radio communication

September 1971

Journal of the Radio Society of Great Britain

NFD 1971—Results: page 636

Members of Southgate Radio Club, G3SFG, erecting their 20m cubical quad. L to r: G8DXW, G3ZVW, G3MWF, G3ZVO, G8DYS (almost hidden), G3TDM, G8ASR (on steps), G3MBL, and G3XSV

Photo: Miss M. M. Marden

September 1971

radio communication

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CONTENTS

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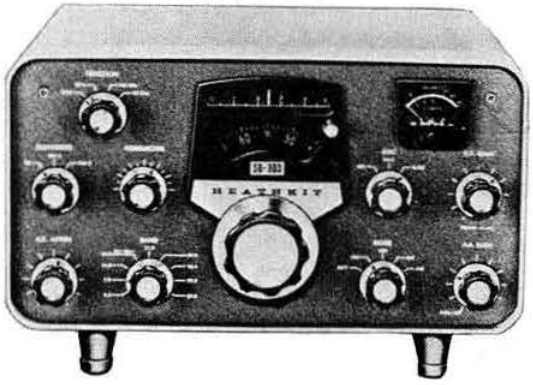
The Outstanding Heathkit SB-303



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Frequency range (MHz) 3·5–4·0; 5·7–6·2; 7·0–7·5; 9·5–10·00; 11·5–12·0; 14·0–14·5; 15·0–15·5; 17·5–18·0; 26·9–27·4; (other options). Less than 100Hz drift. Selectivity 5·0 kHz at 6 dB–15 kHz at 60dB. 8 ohms ext. speaker 110–240V. A.C.

SB-310 **£125** Carriage 70p.

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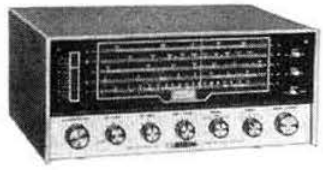
2 MHz to 30 MHz. plus 550 kHz to 1550 kHz, 180 kHz to 420 kHz. Tuned RF. Crystal filter. Product detector. AM/SSB/CW. Noise limiter. Sleek styling. Charcoal grey metal cabinet. 120–240v. A.C.



GR-54 **£53** Carriage 60p.

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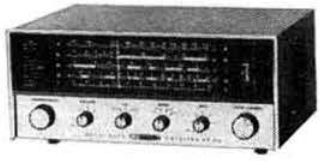
3 shortwave bands cover 1 MHz to 30 MHz, plus 550 kHz to 1620 kHz. Built-in 5" speaker. 7" slide rule dial 4-valve superhet circuit. Handsome styling. 110-240v A.C.



GR-64 **£25** Carriage 50p.

SOLID-STATE GENERAL COVERAGE, GR-78 KIT

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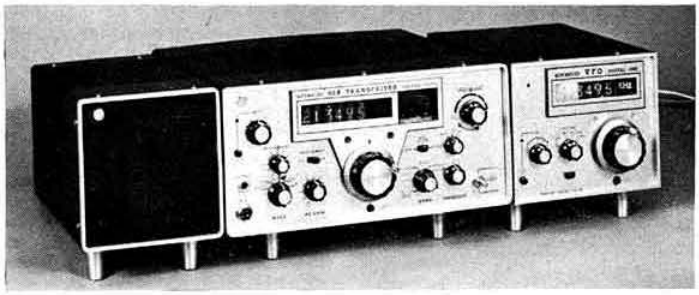
Sim, GM3SAN, 19 Ellismuir Road, Baillieston, Nr. Glasgow. 041-771 0364



NEW EQUIPMENT

Yaesu:

	FTdx560	560W p.e.p. transceiver £195
	FT-101	260W p.e.p. mobile/fixed station transistorized transceiver £230
	FT-200	260W p.e.p. transceiver £132 (p.s.u./speaker £35)
	FRdx400	Receiver. Super de luxe version with FM discriminator, four true mechanical filters and two VHF converters £160
	FLdx400	Matching transmitter. £140
	FL-2000B	Matching linear £130
	FT-2F	2m FM mobile transceiver £80

Matching speakers £10. External VFO's £35.

New Model: FT-401 Designed for the CW man—built in CW filter as well as the normal SSB filter, built in noise blanker, fan-cooled PA. Further details and price to be announced when we have thoroughly vetted the equipment.

Inoue:

New Model: IC-20 Restyled IC-2F retaining all the valuable features with one or two minor improvements £80.

We have just received a batch of IC-700R receivers—these are the solid state amateur band receivers with the top quality 9 MHz crystal filter at a *reduced price* of £75. At the old price they were a best buy, and at this price they are an absolute steal.

F.E.: FE-600 FE-600 200W p.e.p. transceiver. Excellent value at a rock bottom price. A ready-built 80-10 200W p.e.p. (2 × 6146-B's) transceiver with built in p.s.u., VOX, MOX, PTT, RIT, etc. Everybody thinks there's a catch—it can't be any good at such a low price. Nonsense, gentlemen—just listen to them on the air or come along and try one at our QTH. Convince yourself. The daftest thing I ever did was to underprice them in the first place. However, let's see if I can move 'em at £130. (And if anyone wanting a low priced rig misses this, then they want their nut examining!)

New Model: Digital 500D Mr. Hirakawa had turned up trumps—not only has his latest model incorporated all the things we asked for, he has even increased the nixies from 5 to 6 so that the rig now reads to 100 Hz. £275. Digital One—separate VFO also available, illustrated above.

Other new stuff includes the YD846 mike at £5 (this is the one supplied with the FT-101—sound nice, don't they?) and the deluxe table mike YD844 at £10. Keys £1, EK-9X keyers £8.20, low impedance padded headsets £2.50 without plug, £2.60 with stereo plug, 12 hour digital clocks £5.80. Crystal filters KVG XF-9A, B, C, D and M all in stock, as well as the TEW and Kokusai. Fresh batch of Asahi dual meter SWR meters £6.80. Power meters/dummy loads, these are a very superior job, switchable 20 or 120 watts, VSWR 1.2 or better. 50 ohms 3-500 MHz £38. 75 ohms 3-150 MHz £35.

VHF men—at last a *decent* piece of gear at a reasonable price. VHF mobile whips: the G-whip ⅝ vertical at £4.10 plus 15p postage—just the job for the mobile IC-2F, IC-20 or FT-2F.

All prices post free except where stated.

SECOND-HAND EQUIPMENT

Receivers:	Collins 51J4 £250
	AR88D £35-£50, choice of three
	Trio JR310 fitted with optional Kokusai filter. List £92, our price £70
	Trio JR310, standard £55
	National NC-183D £65
Transmitters:	Sommerkamp FL-1000 £65
	Sommerkamp FL-500 £110
	Sommerkamp FL-200B £85
	DX-100 £37.50
	DX-60 and HG10 V.F.O. £30 80-2m V.F.O.
	DX-60 and HG10 V.F.O. £30 80-2m V.F.O.
	Viceroy IV £80
	Hammarlund HX-50 £75
Transceivers:	KW2000A less p.s.u. £135
	KW2000B £170
	HW12 A.C. and D.C. p.s.u.'s £60
	Trio TS510 £140
	Swan 400 £160
	Swan 350 £150
	Sommerkamp FT-150 £150

Please drop us a line enclosing s.a.e. and we will send you all our guff.

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73 de Alan and Bill

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FEATURES

- **PASSBAND TUNING**
- **AVC WITH FAST ATTACK AND SLOW RELEASE** for SSB or fast release for high speed break-in CW. Also AVC may be switched off.
- **NOISE BLANKER** that works on CW, SSB, and AM and **NOTCH FILTER** are built in.
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- **TRANSCEIVE CAPABILITY**; May be used to transceive with the T-4B or T-4XB Transmitters. Illuminated dial indicator shows which VFO is being used.
- **25 kHz CALIBRATOR** embodies sophisticated design, using integrated circuits and FET'S, permits working closer to band edges.
- **NEW SCRATCH-PROOF EPOXY PAINT FINISH.**

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Frequency Coverage: 3·5–4·0 MHz, 7·0–7·5 MHz, 14·0–14·5 MHz, 21·0–21·5 MHz and 28·5–2·90 MHz with crystals supplied. Ten accessory crystal sockets are provided for coverage of any 10 additional 500 kHz ranges between 1·5 and 30 MHz with the exception of 5·0–6·0 MHz.

Selectivity: Drake tunable passband filter provides:
0·4 kHz at 6 dB down and 2·6 kHz at 60 dB down, 1·2 kHz at 6 dB down and 4·8 kHz at 60 cB down.
2·4 kHz at 6 dB down and 8·2 kHz at 60 dB down, 4·8 kHz at 6 dB down and 25 kHz at 60 dB down.
Selectivity switching is independent of detector and AVC switching

I.F. Frequencies: First I.F., 5645 kHz crystal lattice filter; second I.F., 50 kHz tunable L/C filter.

Stability: Less than 100 cycles after warm up. Less than 100 cycles for 10% line voltage change.

Sensitivity: Less than 0·25 uv for 10 dB signal plus noise to noise on all amateur bands.

Modes of Operation: SSB, CW, AM, RTTY.

Dial Calibration: Main dial calibrated 0 to 500 kHz and 500 to 1000 kHz in 25 kHz divisions. Vernier dial calibrated 0 to 25 kHz in 1 kHz divisions. **Calibration Accuracy:** Better than 1 kHz when calibrated at nearest 100 kHz point.

AVC: Amplified delayed AVC having slow (·75 sec.) or fast (·025 sec.) discharge; less than 100 microsecond charge. AVC can also be switched off. 3 dB change in AF output with 60 dB change in RF input.

Audio Output: 1·5 watts max. and ·5 watts at AVC threshold.

Audio Output Impedance: 4 ohms and hi impedance for antivox.

Antenna Input: Nominal 52 ohms.

Spurious Responses: Image rejection more than 60 dB. I.F. rejection more than 60 dB on ham ranges. Internal spurious responses in ham ranges less than the equivalent 1 uv signal on the antenna.

Controls and Jacks:
Front: Main tuning, AF gain, RF gain, AM-SSB/CW with slow AVC, fast AVC, or AVC off, function switch, band switch, xtal switch, passband tuning and selectivity, preselector, and notch.
Rear: Antenna jack, speaker jack, mute jack, anti-vox jack, in-injection jack, accessory power socket, and fuse post.
Side: Notch adjust, S-meter zero, VFO-Xtal switch, and headphone jack.

Power Consumption: 60 watts. 120/240v. A.C., 50 to 400 cycles.

Dimensions: 5¼" high, 10¼" wide, cabinet depth 11⅛", overall length 12¼", weight 16 lbs.

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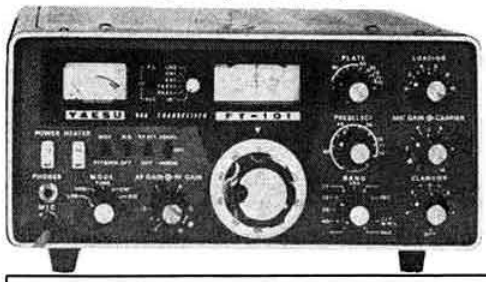
FT 101 (EX-STOCK)



FT101

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J. Beams (ex stock carriage paid)

2m. 2/4y, 4 ele	£2.65	2/14p 14 ele	£13.00	2/12, 6 over 6	£6.15
2/6y, 6 ele	£3.20	2/10xy, cross polarised	£11.00	2/16, 8 over 8	£7.65
2/8y, 6 ele	£3.80	2/10v, omni/bi-directional	£6.50	2/Ho, Halo	£1.20
2/10y, 10 ele	£8.20	2/8, 4 over 4	£4.60	2/HM Halo & mast	£1.50
70/16, 8 over 8	£5.10	70/18p, 18 ele	£6.50		
70/14y, 14 ele	£6.45	70/MBM/46, 46 ele	£9.60		

Bantex (ex stock carriage extra) Fibre glass mobile vertical antennas BTN 2m ¼ wave **£2.95.** B5 2m ⅝ wave **£4.50** Magnetic Mounts **£4.95**

G.Whips (ex stock, carriage extra **£0.65**)

Tri-bander 10, 15 & 20m	£9.45	Multimobile 71, 10, 15 and 20m	£11.50	Base mounts	£1.45
LF40, 40m coil	£4.00	MM40, 40m coil	£4.00	Thread adaptor	£0.25
LF80, 80m coil	£4.00	MM80, 80m coil	£4.00	SAE for leaflet please.	
LF160, 160m coil	£4.00	MM160, 160m coil	£4.00		
Telescopic section for LF coils	£0.70				

WE QUAD 10-20m "boomless" type. Cast aluminium centre. bamboos etc £23.00 carriage paid.

NEW W.E. Trapped dipoles for 10-80m. All are fitted with resin encapsulated traps and a high quality commercial grade centre assembly with cable strain relief.

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FT101/277 Transceiver	£230·00	FV200 Remote VFO	£35·00	FT560/747 Transeiver	£195·00
FT101 cw Filter	£11·90	FR400/500 Receiver	£120-£160	FT401 Fitted cw Filter	£215·00
FV101 Remote VFO	£36·00	FL400/500 Transmitter	£130·00	FV401S Remote VFO	£36·00
SP101 Speaker	£10·00	SP400 Speaker	£10·00	FF50DX Low Pass Filter	£6·20
FT200/250 Transceiver	£132·00	FL2000B Linear 1.2 KW	£130·00	YD844 Table Mic.	£11·00
FP200/250 AC Supply	£36·00	FL2500 Linear 2 KW	£118·00	YD846 Hand Mic.	£5·00
DC200 DC Supply	£40·00	FT2F 2m Transceiver	£60·00	FP2AC AC PSU for FT2F	£25·00

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QTC AMATEUR RADIO NEWS

HQ items

The general manager acknowledges receipt of one box of valves from a member who wishes to remain anonymous.

Will anyone who knows the present address of J. Strong, formerly of Brentwood, Essex, please get in touch with HQ. Mr Strong sat for and passed the RAE in December 1970 but has not yet received his certificate as it has been returned from his previous address.

May RAE results. At the RSGB examination centre at University of London there were 46 candidates, of whom 30 passed.

Golden Jubilee of SRAL

The Finnish national society, SRAL, celebrates its golden jubilee by a banquet to be held in Helsinki on 11 September 1971. The RSGB extends greetings and congratulations to SRAL on this occasion.

Wireless Receiving Licences

Statutory Instrument 548 of 1970, contains the following section: *On and after 1 April 1971 there is hereby exempted from the requirement of a licence under Section 1(1) of the Act* (the Wireless Telegraphy Act 1949) *the installation or use of wireless telegraphy apparatus used only for the reception of messages sent by telephony from authorised broadcasting stations, broadcasting for general reception and messages sent by telephony or telegraphy from licensed amateur stations. Provided that the person responsible for such apparatus shall ensure that the said apparatus shall be open to inspection and testing at all reasonable times by a person acting on behalf of the Minister of Posts and Telecommunications.*

The Statutory Instrument is a document of 18 pages and may be obtained from Her Majesty's Stationery Office, price 10p net.

Heathkit HM-102 power-swr meter

In connection with the recent review of this equipment it should be mentioned that the wattmeter readings are only accurate when the power is supplied in the form of an unmodulated carrier (a.m. or cw) or a single tone (ssb).

RSGB Dinner Club

The next meeting of the RSGB Dinner Club will be at the Kingsley Hotel, Bloomsbury Way, London WC1, on Friday 17 September 1971 at 7.30 for 8pm. The Kingsley Hotel is a few minutes' walk from Holborn tube station and there is ample car parking space in the vicinity. The cost of the dinner is £1.70 and bookings accompanied by a remittance may be sent to Mrs Sheila Evans at RSGB headquarters. Please note that bookings must close 24 hours before the dinner.

All RSGB members are welcome to this informal occasion and a particular invitation is extended to overseas amateurs who may be visiting London.

QSL Cards

In view of the increasing number of QSL managers for overseas stations and the difficulty of keeping up with the numerous changes of manager, the RSGB now sends cards to the QSL bureau of the national society.

BUPA

Included in this issue is an insert setting out details of a BUPA group scheme whereby members of the Society obtain the benefit of a 10 per cent reduction in the subscription. Would members please note that any enquiries on this scheme are handled by the Newcastle branch of the British United Provident Association, Northern Rock House, Regent Farm Road, Newcastle-upon-Tyne, NE3 4PF. Branch manager: Mr J. M. Drew.

Can you help?

Some years ago, at the September 1968 Official Regional Meeting held in Southport, a member present offered to attend to the engraving on the plinth of the Regional Representative's Trophy. Unfortunately the plinth has not been seen since. Can any Region 1 member assist in tracing this part of the trophy? *G2AMV.*

Mr P. J. Smith, G3XJE, of Peterhouse, Cambridge, is currently researching into long delayed echoes and would appreciate reports of such phenomena experienced by any amateur or short wave listener. While any report will be of value, the most important factors are frequency, date and time, and approximate location of transmitting and receiving stations.

A German amateur would like to trace an English amateur by the name of Joe Morgan whom he has not seen for some 20 years. Mr Morgan's callsign in Germany in 1951 was DL2DV (he may also have had a G3 call) and he was located at Fassberg, Luneberger Heath, where he helped to form a radio club. Any information to R. Chadbone, G8JK, 50 Adelaide Road, High Wycombe, Bucks.

One-day course at Garendon

The Garendon School RS is organizing a one-day course at the Garendon Community Centre, Thorpe Hill, Loughborough, Leics, on Saturday 2 October from 10am to 4pm. The object of the course is to introduce the hobby of amateur radio to youth leaders and others. Parallel to the course of lectures for those without previous experience in the hobby, there will be another course of lectures of a more specialist nature for those who already have a knowledge of the art.

Talks on the introduction of amateur radio to youth will be given by D. R. Doughty, G3FLS; and T. Kirk, G3OMK, will talk on workshop practice. The course for established amateurs will include a talk on the world of vhf by Jack Hum, G5UM, and television studio techniques by Loughborough College School in their cctv studio provided by ITN.

A talk-in station on 2m under the callsign G3MKX will be available and an lf-hf station will be operated by young members of the club. SWL facilities will be demonstrated, and networks used by pre-service training organizations will also be shown.

The fee for the course, including lunch and a snack tea, is 75p. Trade stands and literature will be available.

Application should be made to Mr D. Wix, Head of Garendon Community Centre, Thorpe Hill, Loughborough, for enrolment and full particulars.

Scottish VHF Convention

Carlton Hotel, North Bridge, Edinburgh

Sunday 3 October 1971

The convention, organized by the Lothians Radio Society, will commence at 3pm. An exhibition of equipment built by amateurs in the area will open at 2.15pm and members attending the convention are invited to bring additional items of equipment for display.

Main speakers will be Mr T. Douglas, G3BA, and the RSGB VHF Manager, Mr G. M. C. Stone, G3FZL.

It is hoped to operate a talk-in station using the call GM3HAM/A on 2m.

Light refreshments during afternoon.
Dinner at 6.45pm, approximately.

Tickets will be available from Mr V. W. Stewart, GM3OWU, 9 Juniper Avenue, Juniper Green, Midlothian, EH14 5AJ, in September.

Convention and dinner: £1.75

Convention only: 40p

RAE Courses 1972

Aldridge, Staffs. Tynings Lane Evening Institute. Enrolment 10 September, 7-9 pm. On Fridays, 7.30-9.30pm, commencing 17 September. Instructor, G3XFN.

Barking, Essex. Gascoigne Recreation Centre, Gascoigne School, Morley Road, Barking, Essex. On Tuesdays at 7.30pm, commencing 21 September. A morse class is also being arranged.

Borehamwood, Herts. Borehamwood College of Further Education, Elstree Way, Borehamwood, Herts. Enrolment 10am-2pm and 3-8pm 13–14 September. On Wednesdays, 7-9.15pm, commencing 29 September. Lecturer, Mr G. L. Benbow, G3HR. The December RAE can be taken at the college.

Canterbury, Kent. Technical College, New Dover Road, Canterbury. Enrolment 7–9 September. Lecturer, G3LCK. The college is also an RAE examination centre.

Chingford, London E4. Chingford Community Centre, Friday Hill House, Simmons Lane, Chingford E4. Enrolment 8pm during week commencing 13 September. Commences 7.30-9.30pm 20 September. Fees for two terms plus: seniors, £2.65, juniors (under 18), £1.25. Instructor, G2HR. For further details telephone 01-529 2932.

Crawley. Ifield Evening Institute, Lady Margaret Road, Ifield, Crawley. Enrolment 7pm 16–17 September. Commences 20 September. Further details from the instructor, C. McEwen, G3VKQ, 86 Park Way, Pound Hill, Crawley. Telephone 0293 82 2036.

Doncaster, Yorks. Doncaster College of Technology. Details from Mr Robert Lane, Post Office, Scrooby Road, Bircotes, Nr Doncaster, Yorks.

Farnborough. Cove County Secondary School, St John's Road, Farnborough. Enrolment, by post at any time, or in person 7-9pm 13-16 September. Commences 7pm 30 September. Three twelve-week terms. Fees: Over 19 £1.50 per term, £4.50 per session; under 19 £1 per term, £3 per session.

Grantham. St Hugh's School, Dysart Road, Grantham, Lincs. Enrolment 20 September or during previous week at Grantham College for Further Education. Mondays, 6.45pm commencing 20 September. Instructor, Mr A. Ellis, G3PJR.

Heanor, Derbyshire. SE Derbyshire College of Further Education, (Heanor Branch), Ilkeston Road, Heanor, Derbys. Enrolment 10am-12pm and 6.30-8.30pm on 6–7 September. At 7–9pm, Wednesdays (theory), Thursdays (practical), commencing 22 September.

Ilford, Essex. County High School for Girls, Cranbrook Road, Ilford, Essex. Enrolment 7-8.30pm on 6–9 September. Commences 7.15-9.15pm. on 22 September. Fees £3 (over 21), £1.50 (under 21). Apply to W. G. Hall, G8JM, 48 Hawkdene, N Chingford, London E4. (sae please).

Loughborough, Leics. Loughborough Technical College, Dept of Electrical Engineering, Radmoor, Loughborough, Leics LE11 3BT. On Tuesdays 6-9pm, commencing 21 September. (6–7pm morse practice; 7-9pm radio theory). Fee £4.15. Lecturer, D. R. Doughty, G3FLS.

Manchester. Openshaw Technical College, Openshaw, Manchester. Enrolment from Monday 6 September. Details can be obtained from the college or from the instructor, Mr A. B. Langfield, G3IOA, 201 St Mary Road, Moston, Manchester 10.

Newbury, Berks. South Berkshire Technical College, Newbury, Berks. Further details obtainable from the college.

Princes Risborough, Bucks. Princes Risborough Evening Institute, County Secondary School, Merton Road, Princes Risborough, Bucks. Enrolment 7-9pm 7–8 September. At 7–9pm, Mondays (theory), Wednesday (practical), Thursdays (morse), commencing 13 September. Instructors, Mr R. Whiting, G3POF, and Mr S. Ford, G4ACV.

Romford, Essex. Rush Green Technical College, Dagenham Road, Romford, Essex RM7 OXU. On Thursdays, commencing in September. Further details from the College.

Sheffield, Yorks. Crosspool Adult Education Centre, King Edward VII School, Darwin Lane, Crosspool, Sheffield 10. Enrolment 29 September. Commences 7pm on 6 October. Further details from J. Bell, G3JON, QTHR. Telephone 367774 (home), 26602 (office).

Slough. Slough College of Technology, William Street, Slough, Bucks. Enrolment 10am-12 noon and 2 to 8pm. 8-9 September. Basic course 6.30-9.30pm Thursdays, advance course (for licence holders) 7-9.15pm Fridays. Fees: 16-18, £1; over 18, £3.50. Lecturers G3FVC, G3WQC and G3VCT.

Wembley, Middlesex. Wembley Evening Institute, Copland School, High Road, Wembley, Middlesex. Enrolment 7-9pm 13 and 16 September. Commences 20 September, morse practice 7-8pm, radio theory, 8-10pm.

Wolverhampton, Staffs. Ounsdale Schools, Wombourne, Staffs. Enrolment 6–7 September. Commences 15 September Instructor, Mr R. W. Tomkys, G3NOW.

80m integrated circuit ssb transceiver

by A. RYAN, G3VJN/W6*

WITH the advent of the silicon integrated circuit, the author was intrigued with the possibility of constructing a small, low-power, high-performance ssb transceiver, primarily for mobile use. The present design has evolved over a number of years, and the circuits and techniques have been the subject of many tests. No attempt has been made to discuss printed circuit board layout for ICs, as this is beyond the scope of this article; indeed, to do justice to the subject would require an article in its own right. The author will readily acknowledge that it is quite possible to build a transceiver of comparable performance using discrete components; but the point is, circuit functions that would require many transistors to implement using discrete technology, eg the audio derived hang agc function, can be realized with one ic and a few external components. In practical terms this means a simplification of both overall circuitry and pc layout, combined with a higher, more reproducible level of performance.

* 1540B Richelieu Place, Sunnyvale, Santa Clara County, California 94087, USA.

General description of devices used

SL610: rf amplifier, gain 10, 50dB agc range, 6V supply; package, 8 lead TO5.

SL612: i.f. amplifier, gain 50, 70dB agc range, 6V supply; package, 8 lead TO5.

SL621: audio derived hang agc voltage generator, 6V supply; package, 8 lead TO5.

(SL610, SL612 and SL621 are manufactured by Plessey Microelectronics).

CA3028A: wide-band differential amplifier with controllable constant current source. Can be used as a mixer, wide band amplifier, cascode amplifier, with and without agc, limiting amplifier etc, 12V supply; package, 8 lead TO5.

CA3020A: wide-band amplifier with 1W output capability. Has uncommitted emitters and collectors for the push-pull output stage. This is the higher voltage version of the well known CA3020. The latter device may be substituted provided the supply voltage to it is reduced to 9V. Package, 12 lead TO5.

(CA3028A and CA3020A are manufactured by RCA.)

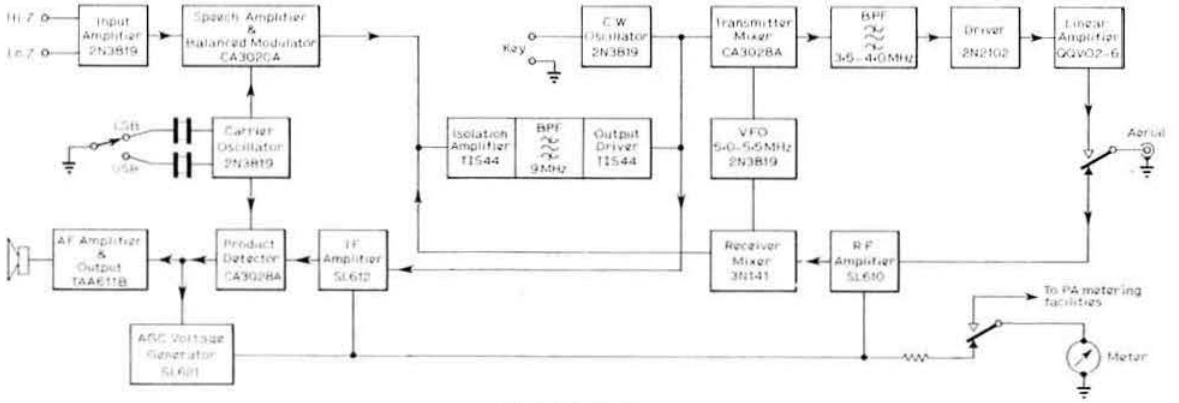


Fig 1. Block diagram

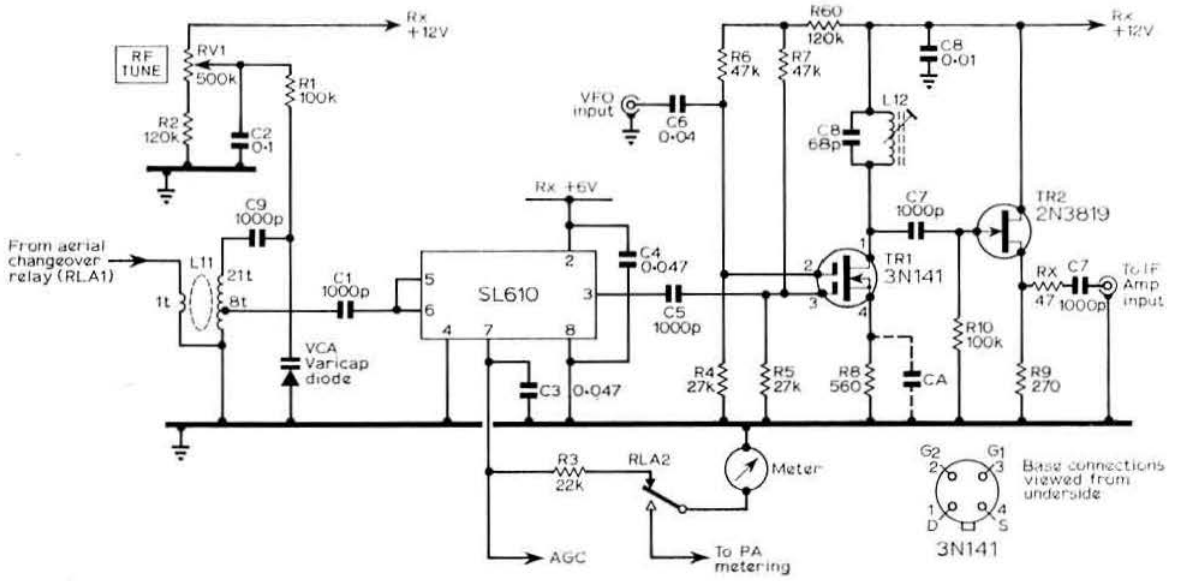


Fig 2. Receiver rf amplifier and mixer

TAA611B: 1W af amplifier. Chosen because of high sensitivity, high voltage capability (12V) and transformer-less output stage compatible with 8Ω loads. Package, 14 lead split dual in line. Manufactured by SGS Ltd.

