire.
Tel. Bridge of Allan (078683) 3223

WALES:
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Power output	10 watts continuous rating	10 watts continuous rating
Drive requirements at 28MHz	500mW or 5mW	500mW or 5mW
Level of spurious output	—65dB	—65dB
Receive converter gain	30dB	30dB
Receive converter noise figure	Better than 2·5dB	Better than 3·0dB
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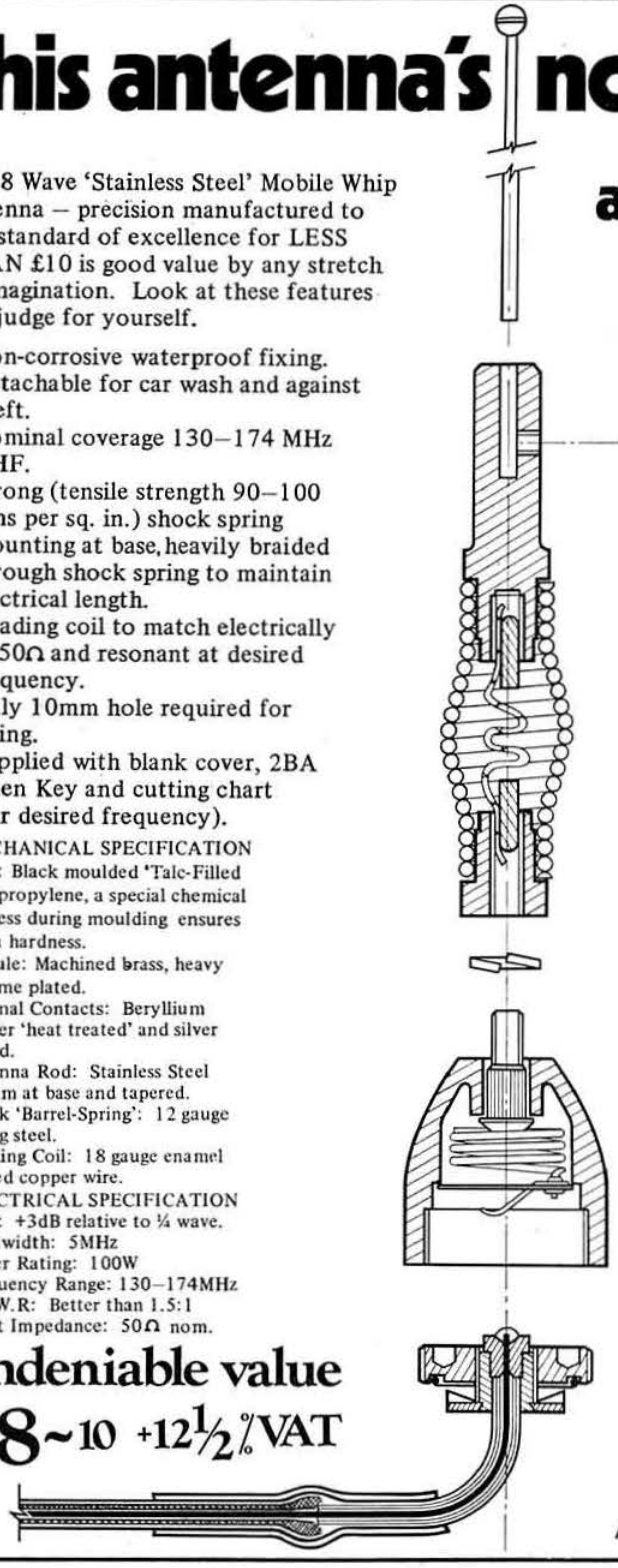

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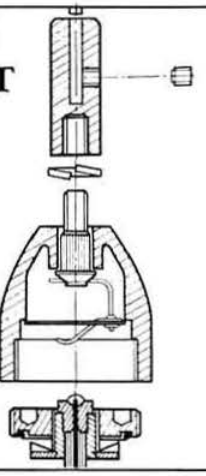

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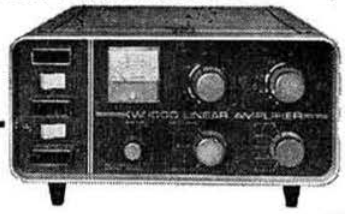

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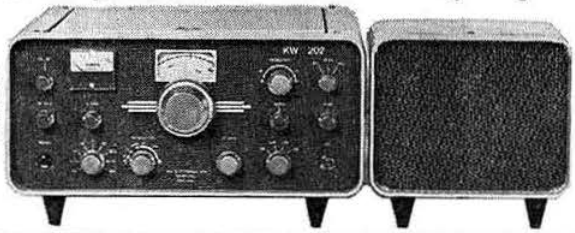

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