It is not proposed to describe the devices in any greater detail as this is more than adequately covered in the relevant data sheets, which the intending constructor would be well advised to obtain.

Performance

Receiver

1μV input for 15dB s+n/n ratio.
1μV cw input for 65mW af output.
AGC threshold, 1μV.
AGC compression, 5dB increase in af output for 100dB increase in rf input above 1μV, ie rf input increases from 1μV to 100mV. I.F. bandwidth and selectivity (determined by filter) 2·4kHz at −5dB, shape factor 5/50dB points, 1·8:1.

Transmitter

Single tone power input, 18W.
Single tone rms power output, 9·2W (Class B no grid current).
Carrier and unwanted sideband suppression, −50dB, measured with 1kHz modulating tone.
Frequency stability, less than 20Hz drift in any 20min. period.

CIRCUIT DESCRIPTION

With reference to the block diagram, Fig 1, it will be seen that this is a conventional filter type transceiver, with the vfo, cio and crystal filter common to both transmit and receive paths.

Receiver section

The input signal from the mobile whip is fed, via the aerial c/o relay contacts RLA1, Fig 2, to the input winding of the toroidal input transformer, L11. The secondary of this transformer is tuned to the signal frequency by varying the reverse bias on the variable capacitance diode, VCA. The signal is then fed to the rf amplifier, SL610, whose input is tapped down the input tuned circuit to avoid excessive damping. This simple input arrangement is more than adequate for mobile use, where the mobile whip provides the main selectivity, and was quite suitable at the author's former home QTH. This was near the BBC Droitwich transmitters, and a wide-band scope connected to the 80m dipole revealed 200–300mV peak to peak of broadcast rf present most of the time. The spurious signals that this level of bc rf produced in other receivers at this QTH were, happily, absent, and the author therefore concludes that this rig is reasonably free from cross-modulation troubles.

From the rf amplifier, which is used mainly to enhance the agc performance, the signal is capacitively coupled to the mosfet mixer. The device chosen for the mixer stage, the 3N141, has given an excellent account of itself in the past. Being a dual gate fet, there is very good isolation between the local oscillator injection terminals G_2 and the signal terminal G_1. Moreover, the transfer characteristics of this device when used as a mixer very closely approximate the ideal square law. Thus the third and higher order mixer products are very low and cross-modulation troubles are minimized. The excellent agc characteristics also help in this respect, by closely controlling the signal level applied to the mixer.

In the prototype, the source bypass capacitor CA was not required as the receiver has plenty of gain in hand. With the source resistor unbypassed the mixer has an insertion loss of approximately −6dB; bypassing this resistor gives a mixer gain of +10dB. The 9MHz i.f. frequency is selected by the tuned circuit L12/C8 and passed via the source

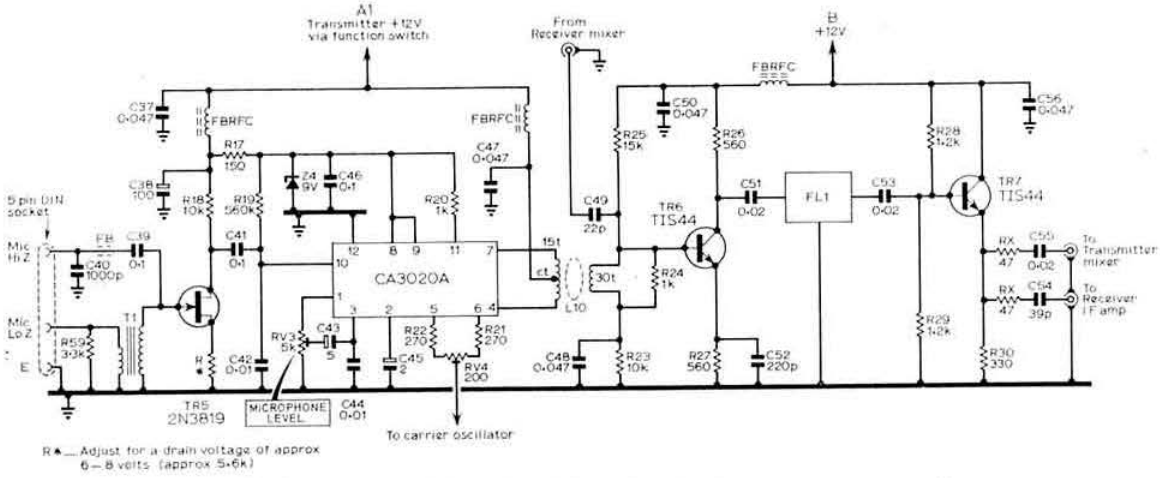


Fig 3. Transmitter speech amplifier, balanced modulator, common filter amplifier

follower TR2 to the crystal filter isolation amplifier TR6, Fig 3. Resistor RX, 47Ω, should be included to prevent the possibility of capacitive loading of the source of TR2 causing oscillation. It was not found to be necessary in the prototype, but is a wise precaution.

The coupling capacitor C49 is deliberately chosen to be small to offset the gain of the isolation amplifier TR6. This gain is required in the transmit channel but not in the receive channel. From the filter, the signal is applied to the ic i.f. amplifier via the emitter follower TR7. Again, the series resistors RX 47Ω are a wise precaution, but were not required in the prototype. The i.f. amplifier, Fig 4, provides the majority of the rf amplification of the receiver, and from here the signal is applied to the balanced product detector which is a CA3028A ic. This device makes an excellent product detector provided it is fed with sufficient carrier signal to ensure that the constant current source transistor is driven between saturation and cut-off. This requires approximately 1V peak to peak at pin 2 of the ic. After many experiments with this ic the optimum load between pins 6 and 8 when used as a mixer or product detector was found to be about 500Ω.

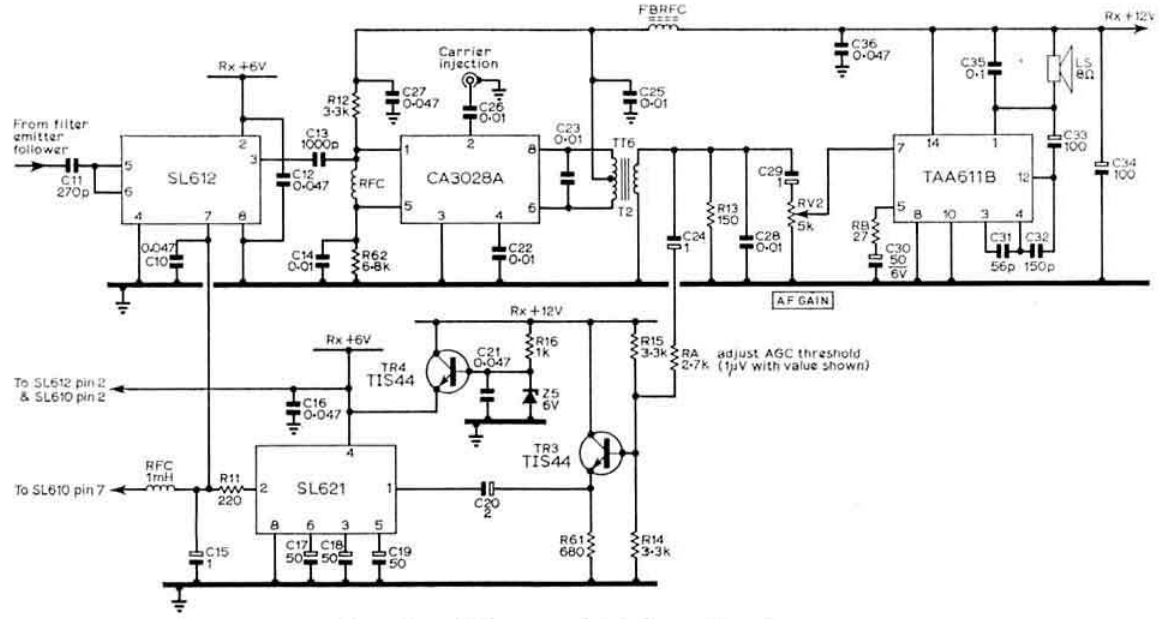


Fig 4. IF amplifier, product detector, audio and agc

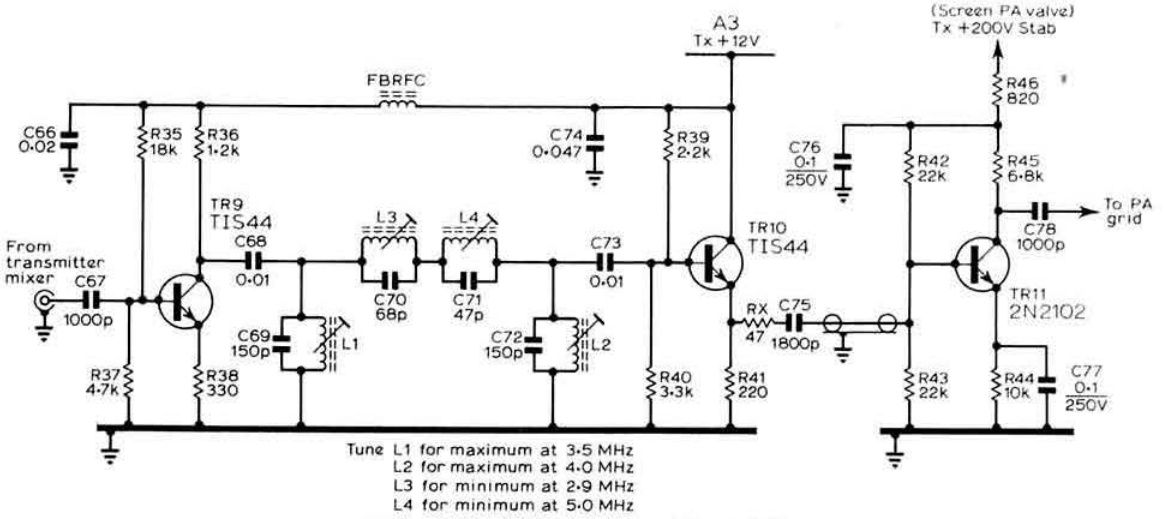


Fig 5. Transmitter 3·5–4MHz bandpass filter and driver

A Radiospares transformer type TT6 was found to be quite suitable as a coupling transformer, but almost any push-pull driver transformer should be equally suitable as the ratio is uncritical.

The resultant audio signal is fed to the combined pre-amplifier and audio power amplifier. This ic has several features to recommend its use here. First, it has a rather high voltage rating, allowing operation from a 12V supply line; second, the overall gain of the device is readily modified by merely changing RB; and lastly, its transformerless output stage is compatible with 8Ω loudspeakers, which are readily available.

When laying out a pc for this amplifier it is important to remember that the high gain, coupled with the high output current capability can cause feedback troubles if any of the input earth line is common with the output earth line. It is also important to ensure that the supply terminal, pin 14, is bypassed effectively. To comply with both of the above, pin 14, the loudspeaker return line (do not use the power supply line as the speaker return), capacitor C35 and the positive side of C34 should all be joined with the shortest possible amount of pc. Similarly, the earthy end of C34 should join with pin 10 via the shortest possible route. It is also vital to ensure that none of this output high current earth return is common with the input earth return pin 8. In other words do not join pin 8 to pin 10 and take a common lead to the nearest earth patch on the pc board as almost certain oscillation will result.

The low frequency cut-off point can be altered by changing the value of C30. The voltage gain of the amplifier is approx $\frac{7500}{RB}$ where RB is in ohms, ie for RB 30Ω the gain is 250, therefore an input voltage of about 11mV rms will give an output power of approximately 1W rms into 8Ω. The cut-off frequency with C30 equal to 50μF is approximately 100Hz.

The final point concerning this amplifier is that care should be taken not to short the speaker leads together, as almost certain destruction of the amplifier will result.

Transmitter section

Consider Fig 3. The audio signal from either a crystal microphone or a low impedance dynamic microphone is fed to the gate of TR5. The input transformer T1 has a turns ratio of 30:1 and a primary inductance of 50H. This input circuit was chosen in order that a high impedance PTT microphone and a low impedance boom microphone could be used as required without the necessity of having to provide a switchable change of gain/input impedance. Naturally, if this facility is not required, then the input circuitry should be changed accordingly. TR5 does not provide much gain, approximately 6dB in the prototype, nor is any required, as the ic following has a pre-amplifier built in.

The source resistor R will need to be chosen to suit the fet used. It should be adjusted to give a drain voltage of about 6–8V. The value of resistance required to achieve this must lie within the range 3·3kΩ to 8·2kΩ for satisfactory operation of TR5. If the value is too low, the gain of this stage will be too high, and clipping of the input signal may result, especially if a high output crystal microphone is used. With too high a value for R, the input stage will act as an attenuator, which is also undesirable.

From TR5 the signal is fed to the ic speech amplifier and balanced modulator. This was taken from *Technical Topics*, where it was originally described for use at 455kHz. The author has performed a number of experiments with this ic and has found that it will function satisfactorily as a balanced modulator at frequencies up to 30MHz, and as a power amplifier up to 30MHz, provided that a tuned collector circuit is used. No tuned circuit is needed here, a wide band toroidal transformer providing all the coupling required. The secondary of this transformer, L10, is damped both by the input impedance of TR6 and additionally by R24. This resistor was added to suppress a parasitic mode of oscillation observed during the development process. Without R24, TR6 would oscillate whenever the filter FL1 was connected. The frequency was very stable, and possibly the parallel resonant frequency of the first crystal in the filter.

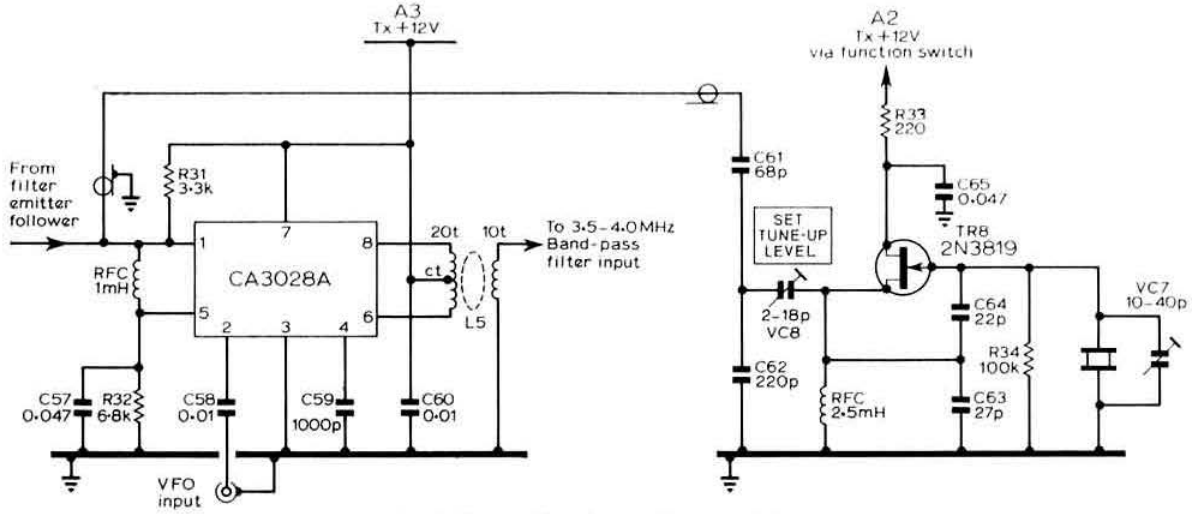
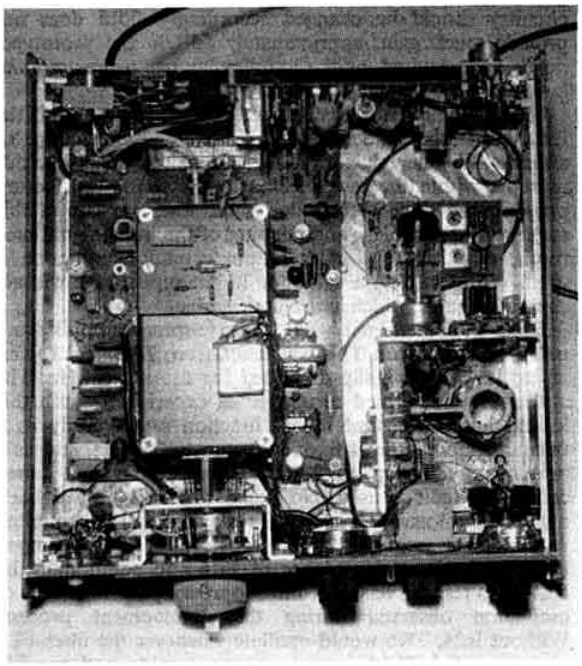


Fig 6. Transmitter mixer and cw oscillator

To be fair, when the original TR6 was checked, it was found to have a beta of 300, and when replaced with a transistor of more modest gain, this parasitic mode could not be provoked. However, R24 was retained to preclude this occurring in the future.

After passing through the filter, the signal is available to the transmitter mixer via the emitter follower TR7. Again, RX may be inserted for the reasons already given. The signal now passes to the transmitter mixer, Fig 6. This is very similar to the receiver product detector, and again, the level of oscillator injection to pin 2 is sufficient to ensure that the constant current source transistor switches between cut-off and saturation. The vfo signal suppression is about 20dB referenced to peak output, further attenuation being provided by the bandpass filter, Fig 5. The coupling element employed is another wide-band toroidal transformer, L5. The bandpass filter is provided to ensure adequate filtering of all undesired signals (spurious mixer products, vfo leakage) prior to the driver and pa stages.



Top view

The author considers the inclusion of this type of filter to be preferable to employing a number of gang-tuned circuits. By utilizing modern filter design techniques, it is often much easier to obtain the required stop band attenuation than by using cascaded stagger tuned circuits. This filter provides more than 20dB of attenuation for frequencies higher than 5MHz and lower than 2·5MHz, while passing frequencies between 3·5MHz and 4MHz with less than 1dB ripple across the passband.

From the filter emitter follower, TR10, the signal is passed to the driver stage, TR11. The choice of driver transistor and circuitry is closely allied to the choice of pa. The pa for this transmitter is a QQVO2-6, a vhf double-beam tetrode, see Fig 7. A valve was chosen after much experimenting with transistor linear power amplifiers. The results of these experiments showed that reasonable efficiencies could only be obtained if relatively high collector voltages were used (50–100V). Power gains were fairly low, 10dB being typical for the more commonly available transistor types, but by far the worst result was the fragility of the amplifiers (electrically) when subjected to mistuned loads. In view of these results, the author turned to a valve.

The type of valve chosen had to have a 12V heater to be compatible with the car electrical system, and the current required to light it also had to be low. The power input had already been chosen as 20W, and the drive voltage and power had to be low to enable a solid-state driver stage to be used. The QQVO2-6 fills the bill very nicely, and while it is used in this transmitter outside its normal ratings, this is common practice for ssb service and is considered as "intelligent

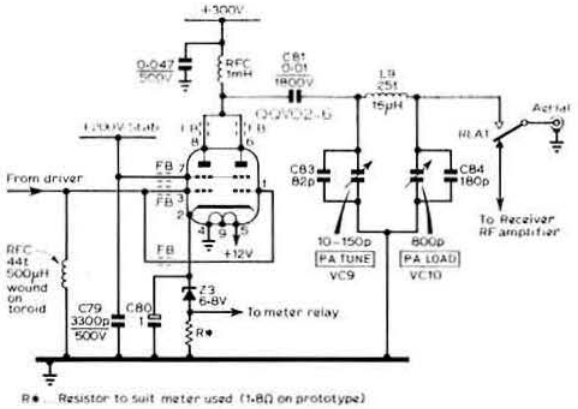


Fig 7. Power amplifier

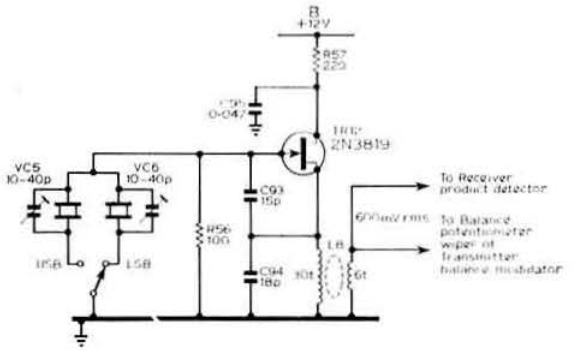


Fig 8. Carrier insertion oscillator

abuse". Suffice to say that even after several hours' use the transceiver case around the pa section is only hand warm, and no change in valve parameters could be observed after three months' use. The drive voltage required for maximum output is approximately 8V peak, and this can easily be obtained from a Class A stage.

The transistor chosen for the driver stage is an RCA type 2N2102. This has a high F_t of 120MHz, and a high V_{ceo} combined with a high power handling capacity. It is used here as a simple Class A amplifier capable of providing more than enough drive for this pa. The amplifier was, in fact, rescued from an earlier version of this transceiver, where it was required to supply 20V peak.

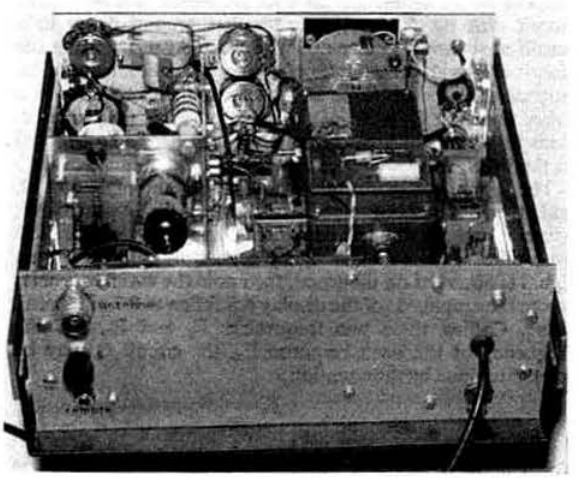
The method of obtaining the bias voltage for the pa is a little unusual, but has proved quite satisfactory in operation. The graphical estimate for the grid voltage was 7·4V, and with the particular zener diode used, the standing anode current is 25mA, slightly higher than the design figure. It will be observed that no neutralizing components are present, none being found to be necessary. Many tests were conducted to establish this point, and it was found that with this valve, and layout, fed from this relatively low value of source impedance, the pa was unconditionally stable at all settings of the anode tuning and loading capacitors and at all drive levels. In particular, it was noted that the change in grid voltage as the anode tuning capacitor was rotated through resonance was greater with neutralizing components present than with them absent. These tests were conducted with seven different pa valves, with the same result.

The final point concerns the pa loading capacitor. This is a modified mica compression trimmer as found in a number of valve tv chassis. The trimmer is approximately of 1in diameter in a black plastic housing and is available in a wide variety of capacity values and working voltages. It is modified after being carefully disassembled by cutting the 6BA brass stud which is moulded into the adjusting knob. A ¼in shaft is then tapped to take a 6BA thread, and the tapped end of this shaft is turned to a hemispherical shape to fit into the depression in the front of the trimmer's plastic housing. The trimmer is then re-assembled with a short piece of 6BA studding, sweated into the new shaft to prevent the studding from working loose. A 6BA nut is then soldered on to the stud, and the result is a panel mounting multi-turn variable capacitor of very small physical size.

Variable frequency oscillator

This is the heart of any rig, and any pains taken to ensure stability will be well rewarded. The circuit, Fig 9, will be seen to be that of a conventional Hartley oscillator. FETs make excellent active oscillator elements and the 2N3819 is no exception. The output is capacitively coupled to another fet acting as a Class A amplifier, the isolation provided by this stage being sufficient to ensure freedom from frequency pulling despite variations in load impedance. L7 is broadly resonant at the vfo frequency.

At this point some comment is necessary concerning the variable capacitance diodes VCA and VCB. Several unmarked diodes were obtained, and after sorting into groups of different types there remained about 10 which seemed useless. These, however, were examined for possible use as zener references as they all had breakdown voltages between 18 and 30V. As an experiment the author tried using them as variable capacitance elements in a 10MHz vfo. Several



View from rear

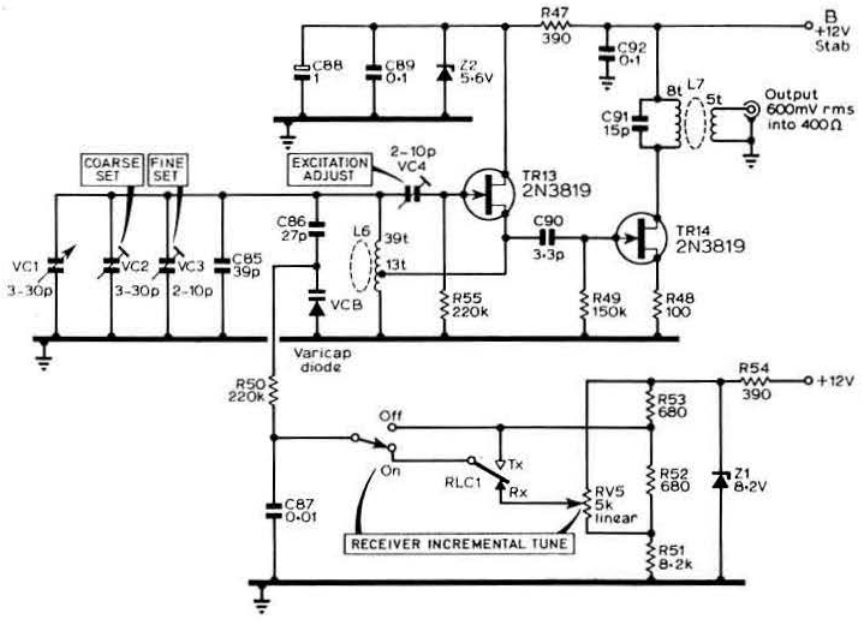


Fig 9. Variable frequency oscillator

were found to have so low a Q that the vfo promptly stopped oscillating. Others were found to have a disturbing effect upon stability and were also discarded. There remained, however, four diodes which had no observable effect upon stability but a large effect upon frequency. Their characteristics were plotted and were found to be very similar. The equivalent capacitance variation, calculated from the frequency change, was found to be 94pF at 12V, 102pF at 10V, and 130pF at 6V. Thus any diode with similar characteristics could be used.

The next point concerns the toroids used in the set. The toroids used in the vfo, forming inductors L6 and L7, were obtained from the cup cores comprising some surplus i.f. transformers. Not all cup cores are suitable and the author checked his by measuring the effective bandwidth of a tuned circuit utilizing them. They were first ground down to a toroid shape and 40 turns of wire wound on. By using the circuit of Fig 11, an estimate of Q may be made. It should be emphasized that the value of Q measured with this set-up is lower than the Q value of the inductor, as all the imperfections in the circuit are being lumped together and attributed to the inductor.

The signal generator used has to have a high output, and the oscilloscope needs to have a high sensitivity; nevertheless, useful measurements may be made. The procedure is to tune the signal generator until maximum signal is observed on the scope, then note the two frequencies where the amplitude of the display has fallen to 0·7 of its peak value. Calling these two frequencies F_1 and F_2, and the frequency of the peak response F_0, the circuit Q may be related to these by the equation;

$$Q = \frac{F_0}{F_1 - F_2}$$

For example, if F_0 is 5MHz, F_1 is 5,050kHz and F_2 is 4,950kHz, substituting,

$$Q = \frac{5{,}000}{5{,}050 - 4{,}950} = \frac{5{,}000}{100} = 50$$

The cup cores chosen for the vfo, isolation amplifier and receiver input circuit, ie L6, L7 and L11 respectively, all gave values of Q between 100 and 200 when measured as above. The toroids used for the wideband coupling transformers gave Q values between 5 and 10 in the above test.

The vfo was constructed on a small piece of copper-clad laminate after etching the required circuit pattern, and the whole assembly mounted in an Eddystone die-cast box. The result is a vfo with excellent stability, free from pulling and other disturbing effects. The slow-motion drive is a Jackson Bros 36:1 epicyclic ball drive giving a final frequency shift of 40kHz/turn of the main tuning control. The receiver incremental shift (ris) is effected by varying the reverse bias on the variable capacitance diode VCB. Only a small portion of the characteristic is used, with the result that the shift is linear without resorting to a non-linear law potentiometer. With the values shown, the shift is +4·6kHz and −5kHz maximum. The overall stability of the vfo is such that in any 20min period the frequency will not change by more than 20Hz.

Crystal oscillators

These are all conventional Colpitts oscillators, needing no further comment.

ALIGNMENT

Variable frequency oscillator

The excitation control VC4 is provided to allow optimum adjustment of the feedback to ensure satisfactory operation with almost any combination of production tolerance found on current 2N3819 FETs. To adjust, temporarily shunt ZD2 with a 4·7V zener, and with power applied to the vfo

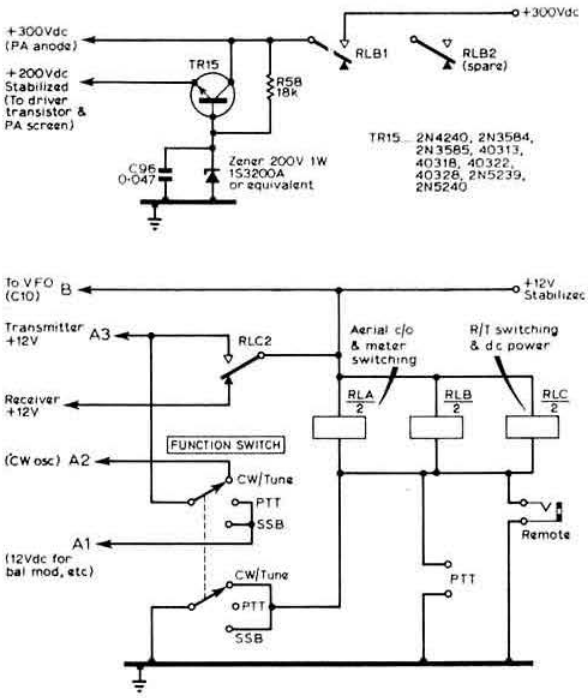


Fig 10. Switching arrangements

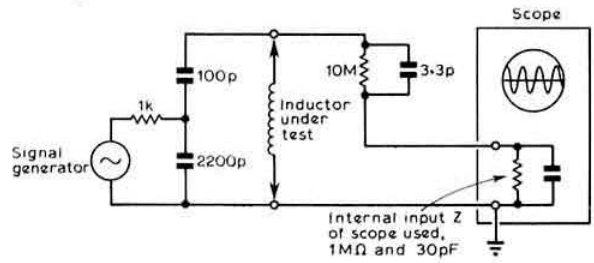


Fig 11. Q measurement for inductors

gradually increase VC4 until oscillation just starts. Check that oscillation commences promptly each time power is applied; if not, increase VC4 until this is achieved. Remove the 4·7V zener and check that operation is satisfactory at the correct supply voltage.

Set VC3 to mid travel, set the main tuning capacitor to 30° before maximum, and roughly adjust VC2 for an output frequency of 5MHz. Rotate the main tuning capacitor VC1 to 30° before minimum capacitance and measure the new frequency. If it is less than 5·5MHz the inductance of L6 is too small, if the frequency is higher than 5·5MHz the inductance of L6 is too large. When the correct conditions have been achieved the vfo should be accurately aligned, the final corrections being performed with VC3.

CW oscillator

See Fig 6. Set VC8 to minimum, switch to TUNE/CW, and adjust VC7 for an output frequency of 9MHz.

Bandpass filter

See Fig 5. In the following procedure, the indicated frequency is given first, and the appropriate vfo frequency appears in brackets after, ie tune to 3,650kHz (5,350kHz). Monitor the pa grid voltage, preferably with an oscilloscope, switch to TUNE/CW, and set the SET TUNE-UP LEVEL VC8 to give a satisfactory indication, say, 5V peak to peak.

Detune L3 well below 2·9MHz and L4 well above 5MHz. Tune to 3,500kHz (5,500kHz) and adjust L1 for a maximum. Tune to 4,000kHz(5,000kHz) and adjust L2 for a maximum. Check that as the vfo is tuned from 3,500kHz(5,500kHz) to 4,000kHz(5,000kHz) the signal remains constant. Tune to 3,500kHz(5,500kHz) and adjust L3 until the pa grid voltage just starts to fall, then back off until the voltage has just returned to its previous value. Tune to 4,000kHz(5,000kHz), switch to ssb and with no audio input, adjust L4 for minimum vfo feedthrough, adjusting the oscilloscope sensitivity as required. If the filter is to be aligned prior to insertion in the rig, detune L3 and L4 as before, and adjust L1 for a maximum at 3·5MHz and L2 for a maximum at 4·0MHz. Then set the signal generator to 2·9MHz and adjust L3 for a minimum; tune the signal generator to 5MHz and adjust L4 for a minimum.

CW level

Switch to TUNE/CW, tune to 3,650kHz, and adjust pa tune and load controls for maximum power into a 50Ω dummy load. Adjust VC8 for an anode current of 60mA.

Carrier insertion oscillator

See Fig 8. This is best adjusted by listening to a known signal in the absence of any data with this filter. In any case it is quite normal to have to adjust the frequencies to suit the voice characteristics of the user. A technique adopted by the author is illustrated in Fig 12. The input to the receiver product detector is temporarily broken, and the output from the filter emitter follower is connected in its place. A tape recorder with a loop of tape having on it a known voice signal (preferably one's own voice) is connected to the audio input of the transmitter speech amplifier and balanced modulator. With both the receiver product detector and af

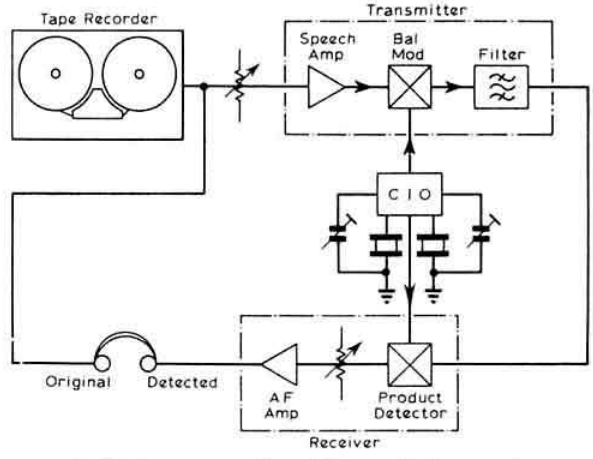


Fig 12. Arrangement for setting carrier frequencies

amplifier and transmitter speech amplifier/balanced modulator energized, the original signal is fed to one earpiece and the up-converted and demodulated signal is fed to the other earpiece. Carefully adjust the trimmers VC5 and VC6 until the recovered signal matches that of the original for both usb and lsb.

CONCLUSIONS

This transceiver has given excellent results in the UK. No opportunity occurred to try out mobile operations, as shortly after it was completed the author was posted to the USA for a short tour of duty. Best contacts in the UK using a rather low 80m dipole (17ft above ground in the centre, 4ft above ground at each end) were 5 and 6 from DK4CS, 5 and 4 from DJ2QH/M, 4 and 6 from GC3ULZ/P and 5 and 8 from GM3WYL/A. Operation in W6 has generally reflected this, the receiver being noticeably free from cross-modulation troubles despite the existence of six local amateurs, all running the legal maximum for this part of the world, and a number of local broadcast stations again running high power.

Components list

Capacitors

(Capacitors specified DC are Disc Ceramic, elec are electrolytic, and p/s are polystyrene. Where a dc working voltage is specified it is indicated as dc wkg.)

C1	1,000pF DC	C49	22pF
C2	0·1μF	C50	0·047 DC
C3	0·047μF DC	C51	0·02μF
C4	0·047μF DC	C52	220pF
C5	1,000pF DC	C53	0·02μF DC
C6	0·047μF DC	C54	39pF
C7	1,000pF DC	C55	0·02μF DC
C8	0·01μF DC	C56	0·047μF DC
C9	1,000pF DC	C57	0·047μF DC
C10	0·047μF DC	C58	0·01μF DC
C11	270pF	C59	1,000pF DC
C12	0·047μF DC	C60	0·01μF DC
C13	1,000pF DC	C61	68pF
C14	0·01μF DC	C62	220pF
C15	1μF elec 6V dc wkg	C63	27pF
C16	0·047μF DC	C64	22pF
C17	50μF elec 6V dc wkg	C65	0·047μF DC
C18	50μF elec 6V dc wkg	C66	0·02μF DC
C19	50μF elec 6V dc wkg	C67	1,000pF DC
C20	2μF elec 6V dc wkg	C68	0·01μF DC
C21	0·047μF DC	C69	150pF
C22	0·01μF DC	C70	68pF
C23	0·01μF DC	C71	47pF
C24	1μF elec 12V dc wkg	C72	150pF
C25	0·01μF DC	C73	0·01μF DC
C26	0·01μF DC	C74	0·047μF DC
C27	0·047μF DC	C75	1,800pF DC, 1kV dc wkg
C28	0·01μF DC	C76	0·1μF 250V dc wkg
C29	1μF elec 6V dc wkg	C77	0·1μF 250V dc wkg
C30	50μF elec 6V dc wkg	C78	1,000pF DC 500V dc wkg
C31	56pF	C79	3,300pF DC 500V dc wkg
C32	150pF	C80	1μF elec 16V dc wkg
C33	100μF elec 12V dc wkg	C81	0·01μF 1,800V dc wkg
C34	100μF elec 12V dc wkg	C82	0·047μF DC 500V dc wkg
C35	0·1μF polyester	C83	82pF p/s 630V dc wkg
C36	0·047μF DC	C84	180pF p/s 630V dc wkg
C37	0·047μF DC	C85	39pF p/s
C38	100μF elec 12V dc wkg	C86	27pF p/s
C39	0·1μF paper	C87	0·01μF DC
C40	1,000pF DC	C88	1μF elec 12V dc wkg
C41	0·1μF	C89	0·1μF
C42	0·01μF	C90	3·3pF
C43	5μF elec 6V dc wkg	C91	15pF
C44	0·01μF DC	C92	0·1μF DC
C45	2μF elec 6V dc wkg	C93	15pF p/s
C46	0·1μF	C94	18pF p/s
C47	0·047μF DC	C95	0·047μF DC
C48	0·047μF DC	C96	0·047μF DC

VCA and VCB, see text.

VC1	3–30pF panel mounting air spaced variable (Jackson Bros).
VC2	3–30pF air spaced trimmer.
VC3	2–10pF 10-turn panel mounting trimmer ceramic.
VC4	2–10pF pc mounting trimmer.
VC5	10–40pF pc mounting ceramic trimmer.
VC6	10–40pF pc mounting ceramic trimmer.
VC7	10–40pF pc mounting ceramic trimmer.
VC8	2–18pF pc mounting trimmer.
VC9	7–77pF air-spaced variable, ceramic.
VC10	800pF mica compression trimmer modified for panel mounting, see text.

Resistors

R1	100kΩ	R22	270Ω	R43	22kΩ
R2	120kΩ	R23	10kΩ	R44	10kΩ
R3	22kΩ	R24	1kΩ	R45	6·8kΩ
R4	27kΩ	R25	15kΩ	R46	820Ω
R5	27kΩ	R26	560Ω	R47	390Ω
R6	47kΩ	R27	560Ω	R48	100Ω
R7	47kΩ	R28	1·2kΩ	R49	150kΩ
R8	560Ω	R29	1·2kΩ	R50	220kΩ
R9	270Ω	R30	330Ω	R51	8·2kΩ
R10	100kΩ	R31	3·3kΩ	R52	680Ω
R11	220Ω	R32	6·8kΩ	R53	680Ω
R12	3·3kΩ	R33	220Ω	R54	390Ω
R13	150Ω	R34	100kΩ	R55	220kΩ
R14	3·3kΩ	R35	18kΩ	R56	100kΩ
R15	3·3kΩ	R36	1·2kΩ	R57	220Ω
R16	1kΩ	R37	4·7kΩ	R58	18kΩ 1W w/w
R17	150Ω	R38	330Ω	R59	3·3kΩ
R18	10kΩ	R39	2·7kΩ	R60	120kΩ
R19	560kΩ	R40	3·3kΩ	R61	680Ω
R20	1kΩ	R41	220Ω	R62	6·8kΩ
R21	270Ω	R42	22kΩ		

RX	As required, see text, 47Ω
RV1	500kΩ lin
RV2	5kΩ log
RV3	5kΩ lin panel mounting trimmer
RV4	200Ω lin pc mounting trimmer
RV5	5kΩ lin

Zener diodes

Z1	8·2V	Z4	9·0V
Z2	5·6V	Z5	6·0V
Z3	6·8V 500mW	Z6	200V 1W, 1S3200A or equiv.

Inductors

FBRFC Ferrite bead rf choke, 20 turns on ferrite bead.

L1	13·7μH
L2	10·5μH
L3	44·2μH
L4	21·5μH
L5	Primary, 20 turns centre tapped, secondary 10 turns, wound on toroid, see text.
L6	39 turns tapped 13 turns from earthy end, wound on toroid, see text.
L7	Primary 8 turns, secondary 5 turns wound on toroid, see text.
L8	Primary 30 turns, secondary 6 turns wound on toroid, see text.
L9	16μH 25 turns wound on 3cm diameter ceramic former.
L10	Primary 15 turns centre tapped, secondary 30 turns wound on toroid.
L11	Primary 1 turn, secondary 21 turns total, tapped at 8 turns from the earthy end, wound on toroid, see text.
L12	4·6μH

Transformers

T1	Crystal microphone to transistor input transformer, see text. Miniature valve type low impedance microphone matching transformer would be suitable.
T2	Radiospares type TT6 or any push-pull driver transformer, ratio not critical.

(Radiospares components are only available through retailers).

Filter

FL1	9MHz crystal filter INOUE obtainable complete with both usb and lsb carrier crystals from Lowe Electronics, 119 Cavendish Road, Matlock, Derbyshire.

Transistors

TR1	3N141	TR8	2N3819
TR2	2N3819	TR9	TIS44, 2N706 or similar
TR3	TIS44, 2N706 or similar	TR10	TIS44, 2N706 or similar
TR4	TIS44, 2N706 or similar	TR11	2N2102
TR5	2N3819	TR12	2N3819
TR6	TIS44, 2N706 or similar	TR13	2N3819
TR7	TIS44, 2N706 or similar	TR14	2N3819

TR15 2N3584, 2N3585, 2N4240, 2N5239, 2N5240, or RCA types 40318, 40313, 40322, 40328.

Integrated circuits

Q1	SL610	Q5	CA3020A
Q2	SL612	Q6	CA3028A
Q3	SL621	Q7	CA3028A
Q4	TAA611B		

Plessey ic available from:
SDS Portsmouth Ltd, Hilsea Trading Estate, Portsmouth; Farnell Electronic Components Ltd, Canal Road, Leeds; WEL Components Ltd, 5 Loverock Road, Reading.
RCA ic available from:
Roberts Electronics Ltd, 17 Hermitage Road, Hitchin, Herts.
SGS ic available from:
Hawnt & Co. Ltd, 112-114 Pritchett St Birmingham.

A pulse count discriminator unit

by B. PRIESTLEY, G3JGO*

THE advantages of this type of discriminator over designs recently published in *Radio Communication* are the absence of any coils or scarce ICs and the possibility of using the device as a deviation measuring instrument in conjunction with an ac valve voltmeter.

The i.f. signal at 450 to 470kHz is applied to the long-tailed pair limiter TR1 and TR2. The variable resistor adjusts the limiting threshold and is set for best a.m. rejection. The limited output is used to switch TR3 on and off, giving a square wave of nearly 12V amplitude, which provides a constant quantity of charge via C into the emitter of TR4. Hence the emitter current of TR4 is directly proportional to frequency, and so variations in frequency produce a corresponding voltage variation across R. As shown, the circuit is set up for about 500kHz = 10V, ie 20mV/kHz, so ±2·5 kHz deviation produces ±50mV peak. This is amplified about 50 times by TR5 and TR6 to give an output suitable for feeding into the receiver af stages.

The circuit can be used at any i.f. up to 500kHz without adjustment, but for much lower I.F.S, eg 100kHz, C can with advantage be raised to increase the af output. Conversely, if C is reduced for higher I.F.S then the af output will fall, and a mixer converting to a lower i.f. may be preferable.

The voltage produced across R is given by:

$$V = v.C.R.f.$$

where v = output pulse amplitude of TR4 = 12V − 0·2V
and f = the instantaneous i.f. frequency

Hence a frequency deviation of ± △ f produces a peak to peak voltage of 2.v.C.R. △ f.

As all these quantities are either easily measured or can be defined with accurate components, an ac peak millivoltmeter can be used to measure the deviation at TR4 output.

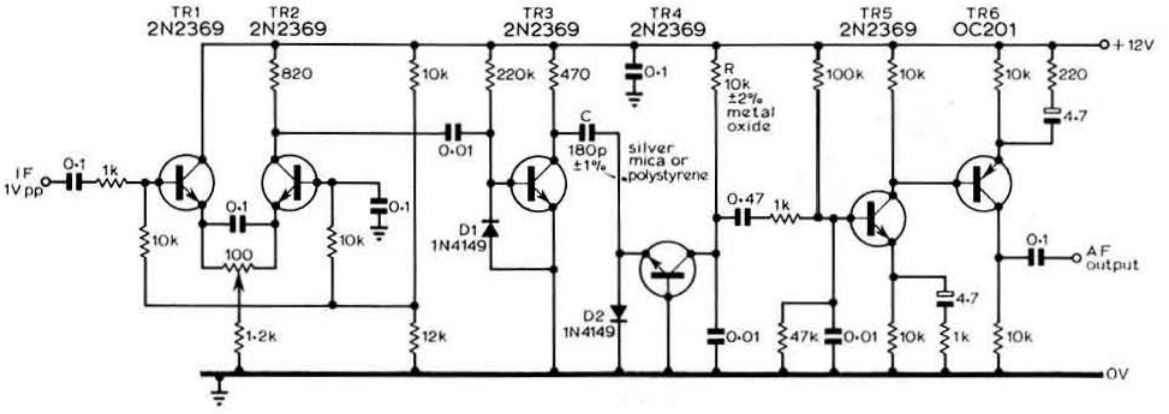
In practice it may be convenient to find the dc output across R when a crystal controlled bfo is fed in and get its millivolts/kHz this way and measure the ac gain of the amplifier TR5 TR6 so that a less sensitive ac voltmeter can be used at the output of TR1. The meter will then not be upset by the residual i.f. voltages.

In use, the device has rendered a weak fm signal quite readable when skirt detection gave barely detectable af output.

Note that TR5 and TR6, as well as amplifying the signal, also serve as an af limiter since although the discriminator output is only 50mV peak of audio, noise voltages can produce outputs of 9·5V when a signal is near the i.f. limiter threshold. Although the circuit may work without TR5 and TR6, their omission will show the need for some form of limiter.

Further information on the operation of this type of circuit can be found in *Wireless World* July 1966.

*43 Raymond Road, Langley, Slough, Bucks.



Using the SL621 agc generator

by J. M. BRYANT, linear applications engineer, The Plessey Company Ltd

THE Plessey SL621 is an audio operated agc generator designed for use with the SL610 series of rf amplifiers in ssb receivers. Its circuit diagram is shown in Fig 1. Another circuit, the SL620C, is designed to provide agc to the SL630C audio amplifier and its operation is very similar to that of the SL621.

An ideal ssb agc generator must set the agc rapidly when a new signal appears, track a rising or fading signal but, if the signal disappears altogether, as in pauses in speech, retain the agc level until the signal recommences. If the signal remains absent for more than a preset time, however, the system should rapidly revert to full gain. The SL621 will perform these functions and will also produce short-lived pulses of agc to suppress noise bursts.

Operation of the circuit is best understood by reference to Figs 1 and 2. Fig 2 illustrates the dynamic response of a system controlled by an SL621 agc generator.

The SL621 consists of input af amplifier, TR1-TR4, coupled to a dc output amplifier, TR16-TR19, by means of a voltage back-off circuit, TR5, and two detectors, TR14 and TR15, having short and long rise and fall time constants respectively.

The audio signal from the detector is applied to the input and will rapidly establish an agc level, via TR14, in time t_1 (see Fig 2). Meanwhile the long time constant detector output will rise and after t_2 will control the output because this detector is the more sensitive.

If the signals at the SL621 input are greater than approximately 4mV rms they will actuate the trigger circuit TR6-TR8 whose output pulses will provide a discharge current for C2 via TR10, TR13.

By this means the voltage on C2 can decay at a maximum rate which corresponds to a rise in receiver gain of 20dB/s. Therefore the agc system will smoothly follow signals which are fading at this rate or slower. However, should the receiver input signals fade faster than this, or disappear completely as in pauses in speech, then the input to the agc generator will drop below the 4mV rms threshold and the trigger will cease to operate. As C2 then has no discharge path, it will hold its charge (and hence the output agc level) at the last attained value. The output of the short time constant detector will drop to zero in time t_2 after the disappearance of the signal.

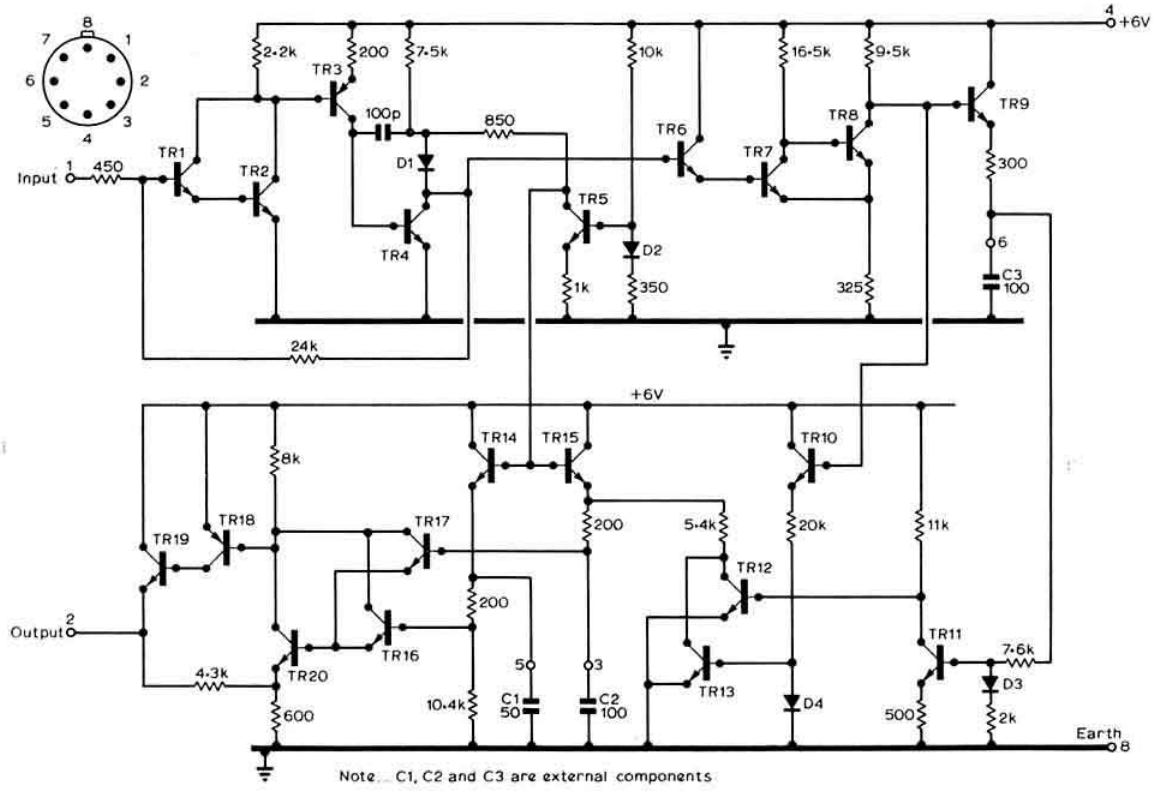


Fig 1. SL621 circuit diagram

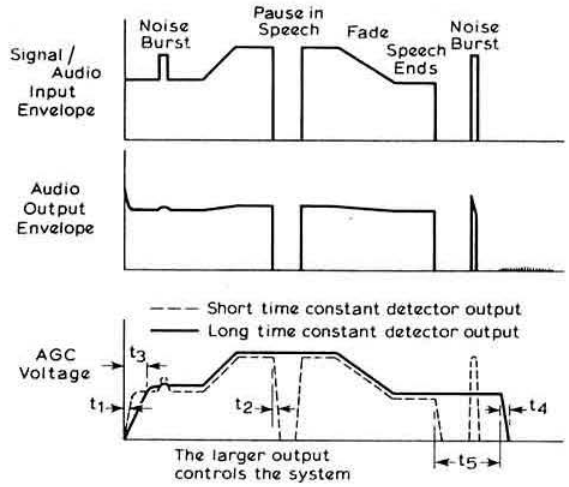


Fig 2. Dynamic response of a system controlled by SL621 agc generator

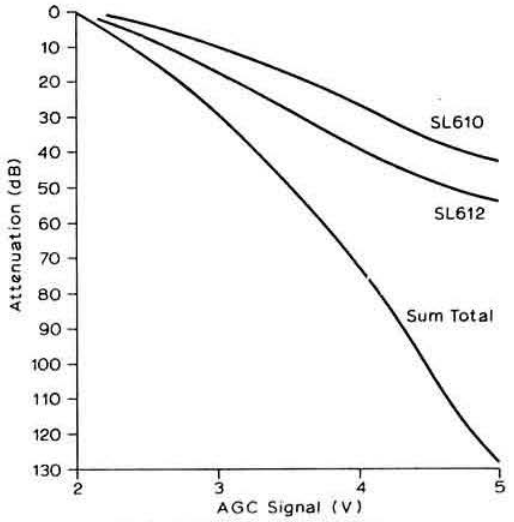


Fig 4. Attenuation/agc signal

The trigger pulses also charge up C3 via TR9, so holding off TR12 via TR11. When they disappear, C3 discharges and after t_5 turns on TR12, rapidly discharging C2 (in time t_4) and so restoring full receiver gain. The "hold" time, t_5, is approximately one second with C3 = 100μF. If signals reappear during t_5, then C3 will recharge and normal operation will continue. The C3 recharge time is made long enough to prevent prolongation of the hold time by noise pulses.

Fig 2 shows how a noise burst superimposed on speech will initiate rapid agc action via the short time constant detector while the long time constant detector effectively remembers the pre-noise agc level.

The various time constants quoted are for C1 = 50μF and C2 = C3 = 100μF. These time constants may be altered by varying the appropriate capacitors.

The SL621 is used in an ssb receiver as shown in Fig 3. AGC need only be applied to two of the gain stages even if there are more than two such stages in the receiver, since agc applied to two stages only will result in over 120dB agc range. It is usual to apply agc to the first rf stage and the first i.f. stage and it will be seen from Fig 4 that an SL612 i.f. amplifier reacts earlier to an increasing agc voltage than an SL610 rf amplifier, this has the effect of delaying the agc to the input stage and improves the signal/noise ratio.

Fig 4 also shows the total attenuation to be expected at any agc voltage when agc is applied to one SL610 and one SL612 in a system, from this one can calculate the calibration of an S-meter for use with the SL621. Such a meter should have a sensitivity of 2·6V fsd and be calibrated linearly from 0 to 120dB. Its action should be delayed by the 2V threshold below which there is no agc action. A suitable S-meter circuit is shown in Fig 5.

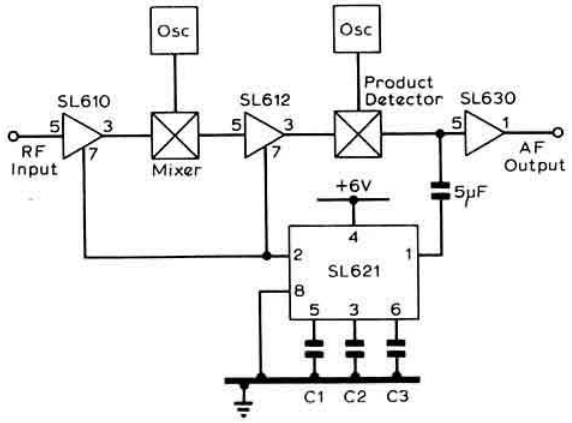


Fig 3. SL621 used to control an ssb receiver

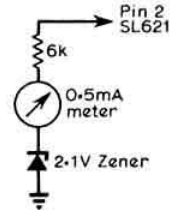


Fig 5. S-meter circuit

There are only two other important points to observe when using the SL621: supply decoupling and input coupling. Since capacitors C1 and C3 may need to charge very quickly, the source impedance of the 6V supply line at low frequencies should be very low, if necessary being decoupled by a 1,000μF capacitor placed near the SL621. The input to the SL621 must be supplied through a capacitor having a reactance below 500Ω at the lowest input frequency to be used.

The SL621 can supply at least 5mA at 5V and may be used with supplies of 6V to 9V.

EQUIPMENT REVIEW

The Trio JR 310 ssb communications receiver

by P. SIMPSON, G3GGK, and
B. ARMSTRONG, G3EDD

THE last receiver to be reviewed in this series was the Trio JR 500SE in June 1969. The subject of this review is the Trio JR 310 which is a development of the JR 500SE and offers more potential facilities for a 14 per cent increase in price. Since inflation over the intervening years must be similar to this percentage, the value for money of the JR 310 would appear to be better than the JR 500SE.

It was rather pleasant for this review to have two receivers for test. The first was supplied by Holdings of Blackburn Ltd, 39-41 Mincing Lane, Blackburn, Lancs. The basic equipment with a.m. type selectivity is £77·50, but Holdings offer several options. They fit the spare frequency range for Top Band 1·8–2MHz for £5; a 200kHz calibration oscillator can be fitted for £5, (the cost of both these mods together is reduced to £7); the WWV range can be modified for vhf converter working 29·5–30·1MHz for £3; and an extra cw or ssb mechanical filter* (for which provision is made on the basic i.f. board) can be fitted for £14·67 each. If the original ceramic filter is removed both cw and ssb mechanical filters can be fitted. Holdings normally stock JR 310 receivers fitted with both Top Band and crystal calibrator and the price in this case is £84·50. The second receiver was sent by the sole UK trade distributors, B. H. Morris and Co (Radio) Ltd, 84-88 Nelson Street, London E1 2DY, in order to compare the Holdings modified receiver with the standard variety.

It is rather interesting that semiconductors are only very slowly being introduced into factory built amateur equipment, whereas similar professional equipment went fully solid-state some years ago. There are probably several reasons for this. The equipment manufacturer buys valves at a unit cost comparable with semiconductors and as a particular cynic once said, "You can do anything with a valve that you can do with three transistors".

The equipment development time is invariably longer with transistors largely due to the greater tolerance of valves. The amateur buyer is rarely fashion conscious and wants an equipment that is good value for money in performance and facilities. The fact that a valve receiver takes about 20s to warm up is rarely of consequence to the amateur, he sees valves as an aid to quick servicing. Whereas the Trio JR 500SE used two bipolar transistors in the vfo, the JR 310 has two field effect and two bipolar transistors in this circuit.

*The ssb filter is also available from other Trio stockists. Unfortunately, while the cw mechanical filter is mentioned in the manual, supplies of this item are not yet available.

General description

The JR 310 circuit follows conventional lines with a crystal-controlled first mixer, a first i.f. of 5·955–5·355MHz and a second i.f. of 455kHz. The vfo frequency is thus 5·5–4·9MHz. Whereas a simple ceramic filter is supplied on the basic equipment, piercings are present on the i.f. board for a mechanical filter. Diode switching of selectivity is used. The ability to receive on both sidebands is provided as standard with two bfo crystals. When this is done, there is no circuit provision for side-swiping the vfo to keep the calibration the same for all modulation modes, and in consequence the vfo scale has three calibration lines.

The split-gear vfo drive has 25kHz per turn and the vfo output is taken to a small nine-pin socket on the rear of the chassis to drive the companion transmitter which is not available in this country. Incremental tune is provided. I.f. and rf circuits are not ganged to the vfo and have to be separately tuned on concentric controls.

The aerial connection can be either by a terminal strip on the rear plate or via an octal socket which is primarily for use with companion transmitter.

The audio output is to a three-way terminal strip for 500Ω or 8Ω loads; there is no built-in loudspeaker. A front panel headphone socket is provided. AC input can be either 110/120V or 220/240V 50–60Hz, selectable by a slide switch which is locked in position by a small metal plate—a very necessary precaution. The ac switch is of a push-on, push-off variety. A cadmium-plated steel chassis is used, and mounted directly on to it are two large printed circuit boards—audio and i.f.; first mixer, crystal oscillator and first i.f. circuits are on a demountable assembly. The vfo is also a separate assembly. Top and bottom covers are painted grey-green hammertone, and the front panel is finished in grey-green gloss. Extruded aluminium mouldings are used above and below the front panel. In common with most Japanese equipment, a large thumb screw is fitted for earthing.

The tests

Sensitivity and signal/noise ratio

The following results were recorded with 1μV pd input modulated (in the a.m. case) 30 per cent at 1kHz.

Frequency MHz	Signal/noise dB SSB	A.M.
1·8	26	13·5
3·5	22	15·5
7·0	15·5	17·5
14·0	20	13·0
21·0	23	15·0
28·0	22	13·5

On all bands except 1·8MHz, 1W output was obtainable. The figure on 1·8MHz was 175mW. Due to the lack of consistency between ssb and a.m. figures, cross checks were carried out on the second receiver, with very similar results. We did not understand why on 7MHz the a.m. figure was better than ssb. However, all the results were good in spite of the anomaly. One problem found in testing was that due to unscreened internal aerial leads, signals could be received with no aerial connected. This would not matter under normal circumstances, but if used on vhf or uhf as a tuneable i.f. it would be essential to use the 28MHz band. Even then, it is suspected that there could be trouble under good propagational conditions on 28MHz.

S-meter

The JR 310 S-meter was one of the most sensitive ever encountered, as the following table shows.

Meter reading	dB rel 1μV pd at 14MHz
S1	− 5
S2	− 1
S3	+ 2
S4	+ 5
S5	+ 7
S6	+ 10
S7	+ 13
S8	+ 16
S9	+ 19
S9 + 20	+ 26
S9 + 40	+ 32

On other bands the sensitivity was even better (or worse, depending on what is expected of an S-meter).

Band	dB rel 1μV pd for S9
1·8	+ 28
3·5	+ 16
7·0	+ 6
21·0	+ 13
28·0	+ 9

The standard which is now, but not universally, accepted is +34dB for S9, the nearest to this was Top Band where the rf coils had been deliberately damped.

AGC

The agc performance was quite reasonable.

Input relative to 1μV pd	Output relative to test level AT 1μV pd
+ 10dB	+ 4½
+ 20	+ 8
+ 30	+ 11
+ 40	+ 14½
+ 50	+ 18
+ 60	+ 20

MANUFACTURER'S SPECIFICATION

Standard JR 310

Frequency range	3·5-4·1MHz 7·0-7·6MHz 14-14·6MHz 21-21·6MHz 28-28·6MHz 28·5-29·1MHz 29·1-29·7MHz WWV 15MHz EXT anywhere 3·5–30MHz. Crystal and coils not provided.
Reception modes	usb, lsb, a.m., cw
Aerial impedance	50-75Ω
Sensitivity	1μV 10db S/N
Selectivity	Less than −50dB at ± 5kHz detuning
Image ratio	More than 50dB
I.F. rejection	More than 40dB
Frequency stability	+ 2kHz in 1-60min after switch on. Subsequently within 100Hz per 30min.
Audio frequency output	More than 1W at 8Ω with 10 per cent distortion
Output impedance	8Ω and 500Ω
Power supply	110-120 or 220-240V ac 50/60Hz 70W
Dimensions	13in by 7⅝in by12⅛in
Weight	20·2lb

Spurious responses

First i.f. breakthrough was better than 70dB on all bands except 1·8 and 7MHz; on these bands if was better than 60dB. 7MHz is the closest band to the first i.f., and the rf coil on 1·8 had been fairly heavily damped to avoid rather critical rf tuning. Second i.f. breakthrough was for practical purposes non-existent. First i.f. image rejection was 88dB on 1·8MHz, falling to 45dB on one of the 28MHz bands where the image frequency is over 40MHz and very unlikely to give problems. Second i.f. image, being 910kHz from the tune frequency, is potentially the worst spurious problem and the rejection varied from 86dB on 1·8MHz to 60dB on 28MHz. The i.f. and rf circuit tuning controls could be peaked on some spurious response frequencies but the calibration is quite good. Only on 7MHz was an unwanted resonance point quite close to the wanted when peaking on noise.

Strong unwanted signal handling

Blocking was measured by feeding two signal generators into the receiver—one was set to give 14dB signal/noise ratio at the tune frequency, and the other was set 20kHz away from the tune frequency at such a level as to achieve 3dB degradation of the wanted signal/noise ratio. The unwanted signal level necessary was +70dB relative to the wanted level.

Intermodulation was measured by feeding in two strong signals 20kHz apart and looking for third-order intermodulation products 20kHz above the upper frequency and 20kHz below the lower frequency. The unwanted signal levels were +40dB relative to 1μV pd to produce the equivalent of 1μV pd at the aerial input. This somewhat disappointing result reflects the problems of trading sensitivity with good unwanted signal performance. A substantial improvement can be achieved by reduction of the manual rf gain, but the law of this control is such that nearly all the useful gain control is cramped at the end of rotation.

VFO

The tuning knob scale can be moved with respect to the knob for calibration purposes, and initially the scale and

dial were mechanically aligned in order to see how well the vfo had been set up in the factory. The vfo frequency error was checked every 50kHz and the greatest error shown was 800Hz, which is less than one division on the knob scale and a very good result. The second receiver was checked and was even better, at less than 600Hz.

Backlash and "resetability" was generally better than 100Hz, again a good performance.

Frequency drift from switch-on was recorded as follows:

Minutes from switch on	Frequency drift, Hz
1	170
2	188
3	197
4	201
5	208
10	218
15	205
30	160
45	160
60	155

The incremental tuning control gave a swing of ± 2½kHz. Mains variation ±10 per cent resulted in a ±25Hz frequency change.

The maximum drift of 58Hz after the 1min point is an excellent result and one of the best ever recorded in these reviews, the only other equipment with a similar performance was the Heathkit SB101.

The crystal oscillators

The first oscillator crystals are the very small wire-in type known as style J and they are strung between bandswitch wafers. No individual trimmers are fitted to trim out adjustment tolerance, but few expensive equipments are supplied with this facility anyway.

Band	Nominal crystal frequency	Error	
MHz	MHz	Hz	ppm
1·8	7·755	+ 1,384	+ 179
3·5	9·455	+ 364	+ 38
7·0	12·955	+ 76	+ 6
14·0	19·955	+ 580	+ 29
21·0	26·955	+ 420	+ 16
28·0	33·955	+ 25	+ 1
28·5	34·455	+ 1,660	+ 49
29·1	35·055	+ 364	+ 10
	453·5kHz	− 62	
	456·5kHz	− 19	

The crystal frequency errors are very good, apart from that used on Top Band which was fitted by Holdings. This suggests that Holdings have not given the correct specification to the crystal supplier. Even so, the resulting error in calibration is quite small. (*Holdings have advised us since this review was written that crystals are now being fitted with a nominal frequency of 7·753MHz without the 10pF parallel capacitor. This brings the calibration correct on Top Band.*)

Trio now supply a crystal calibrator giving 25kHz pips, as an optional extra. This costs £10·52, including crystal.

Selectivity

No claims are made for the narrow ssb selectivity but for wide selectivity the 6dB points give 3·5kHz bandwidth and the 50dB points 10kHz which is within the claim. The mechanical filter fitted to the review equipment had 2·2kHz bandwidth at the 6dB points with a 6/60 shape factor of less than 2, and a 2dB ripple.

Birdies

All bands contain a weak birdy 24kHz in from the lower edge. There was a strong birdy on 4·045MHz but since this is well outside the band, it tends to be academic; this birdy occurs in the same dial position on the WWV range.

In use

The receiver handled well and the optional mechanical filter fitted was very worth while for sorting out a signal in QRM. There were indications that mains-borne interference was more troublesome on this receiver than some others, but this is a very difficult point to measure accurately. The 40m band is one on which few amateur receivers are satisfactory and the JR 310 is no exception. External attenuation in the aerial lead would be of great benefit. Care has to be taken that the rf tuning control is resonated at the right point on 7MHz, since with an aerial connected there are several spurious resonant points—one of the penalties of having one coil for several bands. On all bands except 1·8MHz, the rf control is critical. The loudspeaker hum level tends to be obtrusive in a quiet room when no signals are present to mask it.

Handbook

The 21-page handbook is very good and contains a lot of useful information. For instance, details of how the diode switched selectivity circuit works are given, as well as clear modification instructions for adding the optional mechanical filter. No parts list is given but most of the component details required are given on the circuit. Oddly enough, in both the handbooks examined the vfo circuit was not included, but Holdings supply an additional leaflet which gives the vfo circuit although the legibility is not particularly good.

Guarantee

Trio guarantee all parts for 12 months, but do not cover labour. Holdings, in addition, back the manufacturer's parts guarantee with free labour charges for 12 months. Both, of course, exclude damage due to misuse etc.

Conclusions

In re-reading the conclusions on the JR 500SE we are left with the impression that someone at Trio read our review and decided to take care of most of the comments, which resulted in the JR 310. It would be nice to think so, but for whatever reason, the JR 310 is a better receiver in almost every respect. If all the options are taken up, the price tends to approach that of other receivers with the options in as standard, but these, with the exception of Holdings' Top Band, can easily be added to the basic equipment when purse or inclination allows. It would appear to be a good receiver for the swl who is working for his licence, for it will stand him in good stead whether for listening or communicating. A major plus point of the JR 310 is the vfo, for its linearity, accuracy and stability which are far better than one would normally expect for an equipment in this price bracket.

MICROWAVES–1,000MHz and up

by Dr D. S. EVANS, G3RPE*

Waveguide directional couplers for 3cm

In equipment for uhf and lower frequencies, where most of the circuitry is physically "open", it is comparatively easy to introduce rf as required, such as the local oscillator to the mixer, or to extract rf for monitoring purposes. In a waveguide system, however, the rf is contained entirely within the waveguide (except at the aerial), and an appropriate method of coupling must be used. A most useful device in this respect is the directional coupler, and the following describes a type which has been made and used successfully by a number of people.

The degree of coupling required covers a wide range. Mixer diodes require, for efficient operation, a local oscillator drive of about 1mW, which is roughly equivalent to a mixer current of 1mA. A similar power is useful for monitoring the output of transmitters. Since the rf power generated at present covers the range 10mW to 1W, couplers of 10 to 30dB are of interest.

A form of coupler particularly suitable for home construction is the Moreno cross-guide coupler which, as shown in the exploded diagram Fig 1, consists of two pieces of waveguide at right angles sharing a common wall where they cross. A pattern of holes in this wall couples the field from one waveguide to the other. Their dimensions determine the degree of coupling: representative values taken from the published literature [1] are given in the table and correspond to a slot width of 0·065in. By increasing the width slightly to 0·072in, and using near to the maximum length of slot possible (0·510in), the coupling may be increased to 9dB, which is essential if low-power local oscillators such as Gunn diodes (5–15mW) are to be used.

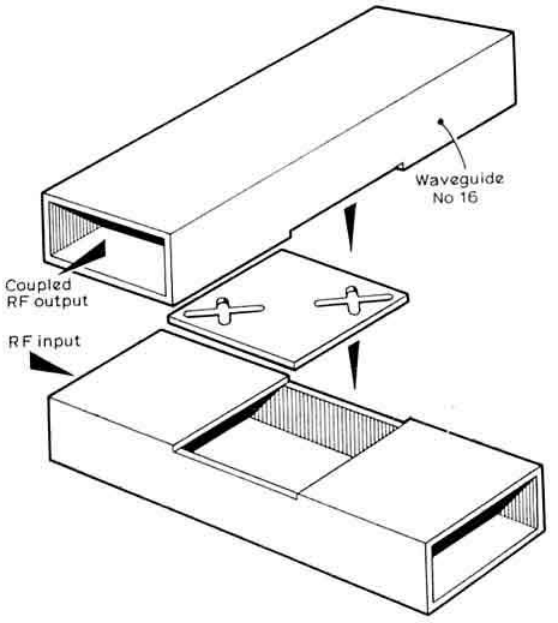


Fig 1. Exploded view of cross-coupler

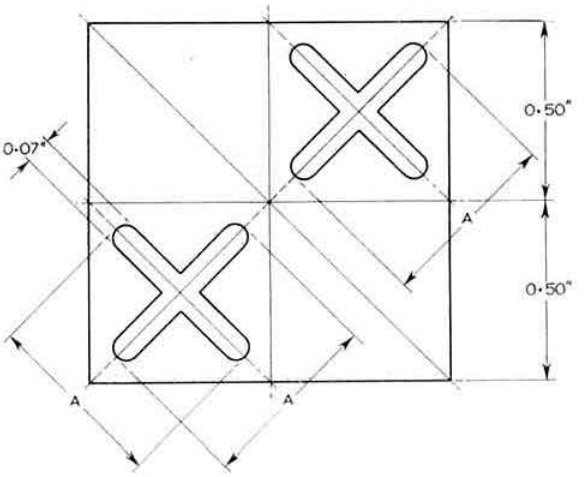


Fig 2. Dimensions of septum plate. Material 0·036in (20g) brass

As can be seen from the table, the dimensions of the slots are fairly critical if a predictable degree of coupling is required. In addition, if the slots are not symmetrical or the waveguides are not at right angles, then the directivity (the measure of power coupled in the wrong direction) will suffer, although this factor is not important in most applications. Therefore, some care must be used in construction. The septum is best made according to Fig 2 by first drilling and filing the slots in an oversize piece of brass, their size perhaps being checked using a gauge made from 16g (0·064-in) sheet. Afterwards the excess brass may be removed using

TABLE

Dimensions of cross-coupler slots

Coupling dB	Dimension A inch	Slot width inch
9	0·510	0·072
12	0·504*	0·065
15	0·462	0·065
20	0·410	0·065
25	0·367	0·065
30	0·328	0·065

*obtained by extrapolation.

(Continued on page 616)

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

C * *

TECHNICAL TOPICS

A monthly feature by PAT HAWKER, G3VA

AT one time, not so many years ago, September traditionally represented the opening of a new busy season for amateur radio activities. Perhaps this is much less true today, with portable and mobile activities filling in the summer months, and the scanning of adverts often taking the place of the workbench. But a little of the old tradition remains. So this month we get straight down to surveying a number of ideas and topics which have only one thing in common—most of them can be classified as "unfinished business" offering possibilities for further investigation in the coming months. Take your pick—and then why not have a go at contributing to their development?

No-coil bandpass crystal filters

A long time ago in *TT* (October 1960) and subsequently in all editions of *ART*, we described briefly a form of no-transformer crystal filter under the name "aperiodic filter". This technique, developed initially for valve amplifiers, can provide either a single filter or, by cascading several stages, a complete transformer-free i.f. strip of extremely sharp selectivity. The technique has since then also been applied very successfully to transistor i.f. strips. But normally this approach has been advocated only for cw filters of bandwidths of around 500Hz or less.

We were therefore extremely interested to find in *DL-QTC* (July 1971) a long article by Henno Schotter, DJ1FO, describing how this approach can be used to produce effective ssb crystal filters between 5 and 7MHz using FT243 crystals. It has long been known that a crystal filter does not really need to have a smooth response curve (it has been pointed out, see below, that two or three humps can actually provide advantages) and can tolerate considerable ripples in its response.

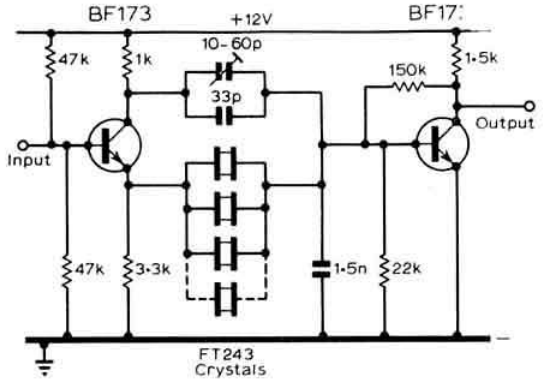


Fig 1. DJ1FO crystal filter using FT243 surplus crystals to form ssb filter in the range 5 to 7MHz. Crystals need to be carefully selected (eg 5,872·810kHz, 5,873·190kHz, 5,874·530kHz etc). For cw use only one or two crystals and reduce balancing capacitance

What DJ1FO does is to use the basic aperiodic arrangement but with several crystals in parallel. He selects the crystals carefully so that their series-resonances are spaced at intervals of about 300 to 400Hz; he suggests that four to six crystals can be used to form a typical ssb filter. The balancing capacitance is, of course, rather greater than for a single crystal. Fig 1 shows his arrangement for placing the crystals between two bipolar transistors; for valves or for FETs one could use circuit values much as shown for the single crystal filter in *ART*. For anyone with a good supply of FT243 crystals of around the same frequency, this approach looks as though it might prove an easy way of constructing an hf ssb filter.

Speech bandwidth compression

A lot of effort has been spent in telecommunications research in determining just what frequencies are and are not important in achieving communications intelligibility. One of the more spectacular results of this research was the development of "vocoders" which allowed speech to be transmitted in a bandwidth of only about 200Hz—but these tended to be so complex that they have found little commercial application (on ocean cables, for example, bandwidth has become much cheaper than it used to be).

Despite the exploitation of ssb, it is still true to say that the vast majority of amateurs occupy or listen to more bandwidth than really necessary—not only antisocial but degrading received signal/noise ratios. The figure of 300 to 3,000Hz is widely accepted as being about the minimum for good speech intelligibility. But do we really use all this band of hertz equally?

Some research by K. Kryter, reported in *QST* December 1960 in a letter from K3IQU, drew attention to the benefits that might result from the use in a receiver of three 500Hz filters rather than a single 2,700Hz filter; the proposed centre frequencies were 500, 1,500 and 2,500Hz. K3IQU strongly advocated that during alignment of crystal filters no attempt should be made to correct the double-humped response curve, leaving dips as pronounced as 30dB.

It appears, from an article in *Radio-REF* (No 4, 1971) that further research has been carried out in this area by NASA in preparation for Apollo communications. This team came also to the conclusion that only three portions of the speech band are really important: 300 to 400Hz and 2,500 to 3,000Hz—plus (for a male voice) 900 to 1,700Hz or (for a female voice) 1,100 to 1,900Hz. The audio bands 400 to 900Hz and 1,900 to 2,500Hz seem to contribute little to intelligibility or even to voice identification. These bands can thus be suppressed to improve signal/noise ratio (in the case of Apollo it is suggested that these bands are used for biomedical telemetry).

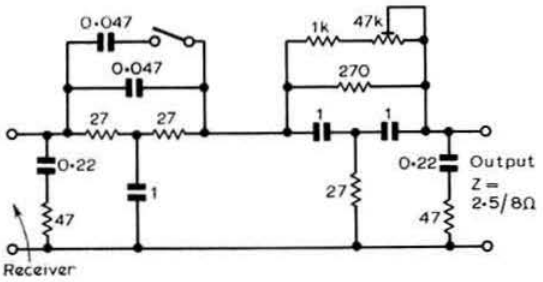


Fig 2. NASA audio filter placing nulls in audio band

Radio-REF reprints a NASA filter design (Fig 2) which puts nulls at these frequencies and can be included in the low-impedance output (2·5 to 8Ω) to phones or loudspeaker. P1 adjusts the null around 600Hz and the switch in the first section can be labelled "yl/om"! We suspect that, for everyday use, the improvement may be rather less than what is theoretically suggested. Nevertheless it seems important that amateurs should be aware of this uneven distribution of the important audio frequencies when constructing crystal filters of the type proposed by DJ1FO since, following these principles, one might reduce the number of crystals to three or four per stage.

Add-on Q-multiplier

To turn to a rather less complex technique for reducing bandwidth, there are still quite a lot of receivers and transceivers that are fitted only with "broadband" ssb filters (ssb adherents may flinch at this description of their system as broadband—but by comparison with cw it certainly is). An add-on Q-multiplier, particularly one that uses the existing i.f. transformer to provide the resonant circuit, is thus a still popular arrangement. Fig 3 is the circuit diagram of a unit, complete with its own miniature power pack working from a 6·3V heater line, described by Adabert Hugenroth, DL2NX in *DL-QTC* (No 3, 1970). This was intended for 465kHz operation, but could probably be used quite effectively at higher intermediate frequencies.

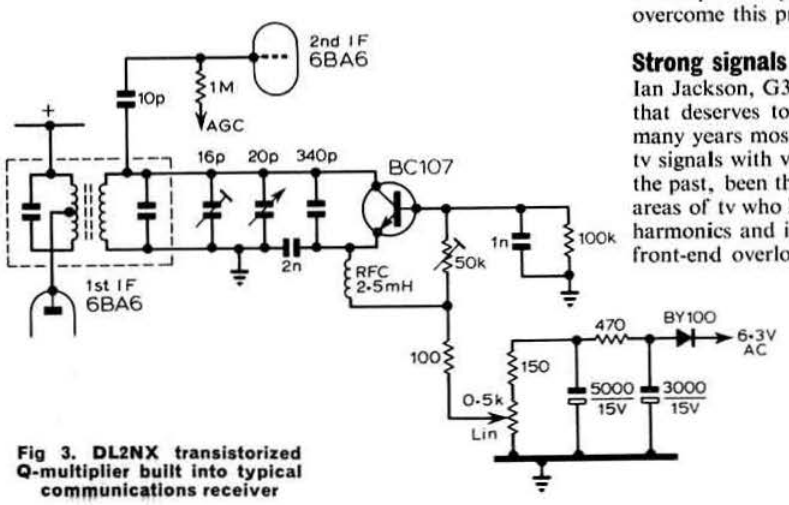


Fig 3. DL2NX transistorized Q-multiplier built into typical communications receiver

Varactor diode tv tuners

The recent review of how receiver design affects the tvi problem (*TT* July) stirred up quite a lot of interest and provoked some further thoughts on the subject.

For instance, John Haydon, G3BLP, spotted one significant omission in design trends that may degrade receiver immunity: this is the growing practice of using varactor diodes to provide electronic tuning of uhf channels (and/or, in some countries, vhf channels). A common practice, as we noted last February, is to use single diodes in the signal-frequency tuned circuits and a twin-diode arrangement for oscillator tuning.

As G3BLP points out: "There is a growing movement towards the use of these tuners for uhf television and this compounds the poor strong signal properties of bipolar transistors. The varicap diode has to be reverse biased and for this application the bias is between about 3 and 30V, a low voltage representing the higher capacitances. The influence of a strong signal across the aerial circuit can considerably disturb the operation of the tuning diode.

"It may alter the capacitance of the diode and so detune the circuit from the wanted signal; it can sweep the tuning diode over a range of capacitance with similar effects; if strong enough it may drive the diode into conduction on peaks, thus not only detuning the circuit but also applying additional damping to the tuned circuit. Even in normal circumstances the static Q of these diodes is much lower than that of tuning capacitors, implying much lower front-end selectivity. Furthermore, towards the limit of its capacitance range the tuning diode is prone to generate mixing products. The varactor diode may be a useful way of generating 70cm with a 144MHz transmitter, but too often it is a confounded nuisance in the front-end of a television receiver. It should be noted that these detuning, low-Q effects apply to all three signal-frequency tuned circuits, and in extreme cases leave the television receivers with virtually an aperiodic front-end!"

G3BLP points out, incidentally, that some published circuits for achieving fm on 144MHz show a varicap diode just slapped across the tuned circuit of a vfo; he emphasizes that clean fm will not be obtained unless the reverse bias is greater than the sum of the peak rf voltage across the tuned circuit plus the peak audio: the use of two diodes can help to overcome this problem as suggested in *TT* last February.

Strong signals and cross-modulation

Ian Jackson, G3OHX, also adds a further comment on tvi that deserves to be widely understood. He notes that for many years most of us have grown used to equating strong tv signals with virtually tvi-free operation. It has always, in the past, been the viewers in the medium-signal and fringe areas of tv who have been most affected by local transmitter harmonics and i.f breakthrough. On the other hand, where front-end overloading is concerned—as increasingly it is—the situation tends to be reversed. G3OHX stresses that crossmodulation *does not* depend upon the strength of the wanted signal; this form of tvi is just as likely to affect strong as well as weak signal reception. This is, of course, in contrast to harmonic radiation etc where the stronger signal areas are much better off.

We can endorse this view from the experience of what happened when multi-channel uhf tv started in 1969. The broadcasters received a number of complaints from viewers getting an ITV picture superimposed on the BBC channel and vice versa. Most complaints were traced to crossmodulation resulting from the overloading of mast-head and/or small distribution amplifiers, and sometimes (though not frequently) overloading of the receiver front-ends. As might be expected, most complaints concerning mast-head amplifiers came from fringe areas—but the receiver overload problems were usually confined to within a mile or two of the high-power transmitters. In these cases, both signals were roughly of the same order of strength; clearly, in the case of a local amateur or other communication transmitter, the cause will be the local signal getting through to the tv front-end, and will depend very little on whether the wanted tv signal is strong or weak. A number of the mast-head and distribution amplifiers have been improved since then—but it is worth remembering that these devices tend to be highly vulnerable to crossmodulation.

In the July survey of tvi we mentioned that the lossy ferrite material type FX1588 was not always now readily obtainable. As a result we received a note from A. F. Trinder, G4MT, pointing out that his firm (Gurney's (Radio) Ltd, 91 The Broadway, Southall. Mddx. tel 01-574 2115) holds considerable stocks of the Mullard type FX1588 material.

Eliminate contact bounce?

The old problem of contact bounce, with its tendency to produce an initial spike before the main keying pulse, can still be aggravating, particularly when using bug keys that do not have effective U-spring damping or with some types of high-speed keying relays (see notes in *ART*). A circuit technique (Fig 4) which looks as though it could help to overcome this problem was found recently in *Electronic Design*, although not specifically intended for cw keying applications. Rather it is intended to clean up switch closures by using a ujt (unijunction-transistor) in such a way that the output consists of only one clean pulse to each closure of a switch. The time-constants in the design are intended to give a 200ns rise-time and a 2ms fall-time. With some lengthening of these times it might well be possible to adapt the system to provide an effective key-click filter in addition to the contact-bounce filter—and we would be interested to learn the results of anyone experimenting along these lines.

The following notes are taken from the original description by Peter Stasz: because R1 provides a current greater than the valley current of the unijunction transistor, the ujt can fire only once. With proper selection of R2 and the supply voltage, the circuit can be made to interface directly with

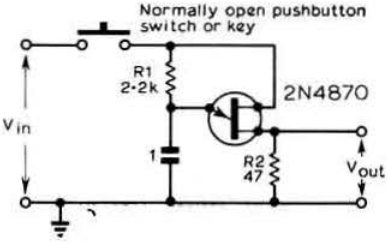


Fig 4. Unijunction transistor circuit designed to stop contact bounce on switch closures but offering interesting possibilities as a keying filter

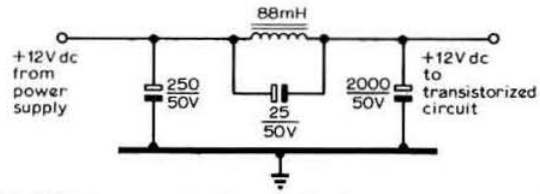


Fig 5. Miniature ripple filter circuit using 88mH toroid choke

digital logic circuitry. Supply voltage can range from 3·5 to 20V and standby power is not required after the switch is released.

Miniature ripple filter

A ripple filter for use with miniature power supplies for semiconductor equipment has been suggested in *QST* by Richard Matteis, W4YAA. This consists of using an 88mH toroid as the inductive element of a parallel tuned circuit to provide a high impedance to ripple frequencies of the order of 100 to 120Hz. The toroid is connected in parallel with a 25μF capacitor as shown in Fig 5. This arrangement is stated to result in a resonant frequency of about 106Hz, and it should thus be even more effective on European ripple frequencies of 100Hz than the American 120Hz for which it was developed. The 88mH toroid has an internal dc resistance of only 10Ω and will handle about 200mA. But remember that this form of ripple filter is designed for use with full-wave rectification, ie ripple frequencies of 100 or 120Hz and not with a single diode arrangement. Since also the tolerance of typical 25μF electrolytic capacitors tends to be pretty wide (usually providing more than the nominal capacitance) we suspect that it may be worth taking care in the selection of a suitable capacitor to bring the circuit near to resonance. W4YAA claims that as a ripple filter it will be some 10 times better than using just a 10Ω resistor.

Phase-lock-loop receivers

Following the earlier notes in *TT* (March and June) on the use of integrated-circuit phase-lock-loop detection, W. M. N. Burridge of Stoke Gabriel has continued his investigations into the practical use of these devices for the reception of amateur as well as broadcast stations. He has put together a receiver for 144 and 432MHz incorporating a Signetics NE561B ic, suitable for a.m. and fm signals. Basically this is in the form of a double superhet (Fig 6) with a modified television transistorized tuner having i.f output at 39MHz followed by an ic amplifier (CA3028A) at this frequency; the signal is then converted to 1·6MHz with an npn phase shifter/splitter driving the NE561B pll ic. The ic driver stage is rather different from that suggested by Signetics but the ic connections other than those shown are as in the firm's applications notes. The CA3028A first i.f. amplifier is adapted from one used in "a second generation mosfet receiver" (*QST* December 1970) and has been found a useful approach. Mr Burridge is using a special fet 144MHz preamplifier which is a combination of cascode and neutralized "double-triode" approach: see Fig 7.

He describes the "feel" of the receiver as follows:

On fm, results are much as described earlier for tv sound except that the i.f. is lower and the tracking range of the pll has been deliberately restricted. One still gets the sudden drop

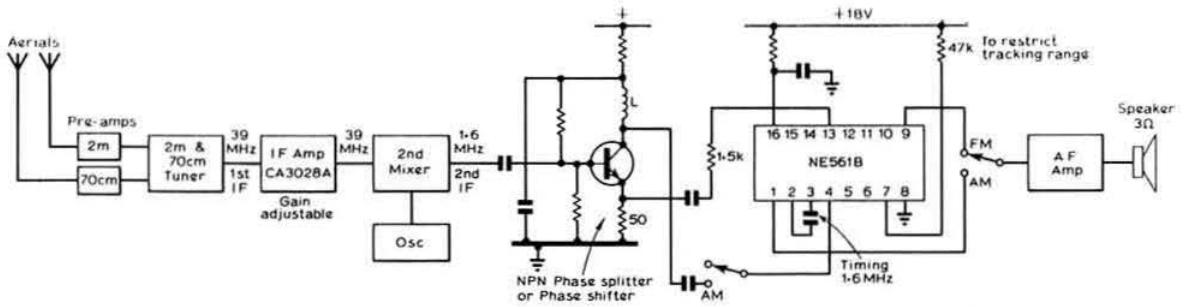


Fig 6. Outline of 144 and 432MHz receiver using NE561B pll integrated circuit. The tuner is a surplus transistorized television tuner with uhf section modified for 70cm and Band III section retrimmed for 140MHz, slide switched between bands

in noise as the carrier is tuned; but with nbfm the audio output tends to be well down to that on wideband broadcast tv or vhf/fm signals. This suggests that some sort of squelch circuit is needed unless one is prepared to put up with a burst of noise when the amateur ends his transmission.

On a.m., one has, in effect, direct conversion with the local oscillator locked to the incoming signal; the "feel" is that of an fm receiver with a Foster-Seeley or ratio detector. When tuning a signal there is a fairly gradual drop in noise as one approaches the central position; this characteristic gives the impression that the receiver can recover modulation from very weak signals indeed—but it is difficult to be sure whether this is really the case. For optimum results, signal levels at both inputs of the pll ic (ie locking input pin 13 and a.m. signal input pin 4) have to be of the right order. The gain of the CA3028A has to be advanced until locking occurs but not so far that the signal is swamped by noise. Too little gain results in a heterodyne whistle; optimum results are achieved when the gain is advanced just enough to permit locking and so stopping the whistle; but the setting is not critical. On a strong incoming signal, s/n ratio is improved by having i.f. gain at a broadly optimum setting. This suggests that work could be done in applying agc to the CA3028A.

With pll, local oscillators, even for 144 and 432MHz, can be at the fundamental because of the built-in automatic frequency control effect. The main design requirement is to get a nice balance between selectivity, afc effectiveness, and tracking range of the phase lock; one also has to consider choice of i.f. and freedom from spurii and "birdies". He restricts the tracking range by feeding pin 7 from the 18V positive supply via a 47kΩ resistor; this might be taken further to the one per cent bandwidth suggested by Signetics.

For an amateur in an urban situation, greater selectivity would be needed, possibly by a lower 2nd i.f., filter, or extra tuned circuits; too great selectivity, however, might affect the afc. In practice there are not many local signals to contend with but during openings stations at good range come through. There are still so many variables in the design of such equipment that it is to be hoped that others will take up this form of reception. Admittedly ssb would represent a difficult challenge (though this might encourage the use of double sideband suppressed carrier which is an extremely effective mode). Mr Burridge is already in touch with several amateurs planning to use pll techniques, including G2RF who intends using an NE560B for 136MHz weather satellite reception.

Fig 8 shows an arrangement suggested in *QST* (March 1971) as being particularly suitable for nbfm reception.

We have also had a letter from P. F. Clarke, G3LST, of LST Electronic Components Ltd (7 Coptfold Road, Brentwood) pointing out that his firm is now marketing a lower cost pll integrated circuit in a dual in-line package. This is

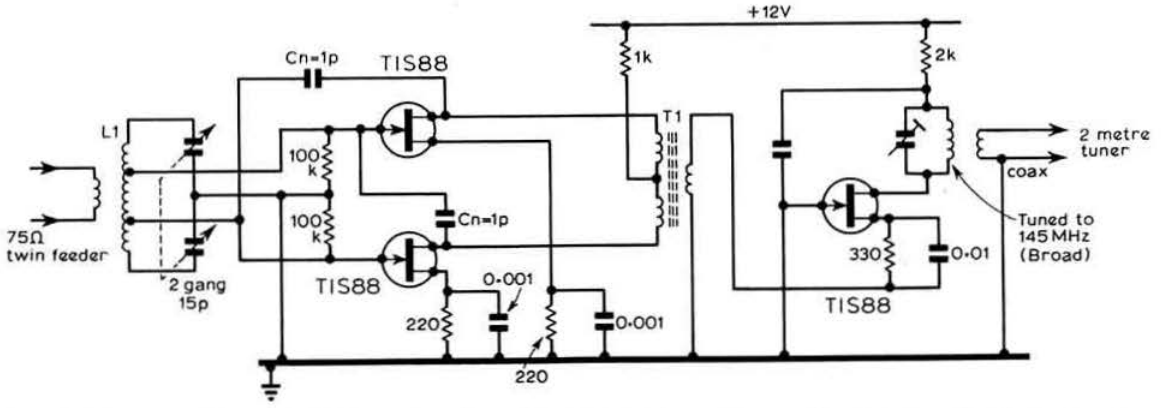


Fig 7. 144MHz pre-amplifier used with the receiver shown in Fig 6 but of general application. The broadband interstage transformer T1 is trifilar wound on a dust core, with coupling as tight as possible, three turns per winding. The two-gang trimmer should be peaked on weak signals as it provides fairly sharp tuning. L1 is seven turns, tapped at two turns from each end

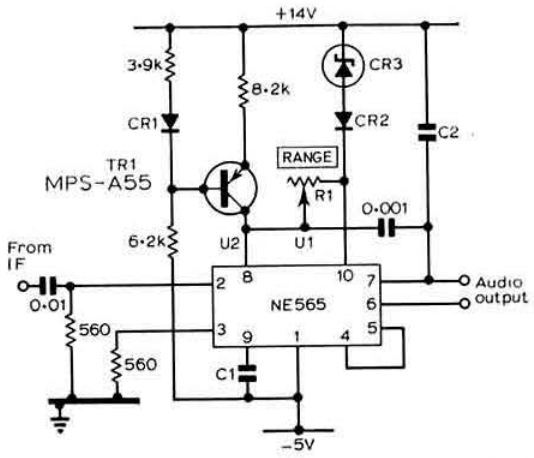


Fig 8. Use of an NE565 pll device (upper frequency limit 500kHz) in a modified arrangement described in *QST* for nbfm reception. The injection of a constant current into pin 8 improves detector performance in applications requiring both a narrow lock range and a large output voltage swing. For details of timing constants etc refer to the *QST* article

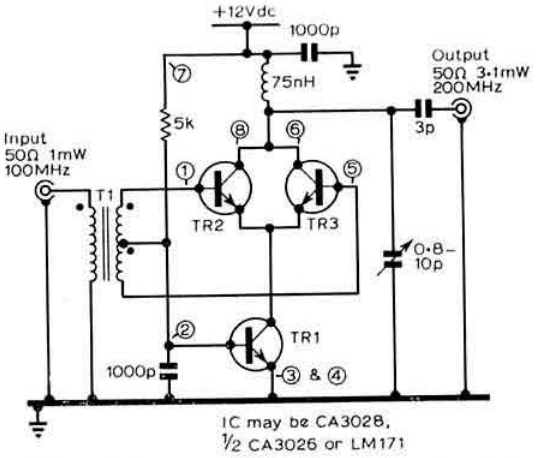


Fig 9. Full-wave vhf/uhf doubler providing unusually pure output described in *Electronic Design*. The balun is specified as six turns of trifilar No 32 transmission line on a Micrometals T.25.22 core

the type M565CN and, with data sheets, is priced at £5.98, well below the cost of some of the earlier pll devices. G3LST says: "We have long believed that the high price was the only barrier to the widespread use of this intriguing type of device." This seems a valid statement and we willingly draw attention to this lower cost ic.

Doubler-converter?

There must be quite a lot of amateurs who have a hf receiver for 3·5MHz upwards, but who occasionally want to listen to 1·8MHz cw. The usual solution is a superhet-type up-converter in front of the receiver. But is there another, in some respects more elegant solution? John Roscoe, GM4QK, poses the question—and immediately answers his own question with another: why not simply "double" the frequency of the incoming signals. Doublers are standard practice in transmitters but seldom used in receivers.

With a Star 700 receiver, GM4QK contemplates trying an EF80 as combined rf amplifier and t/r switch, followed by almost any double-triode as a push-push doubler. For the semiconductor types he wonders about varactor doublers or integrated-circuit doublers (see below). One problem would be to build in sufficient front-end selectivity to prevent strong broadcast stations from quadrupling into the i.f.

Any a.m. stations will end up with distorted frequency-doubled speech—but the basic proposal is for cw reception. The idea of frequency-doubling in receivers is not a new one, as those who have followed the various arguments in *QST* about "micro-band fm" will be aware. But has anyone tried a simple doubler-converter?

Low-distortion ic-doubler

Details of a simple, low-cost full-wave vhf/uhf doubler providing a very pure output were given in *Electronic Design* (1 September 1970) by Carl Andren. He pointed out that the odd harmonic rejection in this type of circuit depends on close matching between base-emitter junctions and that this can be achieved cheaply only by using an ic. His design (Fig 9) has a broadband (balun) input transformer with tuned narrow-band output. It provides around 5dB gain; the 3rd and 4th harmonics are 45dB; all other harmonics (except the wanted second harmonic) are better than 50dB down. Input drive needs to be kept within a few milliwatts of the 1mW shown. A doubler of this type would appear to have useful applications for vhf oscillator chains and the like.

Digital ssb techniques

When we included in *TT* of February 1971 two brief paragraphs on the suggestion by Jim Evans, GI3VDB, that 90° phase shifts might be readily achieved using integrated circuits of the ttl (transistor-transistor-logic) type, we did not foresee the lively interest which this topic would arouse. But the comments from G3JGO, GD3XNU and VK3AXF (*TT* May, June and July) all hinted that this subject is not only of technical interest but also has very significant practical potential.

This month we are able to include a further report on the subject; this time an account by R. W. Gilbert, G3UEZ, of work actually carried out at the University of Aston, Birmingham, as part of two experimental projects.

He writes: "In 1968 I was working on a project which used a digital phase shift technique for the generation of ssb signals by the "third method" (D. K. Weaver, *ProcIRE*, December 1956 and described briefly in *Radio Communication Handbook*). The "third method" requires two 90° shifted carriers, one pair at low frequency, the other at high frequency. In our project the phase shifts were achieved using digital techniques. Our system also incorporated four balanced modulators of rather unusual design (using fet devices as switches instead of the usual diodes); it was capable of producing a completely variable ssb signal over the range of 300 to 500kHz with sideband suppression of the order of 30 to 50dB. Fig 10 shows the fet balanced modulator used in the

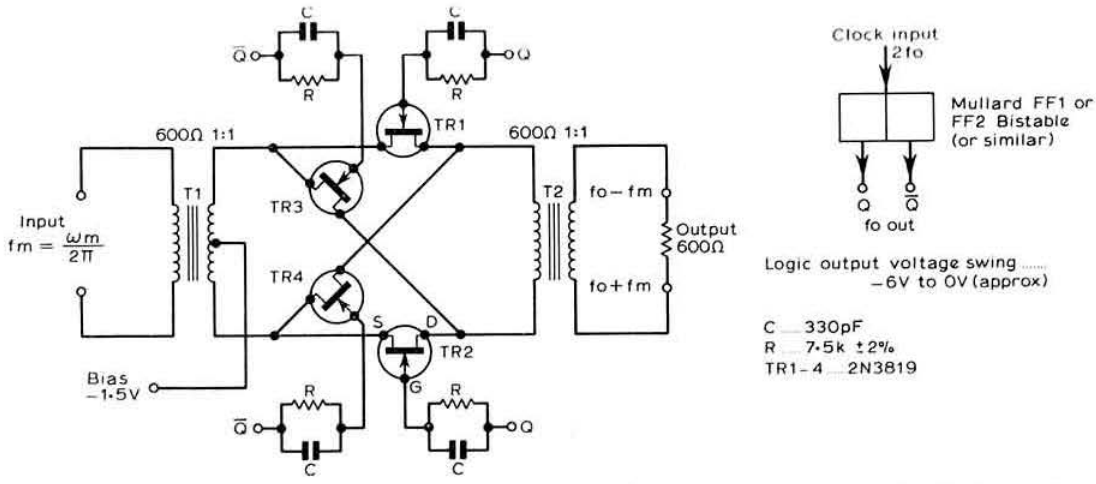


Fig 10. FET balanced modulator used in the low-frequency section of "third method" ssb generator. The FETs are selected so that each device is capable of being fully switched on and off with the available logic voltage swing. This could work up to 50kHz providing 45-50dB carrier suppression without balancing. For operation of a similar circuit at 500kHz, T2 was replaced with an rf transformer and by using 2N3923 FETs and faster logic, results were obtained similar to the low-frequency unit

lf section; it provided carrier suppression, without balancing, of the order of 50dB.

"More recently I have been working with a colleague on an experimental Frenac system. This form of communication system is designed to work under high noise conditions, using an infinitely-clipped ssb signal (for a description of the principles of Frenac see "New techniques for radio amateurs" by G. M. Ward, G3BOB, *Radio Communication* September 1969). In this case, the ssb signal was generated using a modified form of the "third method". The two lf balanced modulators used fet devices while the two hf balanced modulators used Texas Instruments SN7651N integrated

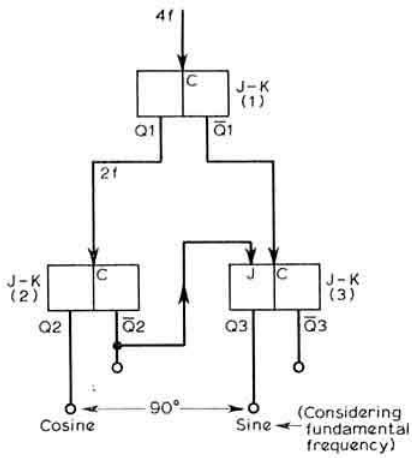


Fig 11. The hf digital logic arrangement providing 90° phase shifts relative to the fundamental frequency. C represents one J & K input joined together. All J-K devices MC1027P. Note that the J-K device (1) must be driven from a high-speed Schmitt trigger ic such as the MC1235F

circuits. Both the lf and hf carriers were obtained digitally; in the hf case using Motorola MC1027P J-K flip-flops.

"In this way, an ssb signal was produced, again completely variable and capable of working up to 2·5MHz with a reasonable degree of sideband suppression (of the order 32 to 35dB). The ssb output signal was filtered to remove the odd harmonics resulting from the square-wave carriers. In our system, 2·5MHz was considered to represent the upper frequency limit for reasonable sideband suppression; it should be noted that a phase error of 1° at 2·5MHz is equivalent to 1·11ns. Calculation indicates that an overall phase error, in the lf and hf digital carriers, of 2° represents a 35dB sideband suppression, while a 3° error represents about 32°. This assumes that the low-frequency low-pass filters, as used in "third method", have identical phase responses. In practice, this requirement is somewhat difficult to achieve; in the experimental system these filters were made as similar as possible.

"The hf digital phase shift was achieved using three MC1027P J-K flip-flops combined with printed-circuit-board "ground plane" techniques; 3ns rise and fall times were obtained. The phase error of this system, outlined in Fig 11, depends on the differences in propagation delay of the flip-flops (2) and (3). "D-type" flip-flops, such as the Motorola MC1670S, were considered, but were rejected on the grounds that three J-K units were cheaper than two D types."

It is clear, from G3UEZ's notes, that digital ssb needs care in design and implementation if reasonable results are going to be achieved. Some readers may question why we should trouble with digital rather than the conventional analogue techniques. At present, in answer to this, one can say only that there is plenty of evidence in other fields of electronics that where tricky or critical systems are involved, a digital system when once set up can continue to work for long periods without further adjustment—a condition not always true of analogue systems. These notes may serve to whet the appetite of the technically inclined. And perhaps

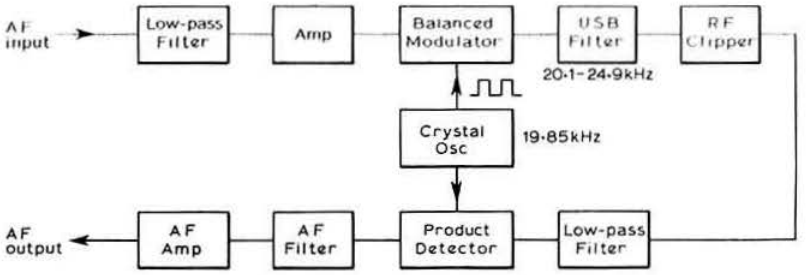


Fig 12. Form of high-quality speech clipper used for "Radio Liberty"

sometime, when all examinations are behind him, G3UEZ might be persuaded to write-up his digital ssb generators in more detail.

"Radio Liberty" speech clipper

Some of the problems involved in the use of speech clippers which produce trapezoidal waveforms were explored in the recent article by HA8WH (*Radio Communication* January 1971). If complex trapezoidal waveforms are to be reproduced without undue distortion, the modulation system has to have linear phase shift between input and output and designed for wider bandwidth than normally required for speech transmission; in addition the modulator power supply needs to be of higher rating in order to handle the extra load.

At the 1970 International Broadcasting Convention, G.Q. Herrick and H. W. Fallis of "Radio Liberty" described a broadcast-type clipper unit which does not result in trapezoidal waveforms yet is claimed to provide the user with the same advantages in allowing the average percentage of modulation to be substantially increased. This design uses the recognized principle of carrying out the clipping at rf rather than af; this means that the harmonics produced in the clipping process are at a sufficiently high frequency to be well outside the basic af spectrum (the problem in clipping at af is that, for example, a 500Hz tone will produce harmonics at 1,000, 1,500, 2,000Hz etc all of which are at audible frequencies). To allow clipping at rf, the audio base band is translated to vlf using a crystal-controlled oscillator and, after clipping and filtering, the signal is again converted back to af using the same oscillator (rather like the GM3-UMW tunable af filter, *ART3* page 85).

A carefully balanced mixer is driven by a square-wave switching waveform derived from a 19·85kHz crystal oscillator and the usb filter has −3dB points at 20·1 and 24·9kHz. The complete unit incorporates 11 transistors, 2 diodes, a zener diode, a silicon bridge rectifier and provides a clipping ratio up to 12:1 (ie if input signal drops 12dB, output drops only 1dB). The system, for a.m. broadcasting applications, has less than one per cent distortion from 70 to 4,500Hz, and is normally used at 6:1 clipping ratio.

All this may seem much more complicated than the pair of clipping diodes and low-pass-filter arrangement commonly employed in vhf a.m. transmitters; but then the distortion is *very* much lower.

MICROWAVES—1,000MHz and up *(Continued from page 609)*

the slots as references. Trying to cut precisely the slots in a 1in square is a much more difficult operation! The walls of the waveguide are best removed by drilling and filing, care being taken to remove the rounded inner corner as this may overlap the slots after assembly. A piece of wood inserted in the guide removes the risk of damaging the opposite face during the drilling operation.

Assembling is straight-forward, as the pieces are self-jigging. Note the obvious point that the septum must be fitted with the correct sense otherwise the coupled rf will emerge from the wrong port. The pieces are clamped together and heated either with a gas flame or on a hot-plate. For this type of work, where the assembly can be thoroughly washed, the author prefers to use solder paint (Entocene or Fryolux) previously spread thinly over the parts to be joined, as this avoids difficulties in feeding inaccessible joints with solder. If this is not available then plain solder with an acid flux (Baker's soldering fluid) may be used. A trick to avoid applying solder over the whole of the device is to feed the solder wire through a glass or stainless-steel tube. Resin-cored solder is less satisfactory in this application as the flux is difficult to remove. After soldering, the assembly should be thoroughly washed and inspected to make sure that the internal joints are soldered well, and any excess solder on the inside should be filed away.

It is hoped to deal with the design and construction of equipment using devices such as these in this column in the near future. However, two examples can be given now. A directional coupler can form the heart of a receiver; an aerial can be connected to one port and a mixer to the opposite end of the waveguide. The local oscillator is connected to the appropriate port on the other arm and the fourth port terminated in a dummy load. A wavemeter, either transmission or absorption, connected between the coupler and either the mixer diode or the local oscillator will provide frequency measurement. A second coupler may be used to feed in calibrating pips.

In constructing a transmitter, one arm of the coupler may be connected between a klystron and an aerial, and a diode detector fitted to the other arm, again via a wavemeter. The detector can then be used as the power indicator essential in setting up the klystron: if a mixer is used in this position, at a later stage its output may be used to control a frequency-locking system.

Reference [1]. T. N. Anderson, *Microwave Journal*, 2, 5, 1959, pp34–38.

FOUR METRES AND DOWN

A monthly account of vhf news compiled by JACK HUM, G5UM*

Same voice, new call

The third-ever amateur to receive a Class B licence, G8AAC, is now G4AGQ (near Barnsley). In the next county G8BGX of Mickleover in Derby has become G4AHN and can now use A1 on 70cm to put a signal into places where A3 could not be resolved. Another top 70-centimentalist, G8AVC, has not allowed the arrival of the all-bands callsign G4AGE to deflect him from the top priority—70cm.

A patient wait brought to G8AJC the new callsign of G4AJC and a chance to increase the contact rate by using the key. "About 50 per cent of QSOs have been on cw", he reports. Active on 2m, 70cm and 23cm from Canterbury, he will be heard on "Four" any moment now.

And in Kettering, Paul Brown did not remain G8EGS for very long. He acquired G4AJE in July. He invites any 2m operator who would care to set up a schedule with Northamptonshire to write to him at 9 Fairfield Road, Isham, Kettering.

Not too devious

It is fine to use frequency modulation on "Two" as an antidote to tvi so long as the other man can understand you. In spite of what has been published in the way of simple modifications to render his receiver "fm ready", it is several chances to one that he will be utilizing slope detection to resolve you on the trusty old i.f. strip—and no problems from the intelligibility point of view if the incoming fm is of reasonable deviation.

There is evidence that some of the fm now going out on "Two" is of decidedly *un*reasonable deviation that approaches the dimensions of a menace to listeners in areas of high amateur population. Because it cannot be resolved except by wideband systems, contacts are sparse, and anyway, say the locals, who wants to talk to a chap putting out stuff like that?

Excessive deviation for these reasons does the deviator no good at all, confounds the terms of his licence by occupying more frequency space than it should, and invites the description of "anti-social" to be attached to what is basically a worthwhile modulation mode.

Tell the over-deviators (if you can get through to them) what they sound like, and where they innocently offend offer whatever help is within your ability to give.

From over the sea

1: ON4ZN: Comment on three current problems with which we in the UK can sympathize comes from ON4ZN, Walter Empsten, who is the VHF Manager for UBA, the Belgian national society.

"I must agree fully," he says, "with the comments by GD2HDZ in *FMD* on the indiscriminate use of vfos". Although the user of a vfo on "Two" since 1957, he switches it in only as a last resort to net on a station not tuning the band. "After or even during the QSO I return to my normal quartz frequency within the Belgian bandplan . . . it is a pity that indisciplined vfo users willingly or in innocence block the frequency of some choice dx they have just worked and in that way prohibit their neighbours from working it also."

Another malpractice on which ON4ZN has definite views was discussed in a recent edition of his UBA *VHF News*: conducting on-the-air tests which could well be—and should be—done on dummy load. We particularly liked the emphasis in the following quote:

"By heaven's sake pse do not run trial tests during contests or known good conditions periods . . . we at least expect a little ham spirit during those very few days."

Thirdly, on technical standards—and here ON4ZN, as a professional labman with Belgian Radio & Television, can speak with special authority—he laments some of the "dirt" distributed on "Two" by "revamped fm gear or newer Japanese transceivers that are not so clean as concerns radiated spectrum as home built gear used to be". With which sentiment British metre-wave men who have heard some of the horrors nearer home will heartily agree.

2: VK3ZBB: Back in Melbourne after a world tour that took in Canada, the USA and three weeks in Britain is VK3ZBB, RSGB member Bob Arnold, carrying home with him memories of Loughborough where he went to school with John Saxton, later to become a world authority on radio propagation and President of RSGB.

The Z callsigns in Australia are broadly equivalent to the Class B G8 calls in the UK, namely, vhf only. "I am only interested in experimentation and have no inclination to work the hf bands" is a Bob Arnold philosophy widely shared by metre-wave men back home. And there is plenty of metre-wave area in VK for the Z-men to do so; for example, "Two" extends from 144 to 148MHz, and in addition to a 30MHz spectrum at 70cm (420-450MHz) there is an interesting band at 576-583MHz, plus similar microwave allocations to those we have in Britain.

Although "Six" (52-54MHz) is available, the proximity of a television station in the state of Victoria precludes its use.

3: 9J2 and 8P6: From 9J2ED (Ed Thompson, City Treasury, Box 252, Lusaka) comes news that the city is the centre of 2m activity in Zambia, with the prospect of more of it in the copperbelt up country.

There is a lively thirst for more information to help get things moving on vhf in the country. "Perhaps some *FMD* readers may be active on the hf bands and be willing to give me advice on modifying equipment," says Ed. "Any sort of encouragement or information I can get on hf would be spread through our radio society newsletter . . . even the most basic advice on modifying 'Rangers' and suchlike would be useful."

* Houghton-on-the-Hill, Leicester LE7 9JJ

Every evening 9J2ED looks for UK stations on 14,090kHz rtty and 14,170kHz ssb, from 1600gmt onwards. This to us sounds like a big chance for the teleprinter specialists to rattle off a few reams of "read it at once" to help the cause of vhf in Zambia.

A few thousand miles to the west in Barbados, 8P6DR (one-time G3RWL and a hefty 2m signal from North London) and 8P6DS (G8AWB) would like to attempt some cross-band 10m to 6m or even 6m to 4m if this were practicable. They are hoping also to equip themselves for earth-moon-earth on 432MHz. Interested UK operators can get in touch with 'DR, Richard Limebear, at Cable and Wireless Ltd, PO Box 614, Bridgetown, Barbados.

. . . and on the sea

Maritime mobile licences are not easily come by, which makes G3UGF/MM a prizeworthy target on "Two". Richard Constantine is radio officer of *Esso Inverness*, a new coastal tanker of 3,000 tons which customarily does the east coast run to Inverness out of Fawley but on occasion touches at EI and GI ports westabout.

Getting the /MM licence was not easy. The specified frequencies to be used were named as 144·108, 144·275, 145·057, 145·3 and 145·8MHz, which is at least a sufficiently wide selection to enable G3UGF/MM to put himself in the appropriate zone nearest to the vessel's course. But there is one particular snag: amateur beams are rarely directed seaward, and in consequence contacts have been few and far between.

Until now the equipment has consisted of a 3/10 series-gate modulated on the four phone channels, but cw preferred and ssb coming along later. "From my listening observations on 2m I have concluded that only cw and ssb are 100 per cent readable regardless of signal strength . . . a.m. and fm don't stand a chance," says 'UGF.

The aerial is a J-Beam 8-element 45ft clear of the water, sited above the vessel's bridge. There is remote motor control from Richard Constantine's cabin two decks below. And, of course, attenuation back to the mainland is minimal.

More about e-m-e

What hopes has the am-in-the-street to receive signals by the earth-moon-earth path? To read of the equipment used—not to mention the supreme patience displayed by operators who specialize in the e-m-e art—is to be persuaded that ". . . this is hardly for me".

Like other more esoteric activities (and vhf itself was one of them 20 years ago) e-m-e techniques will surely come within the purview of increasing numbers as time goes by. A word of encouragement from G3LTF, this country's leading e-m-e exponent, is that W2NFA (who is effectively Peter Blair's counterpart in the USA; the two have had several e-m-e contacts) should be audible ". . . to anyone with a reasonable parametric amplifier and a dish greater than 8ft, providing they can get accurately on frequency 1,296·000 plus or minus 2kHz".

Reporting on e-m-e activity in other countries, 'LTF tells us that in Australia VK2BHL and VK2ALU are nearing completion with moonbounce rigs at Datpo near Sydney; they have a 432MHz set-up comprising a 30ft dish, professionally built, TIXMOS preamp at the focus, circular polarization, and 700W output on 432·000MHz. They should be operational about now, checking for echoes. "The system is somewhat marginal for good copy on 432 but will be worth a try. Liaison is on 14MHz," adds 'LTF.

DX tv in GM

The television channel known as R1 (49·75MHz) has been referred to here several times as representing a useful marker for Sporadic-E propagation. To GM3VTB, Victor Budas of Glasgow, this and other video stations both higher and lower in frequency are resolved sufficiently often to indicate the state of propagation over the whole of the band almost as high as our 70MHz section. The dx is most constant on the lower channels.

Using a Bush TV125 modified to receive 625 negative pictures on Bands 1 and 3, he finds Channel E2 (48·25MHz) especially profitable, steady pictures from Germany, Spain, Portugal, Sweden and Switzerland being so common that several come in together on occasion.

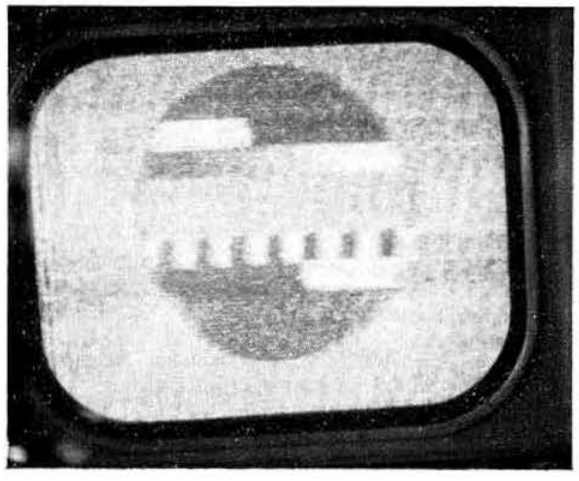
On F4 (65·55MHz) the 819-line positive pictures from ORTF, France, can be resolved simply by a minor twist of the receiver's line hold. But he goes on to report: "Apart from the French sound, which is on a.m., I find great difficulty in resolving the European tv sound which is on fm but is linked to its corresponding vision channel to produce an i.f. of the difference in the two frequencies. I have to inject an rf signal to replace the vision carrier which needs a separation of 6MHz from the sound carrier frequency. The Continental separation is different and does not produce therefore the i.f. necessary to resolve the sound on British television sets."

The above remarkable results achieved in Glasgow had no more than a Channel 3 dipole at a height of 170ft asl behind them; a 4-element Yagi for 49MHz is planned.

Is there, 'VTB goes on to ask, any list of European test cards currently in use? This would greatly help station identification. Perhaps BATC can assist.

* * *

A further comment on the value of tv as an indicator of conditions on the amateur bands comes from Dennis Boniface, BRS27148, of Ripon. He has noted that the emergence of the TF3VHF beacon on "Four" is either accompanied by or preceded by good video from Iceland's television service. Using only a Band 1 vertical dipole at a mere 12ft up, he has identified Stykkisholmur on Channel



BEACON STATIONS

Callsign	Location	Nominal frequency	Emission	Aerial direction
GB3ANG	Angus	145·95MHz	A1	SSE
GB3CTC	Redruth, Cornwall	144·13MHz	A1	ENE
GB3DM	Burnhope, Co Durham	145·975MHz	F1	N/S
GB3GW	Swansea	144·25MHz	A1	ENE
GB3GM	Thurso	70·305MHz	A1	N/S
GB3GM	Thurso	145·995MHz	A1	N/S
GB3GEC	W. London	433·45MHz	F1	N/W
GB3SC	Sutton Coldfield	433·50MHz	F1	N/S
GB3SU	Sheffield (temporary location)	70·695MHz	A1/F1*	Omni
GB3SX	Crowborough Sussex	28·185MHz	A1	E/Omni
GB3SX	Crowborough	70·699MHz	A1	N
GB3VHF	Wrotham, Kent	144·500MHz	F1	NW

* Callsign on F1 continuously, on A1 once a minute. When on A1, F1 is suppressed

E3 (55·25MHz) and Skalafell on E4 (62·25). Receiver is an old Bush TV66 fitted with a 6MHz i.f. amplifier and a transistor tuner.

"Did anyone detect TF3VHF on 2 August?" he asks. "The Icelandic tv was exceptionally good that day."

There is, thinks '27148, a case for extending tv monitoring to the uhf bands, where any increase in the level of distant Group A Channel 21-33 signals might signify a lift on 70cm.

The accompanying picture shows Iceland tv as received in Ripon on 17 July.

* * *

Come to think of it, our own tv stations in the UK are dx to someone, eg to Des Walsh, EI5CD, in Co Tipperary, who reports that a fine uhf colour signal from Caradon Hill in Cornwall is readily resolvable at many locations around the Cork and Waterford coastlines, although gainy aerials such as the J-Beam 4 by MBM46 (ie 184 elements) seem to be mandatory. Reception appears to be tropospheric, adds 'CD, and true to form is poor in wet or windy weather.

* * *

From television at the getting end to television at the giving end: the 70cm video transmissions from Dunstable Downs by G6AFK/T portable have been a great success. At least three tv contacts per session with simultaneous sound and vision at the correct spacing encourage the Dunstable Downs Radio Club to offer video-skeds from the portable site on Thursday evenings. Enquiries to G8AYB/G6AFK/T (QTHR). It is confidently expected that tv contacts well into the Midlands and East Anglia should be possible.

Latest membership list of the DDRC includes seven licensed /T men, almost 5 per cent of the national total.

Contest round-up

Final reminder re VHF/NFD: logs to either G3SEK, 89 Arthur Road, London SW19 7DP, or to G2HIF, 20 Harcourt Road, Wantage, Berks.

* * *

From Norman Horrocks, G2CUZ, details of the annual vhf contest organized by RSGB North West Region:

Overall winner of "G2CIP Shield" and leading station on all bands, fixed section: GD2HDZ with 937pts (and for the second year). Portable leaders: G3WIN/P, 472pts; tops for 4m portable, GW3NWR/P, 321pts; and for 2m portable, GW3AHD/P, 315pts; with 'CUZ himself leading the 70cm portables with 14pts.

The station outside RSGB Region 1 who worked most Region 1 stations was GW8EQH, logging 118pts on 2m.

* * *

First ever 4m Cumulatives begin next month, spread over five Wednesday activity nights 8-10pm clock time. See page 563 last month. And to all microwave men, good weather for hitting the hills on 2-3 October!

* * *

A station to look for specially during the IARU microwave contest will be PA0CJB-PA0MJK/LX operating on the highest point in Luxembourg, 560m asl, with 50W on a calling frequency of 432·09MHz and 25W on 23cm.

First "E" man gets certificate

It took G8EAV, F. D. Johnson of Oldham, less than eight months to secure the necessary 5 plus 30 cards to permit his application for the 144MHz Transmitting Award to be made. Now Certificate No 217 should be on the radio room wall of the first man in the G8E– – callsign block to qualify for this award. His application along with others from G3VNQ (No 216), G8CKX (No 218) and GM8BKE (No 219) were ratified at the last meeting of the Society's VHF Committee.

So was 144MHz Senior No 33, which went to Roger Taylor, G8BBB, and a double distinction for him: he is the first ever Class B licensee to earn the "Two Metre Senior" while already holding the 432MHz Senior Transmitting Certificate. Only three members hold both "Seniors": G3MCS, G3COJ and "Triple B".

Just to round out the picture in respect of Senior Awards we should add that only one holder of the 2m Senior also holds a 4m Senior: he is G5NU, Bill Lord of Reading.

* * *

Unquestionably, more FMD Awards could be claimed if QSL returns were adequate. Says G8DML, Glynne Hughes of Seascale: "I have a few dx counties outstanding before I can apply for an award, and although the stations there asked me for QSLs, which I sent via the bureau followed by a further direct delivery with SAEs, not one out of the six has replied—and each is already an FMD Award holder." And to think that many an operator would give his last-but-one 3/10 for a QSL from Cumberland!

Another point on the awards front is made by G3AHB, Les Coote of Slough. He is within a card or two of his 2m Senior but cannot work the last few remaining remote counties simply because no cw ever comes out of them. He urges expeditionaries to increase their telegraphy sessions, especially when a.m. takers begin to thin out.

Further to the "telegraphy on 2m" theme, on now to . . .

"The dx is always there," says 'RH

Keeping his beam turned north most evenings, G6RH, Bob Holmes of Bexley in Kent, rarely fails to hear the Durham beacon at 200 miles, while nearer, at a mere 150 miles, the two South Lancs brasspounders, G2JT and G6LC, bounce up to S8 at times—though this order of QRK is a bonus on the A1 mode, and much lower levels still find readability staying at R5.

"The dx is always there, but will the northern stations come on cw more often? The band is open more frequently

than they think," adds 'RH. For him the Scottish stations who come up in the top end of "Two" are cut up by North London stations working out of zone with wideband and distorted fm (they clobber the Angus beacon on 145·95). If the remaining GM men still using telegraphy at the top end would transfer to the cw zone, 144·00-144·15MHz, their chances of QRM-free contacts down south would be enhanced.

* * *

Still on the dx front, sadly the chance to work Malta on "Four" has now lapsed with the return of 9H1BL to the UK in mid-August. His latest report via G3VPS of Hailsham rated conditions much down on previous months when the Sporadic-E season was at its height. In spite of this, 'BL pulled in G2DN, G3LVP and G3VPS on 13 July at great strength both on phone and cw. He talked back to them on 14MHz, this between 0900-1130gmt. That evening G3VPS was worked again, and GB3SU was 569. Although 4m appeared to be open for several successive nights, the next big break was 2 August with G3JKV heard on 4m A3 and a remarkable contact established with G3VPS when Peter Lennard, parked in a driveway at Eastbourne, was using only his normal 10W mobile rig and a quarter-wave whip.

Now for further news of "Four" in a slightly different context . . .

High Polish on "Four"

Each evening from 1800-2300gmt during July and August at his Sussex Downs monitoring post, Ron Ham, BRS 15744, kept a watch on Radio Gdansk, the Polish fm broadcasting station, on 70·31MHz, to log the number of meteor pings that impressed its signal on his chart running at ½in/min.

The results will surprise listeners who have not yet listened to Gdansk: frequently the hourly average was above 200, sometimes above 300, and that means a pretty continuous signal from a broadcasting station designed (as fm broadcasters are) to give a localized service.

Observations at Storrington throughout the midsummer months yielded a high incidence of another form of anomalous propagation, Sporadic-E, in our 4m band. Operators on "Four" will have been alerted to many of these by patterning on Band I video reception, and by GB2RS news broadcasts thanks to quick work by Ron Ham in passing on the latest news to HQ.

When both m-s and Sporadic-E are in evidence on 4m at the same time on the Gdansk signal, the problem of sorting out which mode is affecting it takes some doing.

After Oscar-B

Latest news from AMSAT is that Oscar-B, a highly developed package of amateur radio electronics, solar powered, with an anticipated life span of one year, should be ready for launch early next year.

Already its 2m to 10m repeater system has had a quite literal airing in a Cessna which popped about the north-eastern USA taking in signals from 145·9-146·0 and retransmitting them between 29·45 and 29·55MHz, to the delight of hundreds of groundlings participating in the test.

Beyond the next Oscar lies an ambitious project called SYNCART (Synchronous Amateur Radio Transponder) proposed to NASA for inclusion in a launch into earth stationary orbit about 1975. The plan is to use a self-extending 30ft parabola capable of providing high-gain earth coverage in the vhf amateur bands, up frequency on 2m, down frequency on 70cm.

Many of us who watched the superb Apollo 15 television broadcasts and the effortless ease with which the communications links were deployed must have felt that all this made certain aspects of amateur radio seem to be very small beer indeed. Enterprises such as SYNCART should demonstrate that the amateur radio movement *does* have the will to lift its vhf activities from its own backyard, and points the way to what may be commonplace before the decade is out, global dx on the metre wavelengths via satellites.

Your action please on . . .

Next year's VHF/UHF Convention: We enquired here last month whether or not members would like the 1972 VHF/UHF Convention to be a 1½-day affair to allow more time for discussion sessions on the Sunday morning. We had been asked to do this by a number of members. We hinted that unless a strong current of opinion in favour of this innovation began to flow then the traditional arrangement of a one-day event would be adhered to. Judged by the negligible response to the "1½-day" suggestion, everyone seems satisfied with the status quo. So this is your last chance to say "1½ days, please"—and it will need to be said emphatically by one or two hundred members if any change is to be contemplated.

Distance records: The Society's VHF Committee wishes to compile a list of distance records established by operators on all vhf, uhf and shf bands from 4m downwards, and it invites members to submit claims. Only contacts made by "natural" means will be eligible for the tables which it is hoped to publish, ie contacts made via satellites, either natural or artificial, will not count as they come into a special category of their own. Contacts made by m-s, or by Ar and other forms of anomalous propagation may all be included. It is expected that the published table will be constantly changing as new claims are made and increasingly long distances covered. When turning in claims to G5UM please state date, time, frequency, mode, and of course QRB as accurately as you can measure it.

Dutch Callbook: A small quantity of PA0 Callbooks has become available and may be had from G5UM on a first-come first-served basis, at 50p per copy post paid. When sending postal orders *do not fill them in*: it may be necessary to return yours to you if stocks of the book run out.

FMD Certificate claims: Do not send your cards or requests for claim forms to RSGB HQ. Both to G5UM, not forgetting the needful sae.

French balloon goes up

On Sunday 19 September at 1400gmt the French propose to launch a translator balloon, Sonde 4, which will accept signals between 432·05 and 432·35MHz and retransmit them between 145·65 and 145·95MHz

During the flight, F6AFC will transmit via the balloon details of its height and distance from the launch point in eastern France. These will be re-radiated by the balloon transmitter between 145·65 and 145·95MHz.

The balloon is expected to rise to over 60,000ft and to transpond 432 to 145 for about two hours. It should

provide a unique opportunity to make dx contacts for all equipped with 70cm transmitters and 2m receivers. Monitoring of both bands by BRS men will be specially valuable.

Additionally, Sonde 4 will transmit telemetry between 144·8 and 145·2MHz.

Reports to F1NK, Georges Guinard, 15 Route De Villers, 54 Laxou, France.

Gibraltar beacon active

Following the resuscitation of Gibraltar's 4m beacon, several reports have come in that it has been received well in the UK. Although the Sporadic-E season of best reception has waned, ZB2VHF will still be worth looking for in case it should make a fleeting appearance.

For half an hour on 7 August it was up to S7 with G3HBG in Surrey, slowly fading out at 2035gmt. An unusual characteristic was a T6 note, whether due to propagational characteristics or to ac on the carrier is not known. Were any "T6" multipath effects noted by other 70MHz observers?

Here and there

"Heard DJ1KO on 144·005 calling K6MYC on slow cw on 27 June, apparently doing moonbounce tests . . . during a break in the clouds the moon was observed just above the western horizon, but nothing heard of K6MYC!"—G3IPV, Norwich.

* * *

Arthur Owen, G2FUD, who wrote *RTTY—the Easy Way* referred to in July, tells us copies are still available from him at 184 Hale Road, Hale, Cheshire. Present secretary of BARTG is G3VZV, Graham Shirville, 2 Bradford Way, Toddington, Dunstable, Beds.

* * *

"At night rarely find 2m band dead at this lf end . . . had a four-way cw chat for three hours between here and stations in S Wales"—G2JT, Oldham.

* * *

Here is an interesting one for the seventy-centimentalists: for four years at 1830gmt a schedule has been maintained between G3LQR in Suffolk and PA0GDV at The Hague (he is VERON's editor of *VHF Bulletin*). Duplex 2–70 is also a feature.

* * *

"Please continue to plug cw on 2m. It is certainly on the increase, and works up into real gatherings of two-letter calls . . . makes me feel quite young!"—G3JYP.

* * *

"During the contest we had to warn one participating station about misusing fone in the cw-only part of the band. *In the future* we intend *to strictly applicate Region 1 rules.* So any fone working below 144·150 during contests will automatically mean *disqualification without future warning*" —ON4ZN in Belgian *VHF Newsletter* (and the italics are his).

* * *

"You amateurs always seem to have something special on when we call," was the comment of an MPT interference investigator visiting G8EDN of Coventry: the Italians were coming through on "Two" at the time. So 'EDN carried on calling them while the "man from the ministry" checked him out (all was well—no pink ticket).

* * *

". . . a vfo for 2m has its advantages while few people possess one. But if all 2m stations were equipped with them we would be far worse off than we are now. *Must* we follow examples set by the Europeans?"—G3ZKH.

* * *

"Does anyone know a source of nylon nuts and bolts, especially 8BA and 6BA? I have a few, but hardly dare use them as I've no idea where the next will come from . . . and for uhf/shf they're worth their weight in gold"—G2WS (Can anyone help?).

* * *

Lack of 2m activity from normally flourishing Harlow may be explained by announcements of engagement from the following couples: Colin G8AGK and Christina; George G8AOJ and Angela; Brian G8CHC and Pat; Ian G3WMS and Sue; Paul G3NJV and Dot . . . all within a couple of months.

* * *

Devonian G8CBZ reports QSL records lost, evidently from activity by young third harmonic. He will send outstanding cards on request to "Granada", South Furzeham Rd, Brixham.

* * *

EI5CD got his info about the Clegg 22-er (*FMD* July). He now puts out 12W of nbfm on 144·7 and 145·7 into a 6 over 6, and pleads that UK beams be directed westwards more often.

* * *

"Indiscriminate use of *vfos* on 2m is reminiscent of the more antisocial aspects of the hf bands. I could suggest to some users of this device (T9 notes and excellent stability notwithstanding) that they ask, 'Is this channel clear?' before calling CQ. My own preference is for the vxo to be used as a means of sidestepping QRM"—G4AGQ, Barnsley.

A miniaturized history of VHF National Field Day

1962 (for 2m only and held in July): 39 entries, winners Wolverhampton Group, GW3KMT/P.

1963 45 entries, winners Surrey Radio Contact Club G2RD/P-G3ODY/P, using 70, 144 and 432MHz. Three contestants used 1,296MHz.

1964 54 entries, winners Wolverhampton Group in conjunction with Severn Valley ARC, GW3KMT/P-G3SVR/P, using 70, 144, 432 and 1,296MHz. Ten contestants used 1,296MHz.

1965 54 entries, winners The GB2GC Group, using 70, 144, 432 and 1,296MHz. Twelve contestants used 1,296MHz.

1966 57 entries, winners The GB2GC Group, using 70, 144, 432 and 1,296MHz. Fourteen contestants used 1,296MHz.

1967 66 entries, winners The GB2GC Group, using 70, 144, 432 and 1,296MHz. Sixteen contestants used 1,296MHz and one contact was reported on 2,300Mhz.

1968 91 entries, winners Mid-Essex VHF/UHF Contest Group G3VPK/P-G3ORL/P-G3LTF/P, using 70, 144, 432 and 1,296MHz. Twenty contestants used 1,296MHz, three used 2,300MHz and one (G3WZR/P) the 10GHz band.

1969 105 entries, winners Mid-Essex VHF/UHF Contest Group G3VPK/P-G3ORL/P-G3LTF/P, using 70, 144, 432 and 1,296MHz. Twenty-three contestants used 1,296MHz, four used 2,300MHz and one (G3RPE/P) the 10GHz band.

1970 123 entries, winners Mid-Essex VHF/UHF Contest Group G3VPK/P-G3SKT/P-G3LTF/P, using 70, 144, 432 and 1,296MHz. Twenty-four contestants used 1,296MHz.

25 YEARS BACK

". . . 5LL and 5BD still exclusively on 59 have worked another batch of Italians, run a nightly sked with Nottingham and have odd contacts with Liverpool and London"—from "District Notes" (Mid East).

"Interest in 60 continues to grow, and G2AMJ, G3IU, 3PL 4LH, 8IM, 5GX, 6OS, and 2FZX are working regularly. There is already bad QRM at times from radiating super-regens"—from "District Notes" (East Yorkshire), *RSGB Bulletin*, September 1946.

THE MONTH ON THE AIR

A monthly feature by John Allaway, G3FKM*

AS the hours of daylight decrease, the season of the world's major amateur radio contests comes upon us. Rules and results of many of these are reproduced every year in *MOTA* but from comments received from organizers all over the world, and indeed from a study of the results, it is obvious that the interest in these events is abysmally low in the UK. This does not seem to be the trend in other countries and your scribe would be interested to know just *why* British amateurs show so very little interest in contests, dx working, or any other amateur radio activities of an international nature? The impression gained seems to be that it is too much trouble for the average Briton to take part! The Society's own contests are suffering from decreasing participation, and explanations of the reasons for this would be of great value. Are our television programmes really all that superior to those in Germany (for instance) or has the Welfare State knocked all the competitive spirit out of us?

Due to an unfortunate mistake, the information given in June *MOTA* concerning ZL5AX QSLs was not correct. Their correct destination was in fact as given in the February issue—they should be sent to ZL1SV at the address given in *QTH Corner*.

Gordon Pheasant, (43 Station Rd, Great Wyrley, Walsall WS6 6LH, Staffs) would like to offer his services as QSL manager to any station who would like to contact him.

News from overseas

John Oliver, 9J2RO (also G3EJS), has written to say that in spite of his policy of sending out a QSL for every contact he has made since he came on the air from Zambia in 1964, he is finding that not all have reached their destinations. He will be pleased to send a duplicate card to anyone who lets him know that no QSL has arrived via the bureau in six months. Direct cards are answered directly by John or his QSL manager, WA1HAA, even if they have been sent off already via the bureau. WA1HAA took up his duties on 1 February 1971 and queries after that date are most easily dealt with by him. 9J2RO makes a habit of calling and listening for long periods on 28,475 and 28,670kHz.

QSL cards for ZD8CW will be sent out by W2MUM in future. Elliott asks for an sae plus two IRCs from those requiring direct replies, otherwise cards will be sent out via the bureau.

8P6DR (VP2AGA/G3RWL/EI4AP) reports that he managed about 500 QSOs from Antigua before being transferred to Barbados. The 8P6 licence permits the use of 500W input on all bands 160m to 70cm inclusive, and Richard has a seaside QTH where he has a half-wave 160m aerial as well as a G5RV and a G4ZU minibeam with wire elements. As promised, a list of lids is being kept and persistent offenders' calls are passed onto G3JUL who acts as 8P6DR's QSL manager. Three of the worst offences are disregarding selective (directional) calls, breaking in during an established QSO, and not moving off frequency when a contact is over. Richard will be pleased to make skeds and letters should be addressed to Richard Limebear, c/o Cable & Wireless Ltd, PO Box 614, Bridgetown, Barbados.

David Wilcock, G2FKS, the sole operator of 5N2KPT—the station of the Kaduna Polytechnic in Nigeria, returned to his Cambridge QTH for good during August. This means that another 5N2 station will be off the air, at least for the time being, and that the Polytechnic Radio Society has lost its president. That society desperately needs "junk" radio equipment for members to dismantle to enable them to obtain components for constructional projects. David wonders whether there may be any generous manufacturers who would like to help amateur radio and education in a developing country, and he offers to supply more information on request (G. D. K. Wilcock, 19 Cavendish Avenue, Cambridge). He also offers to help anyone contemplating going to Nigeria regarding conditions generally and amateur radio in particular.

Geoff Smith, MP4BHY (ex-MP4QHY), has written to try to clear up some of the misunderstandings which seem to have arisen in connection with amateur activity from Qatar. Geoff says that at the time he applied for his MP4Q licence two and a half years ago it was issued by the British Political Resident in Bahrain. Since then all licences (except for that belonging to MP4QBK—Dave Kane) have been revoked by the Qatar Government and any other call used from there during the last 18 months should be invalid for DXCC purposes. It may be remembered that MP4BHY, MP4BHH and MP4QBK himself ran a dxpedition type operation last year (using the latter's callsign), and it is hoped to repeat the exercise about March 1972. Special efforts are made to work UK stations during these spells, but it seems that the worst QSL return is from UK and most of those who do QSL fail to enclose return postage. Dave, MP4QBK, simply cannot afford to send out 10,000 QSLs per year with postage costs being paid from his own pocket!

Colin McRae, G3WRN, returned to the UK on 17 July following six weeks on the air from Majunga (Malagasy) using the call 5R8AB. His call was a re-issued one and caused some confusion among those who had worked its previous owner. Acquiring a 5R8 call requires considerable preplanning and a good dash of luck, and Colin will be pleased to provide advice to any aspiring 5R8. There will be a slight delay with QSLs but all will be sent out as soon as possible. The address to write to is: C. R. McRae, 9 Portal Close, Barnham, Thetford, Norfolk.

Phil Johnson, G3JPE, has now returned from Gambia where he was on the air as ZD3K. It is hoped to answer all transmitter QSL cards (which were received with SAEs and

*10 Knightlow Road, Birmingham B17 8QB

postage) within the next few months. Phil asks all concerned to be patient and not to send further cards as this will only increase the burden.

John Stratton (ex-ZC4JW) may now be reached at 11 Bondfield Avenue, Northampton, NN2 7RD. He wishes to thank the ZC4s for all the pleasure he had in Cyprus and for a very excellent farewell dinner.

The 10-10 net

Mention of this net in June *MOTA* has brought forth further details of its activities from G3SM, who has been a keen member since 1967. There is the **10-10 Certificate**, to obtain which stations outside the USA need to work five members and then send a list of their calls, time, date and "10-10" numbers to W6LRY, Claud Martin, 3603 Syracuse St, Baldwin Park, Calif, 91706, USA, together with eight IRCs to cover membership and certificate. The certificate enables its holders to take part in special contests etc. In March this year membership was around 2,100. Now that the band is likely to be of limited use for dx work it would seem to be a large open space which could be used for local and semi-local contacts and where there is plenty of room for nice clean a.m. signals. The net monitors 28,800kHz daily (except Sunday).

Top Band news

8P6DR reports contacts with all W districts except 3, 9 and 0, ZD8AY, ZD9BM, PJ2VD, KV4FZ, OA8V, GM3s WDF, YCB and PYs. He transmits on 1,803kHz when looking for Europe, and listens between 1,824 and 1,835kHz (but not on 1,829/30 as there is always QRM there). Reception on 1,803kHz is only possible when the local broadcasting station is not transmitting music, as its second harmonic is on 1,800kHz.

W1BB reports that KL7HEE worked VP8ME on 16 July on two-way ssb. This is probably one of the greatest distances ever covered on the band. WA7ILC, KL7CL, K6DDO and W6KWE all worked ZL1AYG during July, and WA7ILC also worked PY1DVG, VK3XB and VK3QI during the same month. Stew himself is now back on the air with his 265ft high inverted V repaired and in service again after being QRT for most of the 1970/71 season.

The 29 DX Club Newsletter says that George Allen in Perth received signals from G3s IGW and RPB as well as from GW3XJC and two other UK stations not positively identified during the period 2130-2200 on 3 July. Signals were weak but quite readable and the UK stations were happily exchanging reports in the Summer 1·8MHz Contest!

DX news

Interesting signals from the East have been heard and worked recently. AC5PN has been on 14MHz cw in the early afternoon and according to W4PBD (who visited Bhutan) is likely to be genuine. The operator is using the name T. Yonten which was the name of a member of the Bhutan Royal Wireless whom Gus met while in AC5. There *seems* to be some activity from China—BY3NK has been heard on cw and according to stations in Japan has signals which come from the right direction. BY1AB has been worked in the USA but is said not to beam correctly by Japanese observers —however, some HS amateurs say that his signals could come from China. One Far Eastern amateur is said to have

June Buchanan, VK9LA, acts as QSL manager for the club station in Lae, New Guinea. Her husband is Andy, VK9BA, and they emigrated from Scotland to VK9 six years ago

persuaded his nation's embassy in Peking to inquire about amateur radio in BY and the answer was that licences are issued and that two have been given out so far.

Alex Mootou, 3B8DA, is active daily around 14,025kHz between 0200 and 0400, 1100 and 1400, and after 1700. He is willing to make skeds with UK stations (Alex Mootou, 39 Brown Sequard Ave, Vacoas, Mauritius.)

The Micronesian Net meets on Tuesdays, Thursdays and Saturdays between 0800 and 0900 on 14,335kHz and is a collecting place for much Pacific dx.

Unusual prefixes have again been plentiful around the bands. VA2UN was in Montreal and celebrated the 150th Anniversary of the McGill University. WD6WD was the callsign of the ARRL convention at Disneyland in early September. WF7AIR and KQ0NEB were Montana and Nebraska State Fair stations respectively. KC2GMF hailed from the Greater Monmouth County Fair. Outside the USA, 8J1WJ was on from the Boy Scout Jamboree in Japan and 4K2A from Latvia. Nigerian amateurs have applied for permission to use the 5N5 (instead of the 5N2) prefix every October. The Maldive Is have now regularized their callsign pattern and 8Q6AB and 8Q6AC are now the calls of 4S7WA and 4S7YL who operate from there from time to time.

PJ2VD has now left Curacao and returned to the Netherlands where he may now be worked as PA0VDV—all QSLs should be sent to his new address (see *QTH Corner*). A new operator at ZS3AW is asking for QSLs to be sent via DJ7UL. G5GH has pointed out that WA4WTG has never been QSL manager for CR4BC and that cards should be sent direct to the address in *QTH Corner*.

9L1WS has a sked with QSL manager W4LF on 21,050 at 2100 and other times/frequencies are given as follows: 0500-0600, 14,050kHz; 0600-0700, 14,240kHz; 1100-1300, 21,300kHz; 1600-1700, 28,050kHz; 1700-1800, 28,650kHz. At weekends 0800-1100, 21,350kHz, and 1400-1600 on 28,650kHz.

ZL3PO should be on the air again by now from Chatham Is. He will use the callsign ZL3PO/C, and ZL2AFZ will again act as his QSL manager.

9J2TF (G3KEF) will be returning to the UK in late September and all QSLs should be sent via the address given in *QTH Corner*.

KH6EDY on Kure Is is reported to be active again but seems to be operated by a non-dxer. VK3UV/VK9, although using a VK9 suffix, is located in VR4 for DXCC purposes.

ZM7AG is back on the air and has a sked on 14,240kHz at 0400. VR4BS is said to be Bill Rindone, WA6SBO. VR6TC keeps a sked with W5LOG at 2100 on 21,352kHz every Tuesday and it is possible to work him by getting on the list which W5OLG makes before the sked time.

Pirates

The University of Lancaster RS station **G3ZBY** is receiving QSLs for supposed contacts on 160m—a band for which the club has no facilities. **G3WGY** is receiving cards for cw QSOs on the hf bands although he operates on phone only and mostly on vhf. **ZC4JW** reports receiving QSLs from UK stations for 160m contacts and is sorry to have to say that he has never operated on that band, he also finds that very few of the cards for 80m are for genuine contacts. **GW3NSP** has received a batch of QSLs for alleged contacts in 1970. He has been inactive since 1963 and has only just been re-allocated his call, before 1962 he was GI3NSP.

"QSL Manager Directory"

Due to the increased exchange value of IRCs, the price of this useful item has been reduced from 48 to 35 IRCs—£1.50 in the UK. The 68 page 1970/71 issue lists QSL managers of some 4,000 stations and the price includes quarterly supplements. The UK agent is Geoff Watts, 62 Belmore Rd, Norwich, NOR 72 T.

Dxpeditions

Although by now only a memory, the visit to Annobon Is by OH2BH, OH2MM and OH5SE must surely rank as one of the most highly successful dxpeditions ever carried out. The operators of 3C0AN are to be congratulated on the skill and patience which they exercised during the trip. Readers will be sorry to hear that Martii and Willi contracted malaria on the island and spent a period in hospital on their return to Finland but will be pleased to know that both are now fully recovered. The projected trip to Mali Island may take place later.

The visit to Trindade Is (PY0) planned by PY2s EXB, EXD and FCJ will not now take place.

At the time of writing there was no news of further developments in plans to reactivate the Red Sea islands. Transport was proving to be a problem and it is believed that if the August/September plans do not materialize an attempt to travel later with ET3ZU will be made.

Prospects of activity from Mellish Reef seem dim—Larry, K2IXP, is believed to have returned to the USA to join the organization which has now taken over the manufacture of the Signal One transceiver.

According to *Long Skip*, WA5VTU was taking delivery of a 42ft sloop (with sails and engines) in Hong Kong preparatory to starting a one-and-a-half-year cruise around the S. Pacific area. Spratly Is, Minerva Reef, Maria Theresa Reef and Portuguese Timor are mentioned as possible destinations, and INDXA is said to be involved in the planning.

A group of Japanese amateurs may be on the air from Taiwan this autumn.

K9KNW, W9FIU, WA9QCN, W9IGW, HK0BKX, HK0BKW, and HK0AI have tentative plans to visit Baja Nuevo (HK0) this autumn—possibly during September. K4CAH is also reported by *West Coast DX Bulletin* to have a licence for the island and to be interested in going there before the end of the month.

SV0WEE is expecting to operate from Crete for three days in late September. He will be using 15, 20 and 40m.

Darlene, 3B8DK etc, will be in Jordan by now and will be using her JY9DF call.

From 2000 15 September until 0600 22 September there will be continuous operation on various bands 1·8 to 28MHz from Sark. Two stations will be in operation using various callsigns—GC3HZL, GC3VUQ, GC3YCG, GC5ATJ, and that of another GC5 (DJ5PN) whose reciprocal call is not known at the time of writing. Both cw and ssb will be used and 1·8MHz will be covered mainly between 2000 and 0100. All QSOs will be QSLd via the bureau as soon as possible. Skeds may be arranged by contacting G3HZK at 153 Worple Rd, Isleworth, Middlesex (Tel: 01-892-3239). GC5ATJ will continue to be active for another two weeks after 22 September.

Members of the University of Exeter Radio Society will be visiting the small island of Little Cumbrae near to Arran off the West Coast of Scotland during the period 19-25 September. The callsigns in use will be GM3XEU/P, and possibly GM3WZJ/P and GM3YGB/P. The station will be on 160, 80 and 20m, ssb and cw, evenings and most afternoons. Skeds may be arranged by getting in touch with G3WZJ, QTHR.

Awards

The Zone 29 Award

Issued by the WA Division of WIA to those who can produce evidence of two-way communication with 25 different stations in Zone 29 since 1 January 1952. Endorsements will be issued for (*a*) all 25 stations on same band, (*b*) all stations on phone, (*c*) all cw, (*d*) all on phone on same band, and (*e*) all on cw on same band. The award is available to listeners on the same conditions. Zone 29 includes all VK6, VK8 and Christmas Is (VK9). Applicants should send a certified list of QSLs to: The Secretary, WIA (WA Division), Box N1002, GPO, Perth, WA 6001, Australia, together with 10 IRCs, $1(A), or equivalent.

Worked Asian Prefix Award

Issued by TFDXC c/o JA1WPX, for working or hearing different Asian prefixes. No restriction on starting date for QSOs. 20, 40, 60 and 80 prefixes confirmed are Green, Red Silver and Gold classes respectively. Certified list should be sent to JA1WPX, Tadao Shimoichi, 4-12-8 Ebara, Shinagawa, Tokyo 141, Japan, together with seven IRCs. Those who have 100 prefixes confirmed need not send a fee.

The 25th Centenary of the Founding of the Persian Empire Award

Awarded to any licensed amateur who has contacted five different Iranian stations during the period 21 March 1971 to 21 March 1972 (Persian year 1350). Note that EP stations using special prefixes (eg EP2DX using the call 9C9DX) do not count separately from the station's normal call. Any bands/modes may be used and a list of QSOs certified by two other amateurs should be sent (with five IRCs) to: Amateur Radio Society of Iran, Secretary, Box 1000, APO New York, 09205, USA.

Contests

The VK/ZL/Oceania DX Contest 1971
1000 2 October to 1000 3 October (phone).
1000 9 October to 1000 10 October (cw).

All bands. Each QSO with a station in VK or ZL counts two points, with stations in Oceania, other than VK/ZL, one point. QSO exchange consists of RS/T plus serial contact number starting from 001. Final score is total QSO points multiplied by the total number of VK/ZL call areas worked on each band added together. Logs must show date, time (gmt), callsign of station contacted, band, serial number sent and serial number received; and a separate summary sheet giving callsign, name and address (in block letters please!) and details of equipment used should be sent. This sheet should also show QSO points for each band and the call areas worked on it. In the logs each new call area worked should be underlined and a separate sheet must be used for each band. A declaration that all regulations were observed must also be made and signed. Entries may be single- or multi-band and attractive certificates will be awarded to winners in each country. Listeners may take part and should log VK/ZL stations only—they must log date, time, call of station heard, call of station he was working, RS/T of the VK/ZL station heard, and the serial number sent by the VK/ZL station heard, band, points. Scoring is as in the transmitting section. All logs must be posted to reach Federal Contest Committee, WIA, Box N1002, GPO, Perth, WA6001, Australia, before 30 January 1972.

Much delayed results of the **1969 SAC Contest** have been received. **G3TXF** is to be congratulated in being world top score (non-Scandinavian) in the cw multi-operator category, and G3WTV (third), G3TR (sixth) and G3NSY (11th) in the phone single-operator category. UK scores were as follows:

CW section, single-operator—**G3ESF** (3060 points), G2DC (2,304 points), G5GH (2,250 points), G3NSY (1,326 points).

Phone section, single-operator—**G3WTV** (8,338), G3TR (4,599), G3NSY (3,990), **GC5AET** (3,400), **GW3LAD** (1,680), GW3SFC (1,380), GW3LZQ/A (1,376), **GM3VTB** (150), G5ALW (80 points).

The CQ WW DX Contest
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 zone number (the UK is in Zone 14). Contacts between stations in the same continent count one point, in different continents three points. Stations in the entrant's own country may be worked for country or zone credit but do not count for QSO points. There are four classes of entry—single-operator, single- or multi-band, multi-operator single-transmitter, and multi-operator multi-transmitter (these last two are multi-band only). In the multi-transmitter section only one signal per band at any time is permitted. Total score is QSO points multiplied by total number of zones, ARRL and WAE countries worked on each band added together. Separate log sheets should be used for each band and should indicate zones/countries the first time they are worked. They should list 40 QSOs per sheet and a *small* supply is available from G3FKM. Further copies may be made up or may be obtained from *CQ* by sending an sae and IRCs. Summary sheets are also available from your scribe. Winners in each country receive certificates, and over 25 trophies are awarded to winners of specified parts of the contest. Logs go to: CQ WW DX Contest, 14 Vanderventer Ave, Port Washington, LI, NY, 11050, USA. Phone logs must be postmarked not later than 1 December, cw logs not later than 15 January.

Dr Jack London, K2JVA, received the MARCO Certificate of Merit on behalf of Ted Newland, G3TMN, from K1EEG, President of MARCO, at their annual meeting in Atlantic City in June

Guatemala 150th Anniversary of Independence Contest
0000 25 September to 2400 26 September.
All bands 10 to 80m, phone only. Single-operator, single- or multi-band. Multi-operator both single- or multi-transmitter. Exchanges consist of RS plus QSO number (starting from 001). QSOs with TG count five points, with other Central Americans three points and with others one point. Multiplier is total TG call areas plus DXCC countries worked on each band totalled together. QSOs with TG0AA count as 20 QSO points and an extra multiplier. Entries should be sent to: CRAG, PO Box 115 Guatemala City, Guatemala, not later than 26 October and should be accompanied by 10 IRCs or $1.

Congratulations to **G3LNS** and **G3HCT** who are UK winners of the 1971 Bermuda Contest.

Band reports

Most readers seem to have been finding conditions rather indifferent, and from the sunspot predictions it is clear that we are now entering a period when dx signals will have to be searched for and when the lf bands will be coming into their own once more.

Many thanks to all correspondents and especially to the following: G2HKU, G3HB, G3AAE, G3GVV, G3UKH, G3YWX, G5JL, G6GH, G8VG, BRS2098, BRS17567, BRS30231, BRS32669, A6966, A7056 and A7082.

1971 Countries Table

	1·8MHz	3·5MHz	7MHz	14MHz	21MHz	28MHz	Total
G3YHB	—	9	24	86	91	29	239
G8VG	1	17	38	40	60	26	182
G3YWX	—	12	18	70	22	—	122
BRS27263	—	87	67	185	135	92	566
BRS27880	1	36	40	87	81	39	284
BRS30694	5	9	17	69	60	35	195
A7511	2	36	13	9	15	—	75

QTH Corner

AC5PN	T. Yontan, PO Thimphu, Bhutan.
C31DN	DJ9ON, Dieter Messer, Redtenbacherstr 23, 85 Nuernberg, Germany.
C31DZ	G5YC, Imperial College RS, Imperial College Electrical Engineering Building, Prince Consort Rd, London SW7.
CR4BC	Julio Vera Cruz, Box 36, Mindelo, Cape Verde Is.
F0CH/FC	HB9TL, J. Laib, Einfangstr. 39, CH 8580 Amriswil, TG, Switzerland.
FG7AF	Yves Reignard, 221 Route de Chauvel, Abymes, Guadeloupe.
FM7AG	Donald Scotte, Pointe des Sables, BP 619 Fort de France, Martinique.
FM7AF	Robert Le Joliff, Pointe des Pointes, BP 619 Fort de France, Martinique.
FM7AI	Jacky Coutin, Pointe des Sables, BP 619 Fort de France, Martinique.
FO8BQ	via WA6MWG, 4040 Via Opata, Palos Verde Est, Calif, 90274, USA.
FP0CA	via K2OJD, 32 High Ridge Drive, Dvr, NJ, 07801, USA.
FR7AM/E	BP 178, St Denis, Reunion Is.
HC8GS	W5GTW, 2721 Eton, New Orleans, La, 70114, USA.
JY9FB / JY9YL	W3EMH, William Frisbie, W.Oak St. Rahns, Pa, 19426, USA.
W6DDM/KB6	Box 160, APO San Francisco, Cal, 96401, USA.
PJ2VD	J. v.d.Velde, Torenzicht 67, Eemnes, Holland.
PJ8KG	DJ9ZB, Franz Langner, Carl Kistner Str. 19, 78 Freiburg, Germany.
SV0WLL	Box 1134, APO, New York, NY, 09291, USA.
VA2UN	via DOTM, Box 7388, Newark, NJ, 07107, USA.
VP2MAA	VE3GCO, G. V. Hammond, RR4, Main St, Atwood, Ont, Canada.
VP5KG/P	DJ9ZB (see PJ8KG).
VQ9XX	Box 193, Mahe, Seychelles.
VR4BS	Box 238, Lake Oswego, Ore, USA.
VU2HLU	W0PAH, 444 Westview Dr, Manhattan, Kansas, 66502, USA.
VU2IRA	Jinny Beyer, 55 Lodi Estate, New Delhi, India.
YA1OS	via SM5BGK, Gary Wikstrom, Orrstigen 36, 15025 Ronninge, Sweden.
ZD3K	Phil Johnson, G3JPE, "Camels", Annscroft, Shrewsbury, Shropshire.
ZD8MG	K9FYD, Milton Green, 1927 Mulford Rd S, Rckfd, Ill, 61108, USA.
ZL5AX	via N. Hardy, ZL1SV, 17 Tawa Cresc, Manurewa, Auckland, New Zealand.
7Q7AA	now via K4CDZ, F. Wayne Ashworth, RFD 2-Box 353, Lewisville, NC, 27023, USA.
5Z4MO	via G3YWP, "Sycamore", Lower Lane, Freckleton, Preston, Lancs PR4 1HJ.
8J1WJ	via JARL.
9J2TF	via A. Whitmore, 7 Fair Isle Drive, Glendale, Nuneaton, Warwicks.

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

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

1·8MHz. 1100 PA0PN.

3·5MHz. 0100 VE0MD, VOs. **0200** EP2BW, *9F3USA*. **0500** ZL4JF/A. **0600** ZL1BKR, ZL3LE. **2000** HB0XTH (QSL DJ9MH). **2100** DU1FH, YA1OS, ZC4IK, 3V8ZK (QSL F5ZK), 9M2RI, 9V1QI. **2200** FP8CT, JY1, PY7AF, 9Q5BG.

7MHz. 0000 A YV net led by YV3UF meets on 7,084kHz and is looking for stations in GC, GD, GM and GW. **0100** CE3AQW, OB8V. **0500** *CM2AA, PJ8KG, ZE3BL, ZL4JF/A, ZP5AQ*. **0600** *CX1AA, FP0BG, HI8LC*, PYs, VKs, ZLs. **0700** PZ1AV, VKs, VK9ES (TNG). **0800** *HB0XTU* (QSL DL1GK), **1200** EI2VEM (trimaran *Chimaru* in port). **1700** *OH0MA*. **1800** *UL7CB*. **1900** *C31BL*. **2000** *JX2HK*, VS9MT. **2100** VK3MR, *9E3USA*. **2200** *CE8AA*.

14MHz. 0500 *K4BZN/VP7*. **0600** *CE1LW, HR2GK*, VK8CW. **0700** *FO8BQ*, KH6, KJ6CF, KS6DT, VR6TC, W6/7, ZK1CD. **1500** FR7AM/E, *9V1OK*. **1600** VS5CB, YB2AY. **1700** 9M8OEA. **1800** JT1AI, *TJ1AW*. **1900** AP2KS, F0US/FC (W1PRT), 7X7MD, 9K2AL/AM. **2000** *G6ZY/CN/M*, JY9XL. **2100** JY1/Portable HZ, JY9s AL, HF, MA, SA. **2200** DU3ZAE, VP1BH, VP2MA. **2300** VQ9YL.

21MHz. 0900 JAs. VS9MT. **1000** 5N2AAN. **1100** KR8IU, *VP9BK*, 9Q5ITU. **1300** 9M8s OEA/SPD (QSL Box 795, Kuching, Sarawak). **1400** ZD8KO, 9V1QH. **1500** LG5LG (QSL LA4YF), *VP9BK*, 9M2BQ. **1600** *ZD8CW*. **1800** ZS3KC. **1900** LU1ZAB *VQ9R*, 5U7AS, 5X5NA, 9L1WS. **2000** PJ0DX (QSL K3NPV), VP2MO, ZD8D. **2100** OA6CA/7, VQ9R. **2200** VB1MSA, VP9GE.

28MHz. 1000 *ZE1CR*. **1400** W5ILR/TF. **1600** 5H3LV, 7Q7RM, 9G1GY. **1800** CX3BBA, LU2DEK.

Many thanks to the authors of the following publications for supplying them and for items reproduced: **CARS Newsletter** (*ZC4RS*), the **West Coast DX Bulletin** (*WA6AUD*), the **Ex-G Radio Club Bulletin** (*W3HQO*), **DX'press** (*PA0TO*), **DX News Sheet** (*Geoff Watts*), the **29 DX Club Newsletter** (*VK6PG*), **QUAX** (*G3DME*), the **DX'ers Magazine** (*W4BPD*) **NARS Newsletter** (*5N2ABG*), and **Long Skip** (*Nick Sawchuk*).

Please send all items for **October** issue **to reach G3FKM** on later than **13 September,** for **November** issue by **11 October,** and for **December** issue by **15 November.**

Propagation Predictions

While the F2 MUFs are relatively low during June and August, they begin to increase again slowly during September. For this reason dx conditions on the hf bands (28 and 21MHz) will improve steadily during the month to reach a maximum during October/November.

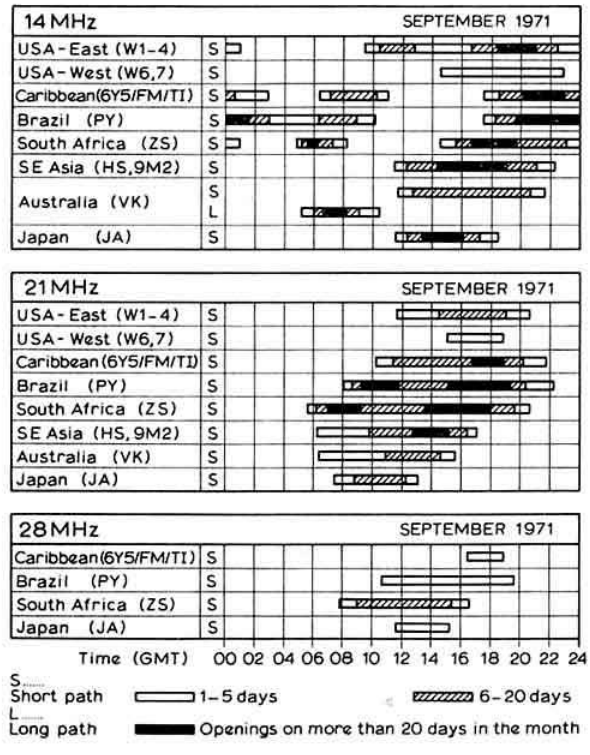
On **28MHz** this improvement will only be very gradual and become more noticeable towards the end of the month. The seasonal short-skip condition on 28 as well as on 21MHz should end this month.

On **21MHz** conditions for traffic with North and Central America as well as Japan and Australia should be improved compared to last month, being more noticeable on this band towards the end of the month. In the early part of the month it will not be possible to reach all continents with certainty.

With the coming of autumn the F2 MUFs will increase in daytime, but fall at night. For this reason dx conditions on **14MHz** will deteriorate, especially during the latter half of the night towards the end of the month.

Local contacts will be possible over greater distances on **7** and **3·5MHz** in daytime. With the approach of winter the dx opportunities on **7MHz** will increase, when the greater part of the transmission path lies in darkness and local QRM permits. Local traffic on **3·5MHz** will often be interrupted by the dead zone during the second half of the night during autumn and winter.

The provisional sunspot number for July 1971 was 81·7 with activity distributed reasonably evenly throughout the month. July 3, 19, 24 and 25 showed daily figures greater than 100. The predicted smoothed sunspot numbers for November, December and January 1972 are 56, 54 and 52 respectively.



THE SPACE CONFERENCE

World Administrative Radio Conference for Space Telecommunication

Geneva, 1971

(Part 1)

THE conference was convened by a decision in 1969 of the Administrative Council of the International Telecommunication Union. Provision was made for a conference commencing on 7 June 1971 for a duration of six weeks. The agenda of the conference was based on the substantial progress in the field of space telecommunication achieved since the 1963 conference.

In June 1970 invitations were sent to all members of the ITU. Subsequently Fiji, the Republic of Equatorial Guinea and Swaziland acceeded to the Convention of the ITU and invitations were sent to these new members. On 1 June 1971 membership of the ITU comprised 140 countries.

Voting rights

For a country to have full voting rights at an ITU conference, it is necessary that the Montreux Convention shall have been signed and also that subsequent ratification of the convention shall have been made. At the commencement of the conference the following countries did not have the right to vote:

Belgium	Honduras
Chile	Liberia
Cyprus	Mongolian People's Republic
Colombia	Panama
Costa Rica	Philippines
El Salvador	Sierra Leone
Ghana	Sudan
Guatemala	Uruguay
Haiti	Yemen

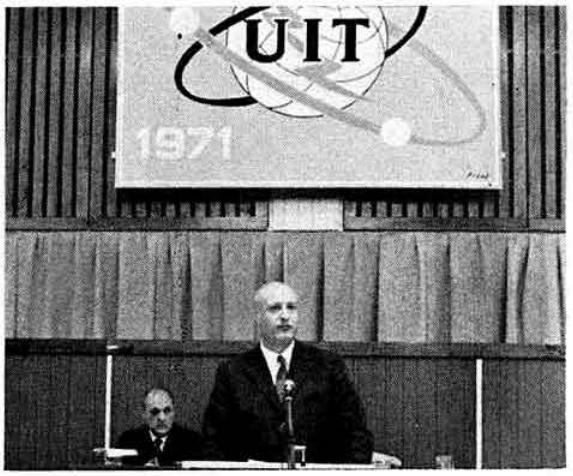
After the commencement of the conference Cyprus, Uruguay and Belgium ratified the Montreux Convention and consequently acquired voting rights.

Opening

The conference was opened on 7 June in the Palais des Expositions, Geneva, with speeches from Mr Roger Bonvin, Federal Councillor, Chief of the Department of Transport, Communications and Power of Switzerland; Mr Candau, Director-General of the World Health Organization, who represented the Secretary-General of the United Nations; and the Secretary-General of the ITU, Monsieur M. Mili, gave the final address at the inaugural meeting. At the first plenary meeting of the conference, Mr Gunnar Pedersen, Director-General of the Posts and Telegraphs of Denmark, was elected conference chairman. Mr A. Badalov, Deputy Minister of Telecommunications of the USSR, and Mr R. C. Tyson, Ambassador of the USA, were elected conference vice-chairmen.

Work of the conference

At the first plenary meeting the delegates constituted the conference committees to which they elected the following chairmen and vice-chairmen:



The Secretary-General of the ITU addressing the opening session of the conference

Committee 1: **Steering Committee**
(Composed of the chairman and vice-chairmen of the conference and the chairmen and vice-chairmen of the committees).

Committee 2: **Credentials Committee**
Chairman: C. L. Martinez (Venezuela).
Vice-chairman: N. P. Kamga (Cameroon).

Committee 3: **Budget Control Committee**
Chairman: L. Constantinescu (Roumania).
Vice-chairman: A. Zaidan (Saudi Arabia).

Committee 4: **Technical Committee**
Chairman: E. Sandbach (Australia).
Vice-chairman: J. Hernandez (Mexico).

Committee 5: **Allocation Committee**
Chairman: H. A. Kieffer (Switzerland).
Vice-chairman: J. Marsicek (Czechoslovakia).

Committee 6: **Regulations Committee**
Chairman: S. H. Butler (Liberia).
Vice-chairman: M. K. Basu (India).

Committee 7: **Editorial Committee**
Chairman: F. Job (France).
Vice-chairmen: D. Baptiste (United Kingdom), B. A. Duran (Spain).

Finally the conference admitted the representatives of 26 international organizations as observers. One of the organizations so admitted was the International Amateur Radio Union.

In order to speed the work on the very full agenda of the conference each of the main committees was split up into smaller working groups. Proposals concerning the amateur service appeared on the agenda of Committee 5 and this work was subsequently assigned to Working Group 5C. The structure of the working groups of Committee 5 were as follows:

5 Ad hoc group: **Definitions**
Chairman: A. Petti (Italy).

Delegates to the Space Conference in session. In the foreground is the British delegation with Dr J. A. Saxton, Immediate Past-President of RSGB, at bottom right

Working Group 5A: Communication satellite service
Chairman: L. C. Bahiana (Brazil).

Working Group 5B: Space research service, radio astronomy service, telemetry, telecommand, tracking
Chairman: B. Desta (Ethiopia).

Working Group 5C: Meteorological—satellite service, earth resources satellites (ERS), standard frequency and time signals, amateur service
Chairman: K. Olms (Federal Republic of Germany).

Working Group 5D: Mobile services and radio determination
Chairman: M. Chef (France).

Working Group 5E: Broadcasting satellite service
Chairman: R. Galic (Yugoslavia).

Working Group 5C first met on 14 June and considered the method of dealing with the proposals concerning the four services assigned to the group. The second meeting of the group was devoted solely to the consideration of proposals concerning the amateur service.

These proposals were published as a separate conference document embodying proposals from the following countries: Argentina, Australia, Belgium, Canada, Federal Republic of Germany, France, Greece, Netherlands, New Zealand, United Kingdom and the United States of America. Subsequent proposals were received from Cuba, Mexico and the USSR. The later proposals were of a general nature rather than the detailed proposals that had been submitted before the start of the conference.

The proposals concerning the amateur service were collated in conference document DT 115 and these were considered at the first meeting of Working Group 5C on 14 June. Further meetings devoted to the amateur service proposals were held on 16 and 17 June, at which latter meeting consideration of the amateur service proposals was concluded. The decisions of the group were reported to Committee 5 in documents DT/30 and DT/47.

These decisions were:

1. There was agreement to the introduction of a footnote (211A) which read as follows:

   "In the bands 7,000-7,100kc/s, 14,000-14,250kc/s, 21,000-21,450kc/s, 28-29·7Mc/s and 144-146Mc/s space radiocommunication techniques may be used by the amateur service".

   The existing footnote concerning the 144-146MHz band was deleted.
2. The working group decided against the use of space techniques by the amateur service in the regional bands 50-54, 146-148 and 220-225MHz.
3. The working group reported two differing opinions concerning the use of space techniques in the shared band 420-450MHz. Some delegates were against the introduction of space techniques in this band and other delegates could accept a reduced portion of the band in which the use of space techniques could be permitted, subject to a footnote providing for non-interference and the cessation of emissions from amateur satellites, if required.
4. By a considerable majority the working group decided against the use of space techniques in the amateur bands at 1,215, 2,300, 3,300, 5,650, and 10,000MHz.
5. It was decided by the working group to allocate the band 24·0—24·050GHz exclusively on a world wide basis to the amateur service and to add the amateur service as a secondary service in the segment 24·05–24·25GHz. In the amateur exclusive portion the following footnote was added "space communications techniques may be used by the amateur service in this band".

During the period between the end of the meetings of Working Group 5C and the submission of the conclusions to a plenary meeting of Committee 5C, Sweden prepared a proposal, contained in document 244, which envisaged the allocation of 432-434·25MHz to the maritime mobile service for downlink purposes when using space techniques. The proposal was made on the basis that this segment would be world-wide exclusive to the maritime mobile service, and all other users, including the amateur service, would not in future have the use of these frequencies. After considerable discussion in the working group this proposal was rejected.

Concurrently with the working group meetings considering frequency allocations, other working groups were dealing with allied matters. Working Group 5 ad hoc made a proposal to Committee 5, which was accepted, that a new definition 84ATA, should be added to the regulations. This is: *Amateur-satellite service: a radiocommunication service using space stations on earth satellites for the same purpose as those of the amateur service.* This definition replaced the phrases previously used, such as space communication

techniques, and established the existence of the service for the future.

The decisions of Working Group 5C against the amateur service were brought to a plenary meeting of Committee 5 on 6 July. The proposals concerning the amateur exclusive world-wide bands between 7 and 146MHz were accepted but the proposals for the higher frequency bands were again rejected. The decision against 420 to 450MHz was by 31 votes to 25 with 9 abstentions, and against 1,215MHz and higher bands (taken as a block proposal) by 46 votes to 18 with 7 abstentions. Several countries, including the UK, Italy and New Zealand, reserved the right to again raise these proposals in the plenary session of the conference.

The position at this time after two rejections was that there were no facilities for amateur space communication between 146MHz and 24GHz.

Due to the extremely large input of documents to the printing service of the conference, the appearance of the papers for the approval of the final plenary meetings was considerably delayed. Final reconsideration of the proposals affecting the amateur service was provided by a specially modified agenda for the conference plenary meeting held on the morning of 15 July. The agenda called for consideration of proposals affecting the following frequencies: 435-438 MHz, 5,650-5,670MHz, 1,215-1,230MHz and 10,350-10,400 MHz. After the rejection of the original proposals to allow space communication in the band 430-440MHz, the UK submitted conference document 315 which set out the case for an amateur satellite allocation in the segment 435-438MHz. This document is reproduced as Appendix 2 to this report. The proposal was introduced by Mr D. E. Baptiste, head of the UK delegation, and was supported by statements from a number of delegations including the Philippines, Saudi Arabia and Uganda. After considerable discussion the proposition was put to the vote with the result: For, 63; Against, 3; Abstentions, 14. The three delegations who voted against the proposal were Indonesia, Iraq and Iran.

In order to support the proposals for amateur space activities, Italy prepared conference document 342 which proposed segments in the 5,650, 1,215 and 10,000MHz amateur bands. After an introduction by Mr A. Petti, deputy head of the Italian delegation, the proposal was submitted for discussion and it was agreed that each of the three bands would be considered separately. Initial comments indicated opposition to the 5,650MHz proposal following comments from the delegations of France, Sweden and USSR. An amendment by Greece to divide the space frequency into two 10MHz segments was adopted and a vote on the original Italian proposal, as amended, gave the result: For, 25; Against, 42; Abstentions, 9.

The next band to receive consideration was 23cm, where a segment of 15MHz between 1,215 and 1,230MHz had been prepared for the amateur satellite service. This proposal was defeated by 42 votes to 12 with 13 abstentions.

There was considerable discussion concerning the proposal to allocate the segment 10,350–10,400MHz to the amateur satellite service but opposition was again provided by several of the West European members of CEPT, some African countries and the socialist bloc. Eventually the proposal was defeated by 36 votes to 30 with 7 abstentions.

The discussions concerning the amateur satellite frequencies had occupied the first part of the eighth plenary meeting of the conference.

Consequent upon the adoption of the proposal to allocate 435-438MHz to the amateur satellite service, the following footnote was included in Article 5 of the Radio Regulations:

> "320A. In the band 435-438MHz, the Amateur Satellite Service may be authorized, on condition that harmful interference shall not be caused to other services operating in accordance with the Table of Frequency Allocations. Administrations authorizing such use shall ensure that any harmful interference caused by emissions from amateur satellites is immediately eliminated in accordance with the provisions of No. 1567A".

Rule 1567A will form part of Article 41 of the Radio Regulations which contain a number of provisions applying to the amateur service. The text of this rule is:

> "Space stations in the Amateur Service operating in bands shared with other services shall be fitted with appropriate devices for controlling emissions in the event that harmful interference is reported in accordance with the procedure laid down in Article 15. Administrations authorizing such space stations shall inform the IFRB and shall ensure that sufficient ground command stations are established before launch to guarantee that any harmful interference that might be reported can be terminated by the authorizing Administration".

The decisions concerning amateur frequencies were subsequently ratified during plenary meetings held in the last week of the conference. No further alterations were made and the final position is that the amateur satellite service, previously confined to 144-146MHz, is now allocated the following bands:

7,000 to	7,100kHz
14,000 to	14,250kHz
21,000 to	21,450kHz
28,000 to	29,700kHz
144 to	146MHz
435 to	438MHz
24·0 to	24·05GHz

This constitutes a factual record of the events affecting the amateur service during the WARC-ST. No mention has been made of the background to the decisions nor of the continual work and lobbying on behalf of the amateur service that continued throughout the conference. The second part of this article will endeavour to provide this information.

G2BVN

APPENDIX 1

List of member countries of the ITU. Those marked with an asterisk were represented at the WARC-ST.

Afghanistan	*Ceylon	*Finland
*Albania	Chad	*France
*Algeria	*Chile	*French Overseas Territories
*Argentina	*China	*Gabon
*Australia	*Colombia	*Germany, Fed. Rep.
*Austria	*Congo (Kinshasa)	*Ghana
Barbados	Congo (Brazzaville)	*Greece
*Belgium	*Costa Rica	Guatemala
*Bielorussia	*Cuba	Guinea
Bolivia	*Cyprus	Guyana
Botswana	*Czechoslovakia	Haiti
*Brazil	Dahomey	Honduras
*Bulgaria	*Denmark	Hungary
Burma	Ecuador	*Iceland
Burundi	El Salvador	*India
*Cameroon	*Equatorial Guinea	*Indonesia
*Canada	*Ethiopia	*Iran
*C. African Rep.	Fiji	

*Iraq
*Ireland
*Israel
*Italy
*Ivory Coast
*Jamaica
*Japan
*Jordan
*Kenya
Khmer Rep.
*Korea
*Kuwait
Laos
Lebanon
Lesotho
*Liberia
*Libya
*Liechtenstein
*Luxembourg
*Malaysia
Malawi
Maldives
*Madagascar
*Mali
Malta
Mauritius
*Mauretania
*Mexico
*Monaco
Mongolia
*Morocco
Nauru
Nepal
*Netherlands
*New Zealand
*Nicaragua
*Niger
*Nigeria
*Norway
*Pakistan
Panama
*Paraguay
*Peru
*Philippines
*Poland
*Portugal
Portuguese Overseas Provinces
Rhodesia
*Roumania
*Rwanda
*Saudi Arabia
*Senegal
Sierra Leone
*Singapore
Somalia
*South Africa
*Spain
Spanish Provinces in Africa
Sudan
*Sweden
*Switzerland
Swaziland
*Syria
*Tanzania
*Thailand
*Togo
Trinidad and Tobago
*Tunisia
*Turkey
*Uganda
*Ukraine
*United Arab Rep.
*United Kingdom
*UK Overseas Territories
*United States of America
*USA Overseas Territories
Upper Volta
*USSR
*Uruguay
*Vatican
*Venezuela
*Viet-Nam
Yemen Arab Rep.
Yemen (Aden)
*Yugoslavia
Zambia

APPENDIX 2

Conference document 315 submitted by the United Kingdom after the conference had rejected all proposals for amateur space communication between 146 MHz and 24GHz.

UNITED KINGDOM

Proposed Amendments to Article 5 of the Radio Regulations

The proposals coming before the plenary meeting make provisions for the Amateur Satellite Service in a number of bands allocated exclusively to that service but do not provide for any use of space techniques in the region of the spectrum lying between 146MHz and 24GHz. The United Kingdom considers that the Amateur Satellite Service needs to have access to this part of the spectrum and that this is practicable in the bands the amateurs share with radiolocation, on a secondary basis. This was reflected in the proposals brought to this conference, in which safeguards were included as a precaution against any interference by the Amateur Satellite Service.

From the very first days of wireless experimentation at the turn of the century, amateurs have contributed to the advancement of the art of radio communication. Initially relegated to the "worthless" bands below 200 metres, in the early 1920s amateurs were responsible for the discovery of the real value of those high frequencies for long-distance communication. Nor is their interest in space phenomena new; in 1936 an amateur built the first radio telescope and received radio noise of extra-terrestrial origin. Inspired by the historic 1957 launch of the first earth satellite, and facilitated by advance technical data published in the Soviet amateur magazine *Radio*, amateurs around the world in the very first hours monitored the 20 and 40MHz transmissions and provided many eager scientists with some of the first orbital data. Five "OSCAR"amateur satellites, the first in 1961, have been placed in orbit, as additional packages to basic launch missions, for the purposes of experimentation and self-training in space communications techniques. Amateurs in more than 25 countries have participated in monitoring, tracking and reporting data. The use of voluntary services by thousands of individuals on a world-wide basis provides a service to humanity in the advancement of scientific knowledge that cannot be matched by any single country.

Of particular importance to the Amateur Satellite Service is the band 420-450MHz. At the fourth meeting of Committee 5 on 6 July, when dealing with the first report of Working Group 5C, a majority voted against approving the use by amateurs of space techniques in the band 420-450MHz. However, as United Kingdom pointed out at the time, it appeared that no special or separate attention was given to the proposal under the same heading in the Working Group Report for a compromise arrangement whereby amateur space techniques could be permitted in a small section of the band, namely 435-438MHz. This compromise, first proposed by Switzerland, received considerable support at working group level (Third meeting Working Group 5C of 17 June). The United Kingdom considers this provides the possibility of unanimous agreement and accordingly proposes that amateur space techniques be approved in a narrow portion of the existing band. by means of a footnote, 320A, reading:

"In the band 435-438MHz, the Amateur Satellite Service may be authorized, on condition that harmful interference shall not be caused to other services operating in accordance with the Table of Frequency Allocations. Administrations authorizing such use shall ensure that any harmful interference caused by emissions from amateur satellites is immediately eliminated".

The attention of Administrations is also drawn to Document No. 259, the fourth report of Working Group 4E to Committee 4, covering an Addition to Article 41 of the Radio Regulations:

"ADD 1567 bis 5 bis. Space stations in the Amateur Service shall be fitted with appropriate devices for controlling emissions in the event that harmful interference is reported in accordance with the procedure laid down in Article 15. Administrations authorizing such space stations shall inform the IFRB and shall ensure that sufficient ground command stations are established before launch to guarantee that any harmful interference that might be reported can be terminated by the authorizing Administration."

APPENDIX 3

Conference document 342 submitted by Italy.

ITALY

Proposals concerning the allocation of small bands to the Amateur Satellite Service between 1 and 10·5GHz.

At the fourth meeting of Committee 5, when proposals for the Amateur Satellite Service came up in the working group reports, a majority voted against any provision for this Service between the exclusive amateur bands at 144MHz and that proposed at 24GHz. When dealing with the possibility of amateur space operation in the shared bands in this part of the spectrum, it was decided to deal with all bands together and on this basis no provision for amateur space operations was made. Italy pointed out that the study of these bands on a separate, more detailed approach might well yield small bands that would not inconvenience those delegations opposed to general sharing. We consider that this has not been adequately studied at this conference.

This matter is raised at this stage of the conference in the belief that to be effective in their operations of experimentation and self-training the amateurs need at least some possibility of operating at representative parts of the spectrum, to give them wide scope.

Accordingly, Italy proposes that small portions of three bands be allocated for amateur space techniques and the exact locations of these small bands are chosen following discussions with some other delegations as ones that are eminently suitable for this purpose.

Proposal A

In the band 5,650-5,925Mc/s, add a footnote:

"The band 5,650-5, 670Mc/s is also allocated to the Amateur Satellite Service on a secondary basis".

Coming between the provisions for communications satellites in the 4,000 and 6,000Mc/s parts of the spectrum, this would give amateurs the opportunity of developing simplified and small earth stations and contributing in design techniques.

Proposal B

In the band 1,215-1,300Mc/s, add a footnote:

"The band 1,215-1,230Mc/s is also allocated to the Amateur Satellite Service on a secondary basis".

This is in a part of the spectrum in which attenuation of signals passing through the ionosphere is significantly less than at lower frequencies and is accordingly of special use and interest to amateur propagation studies.

Proposal C

In the band 10,000-10,500Mc/s, add a footnote:

"The band 10,350-10,400Mc/s is also allocated to the Amateur Satellite Service on a secondary basis."

This is regarded as a useful intermediate band for developing millimeter wave techniques and giving experience between the lower frequencies and the proposed provisions at 24Gc/s.

(To be continued)

MOBILE RALLY NEWS

RSGB Woburn Abbey Rally

A small part of the car park at the Woburn Rally with the Versatower and marquee in the background
Photo: G3GJW

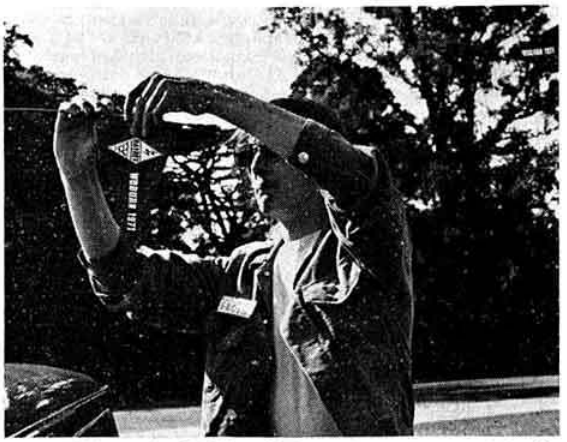
Yet again, the RSGB Woburn Abbey Rally was blessed with good weather. This year's event, the 15th, attracted an estimated attendance of 2,500, the largest on record, and there was a record number of 25 trade stands.

One feature of this year's event was the participation of Raynet. It had a marquee for the reception of Raynet members from all over the country, and where various types of equipment used by them were displayed. Main exhibit of the display was the Raynet communications caravan from Manchester which fulfilled a very useful function by providing 4m talk-in.

Dunstable Downs Television Society was represented this year and gave us some excellent programmes from mobile and portable tv stations located at Dunstable Downs; a feature which was of great interest to all.

Talk-in facilities on 2m and 160m were provided by the Hatfield Club, which again worked very efficiently. By courtesy of Strumech Engineering Ltd a Versatower system was made available which gave the talk-in stations a head start, resulting in some of the best talk-in signals we have heard from Woburn.

The Mobile Committee would like to express its thanks to all the wives and friends who assisted in making this year's rally such a success.



C. R. Whitmarsh, G8CIU, affixing a Raynet pennant to his whip aerial at Woburn
Photo: G3GJW

Peterborough Mobile Rally, 26 September
At Walton School, Mountsteven Avenue, Walton, three miles north of Peterborough. Talk-in on 160 and 2m. Further details from A. H. Jackson, 57 Peterborough Road, Castor, Peterborough, PE5 7AX, tel: Castor 353 after 6pm.

SPECIAL EVENT STATIONS

Daventry Festival Week
An exhibition station, GB2DAV, will be operating on 160-10m ssb and 2m vhf during Daventry Festival Week from the Community Centre, Ashby Road, Daventry. The station will be operated by members of the Ariel Radio Group and other local amateurs from 20-24 September. Special QSL cards will be issued to acknowledge all contacts.

Porchester Community Centre Open Week
The Fareham & District ARC will operate GB3PCA at the Porchester Community Centre from 20 to 27 September. It will be in operation nightly from 7 to 11pm on all bands 160–10m and 2 to 4m. All contacts will be confirmed by special QSL card.

Radelec 71
This event takes the form of a weekend camp at Gilwell Park, Chingford, London E4, from 1–3 October. It is open to all members of the Scout movement and the programme includes amateur tv, demonstrations of hf and vhf radio, rtty, a constructors' contest, and items on swl aerials and ultrasonics. The call will be GB3GP, on the air for most of the weekend.

Royal Leamington Spa Hobbies Exhibition
The Mid-Warwickshire ARS will operate GB3RLS on the 80, 40, 20 and 15m bands, ssb and cw, at this exhibition which will be held from 10 to 11 September.

UMIST Freshers' Week
The University of Manchester Institute of Science and Technology will be operating GB3MAN from 26 September until 24 October in connection with the above and will be on all bands from 160 to 10, ssb/cw, and on 2m a.m. A special QSL card may be issued for the occasion. Further information can be obtained from: The Secretary, Amateur Radio & Electronics Society, UMIST Union, PO Box 88, Sackville Street, Manchester M60 1QD. Telephone 061-235 1281

COUNCIL PROCEEDINGS

A brief report of the Council meeting held at Society HQ on 7 July, 1971

Present: *Mr F. C. Ward (President, in the Chair), Dr E. J. Allaway, Messrs B. D. A. Armstrong, R. J. Hughes, G. R. Jessop, W. F. McGonigle, A. C. Morris, L. E. Newnham, C. H. Parsons, J. R. Petty, W. A. Scarr, A. W. Smith, R. F. Stevens, E. W. Yeomanson (members of Council), D. A. Findlay, general manager, A. W. Hutchinson, editor.*

Apologies for absence were received from Dr J. A. Saxton, Messrs J. Bazley, J. O. Brown, E. G. Ingram and G. M. C. Stone.

President's visit to Geneva Space Conference
The President reported that he had attended the IARC Convention in Geneva on 26 June 1971, and had also visited the Space Conference. Mr Ward said that he was very impressed by the favourable comments on the work done by the RSGB.

Mr Stevens said that he felt that the standing of the RSGB was enhanced by the presence of the President at Geneva.

Space Conference
Mr Stevens reported on the Space Conference at Geneva, which was still in progress. He would be submitting a full report for publication in *Radio Communication* as soon as possible after the conference ended.

Membership and affiliation
It was resolved:
(i) to elect 121 corporate members and 32 associates;
(ii) to waive the subscriptions of nine members on the grounds of blindness or other disability;
(iii) to accept reduced subscriptions from six members;
(iv) to grant affiliation to the British European Airways Amateur Radio Society.

Society photographer
It was agreed that Mr Paul Fletcher be invited to attend as a photographer at Society functions.

Trophies
The general manager pointed out that the terms of reference for the Horace Freeman and John Rouse Trophies required that the awards be made for home-constructed equipment exhibited at the yearly exhibition. As no exhibition would be held in 1971 it was suggested that no awards be made but it was agreed to request comments from the Technical Committee.

Radio Club of Argentina
It was agreed that a congratulatory telegram should be sent to the Radio Club of Argentina on the occasion of that club's 50th Anniversary provided confirmation of the date is available.

Committee minutes
Council received the minutes of the following committees: MPT Liaison Committee (2.4.71), RAEN Committee (24.4.71), VHF Committee (5.5.71), Scientific Studies Committee (24.5.71), Finance and Staff Committee (27.5.71), VHF Contests Committee (9.6.71), Education Committee (26.6.71), VHF Committee (23.6.71), Mobile Committee (23.5.71).

RSGB Articles of Association

ARTICLES of Association set out the statutory requirements for the conduct of the affairs of a company.

The present Articles of Association of the RSGB (which is a company registered under the Companies Acts) were revised in 1963-64 and were adopted at an Extraordinary General Meeting held on 4 July 1964. Subsequently, amendments were incorporated in December 1968 and August 1970.

The Council considers that in the interests of members certain additions and amendments are desirable. Details of these are set out below. The opportunity has been taken to make a number of minor amendments that are necessary due to recent updating of the Companies Acts.

The proposed amendments will be the subject of a Special Resolution submitted to the members at an Extraordinary General Meeting to be held in December 1971 (on the occasion of the Annual General Meeting). The notice calling the EGM will set out in detail the proposed amendments. Details of the proposed amendments have been submitted to the Department of Trade and Industry and no objection has been raised by that department.

However, in order that members may be familiar with the changes that are proposed, the following notes have been prepared. The amendments fall into three categories:

Firstly, amendments which substantially alter the Articles;
Secondly, amendments where the wording of the original Article has been slightly re-arranged or the Article renumbered but the requirements of the Article are not affected; and **Thirdly,** amendments which are only updating the references to the Companies Act. The original references are to the Companies Act 1948 but there has been more recent legislation and the reference is now to the Companies Acts 1948 and 1967.

Only the first category of amendments is dealt with in these notes.

Corporate Members
Associate Members
Article 7 provides that candidates for election as Corporate Members must be 21 years of age or over or must hold the permission of any competent authority to install, maintain and operate an Amateur Radio Transmitting Station.

Article 8 provides that candidates for election as Associates must be under 21 years of age and must transfer to corporate membership on attaining that age or on acquiring the status set out in Article 7.

The amendments will reduce the limit to 18 years of age in line with current legislation.

Family Membership
An addition to Article 20 will provide for "Family Membership" as follows:

Where two or more members of a family have the same address registered with the Society, the second and subsequent members will be eligible for a reduced subscription which will entitle them to all privileges of their grade of membership except that of receiving a copy of each issue of the Society's journal (*Radio Communication*).

The annual subscription payable by the second and subsequent family members will be decided by the Council from time to time.

The reduced subscription will only apply so long as the members have the same registered address. If this condition is not met then the full subscription is payable by the appropriate members.

It must be noted, however, that family members will still receive any issue of *Radio Communication* which contains a statutory notice of a meeting (AGM, EGM) or details of elections of Council members, Regional Representatives or any matter that must be brought to the notice of all members.

Waivers
The Council has power under Article 23 to waive the subscription of a Corporate Member (who suffers from blindness or other disability). Occasions may arise when it is desired to waive the subscriptions of Associates. "Corporate" has therefore been deleted.

Life Membership
Article 24 states that the amount payable to commute all future subscriptions is forty-five pounds. An amendment will increase this sum to an amount equal to twenty times the annual subscription.

Proxies
The position of proxies is unsatisfactory. Article 44 requires that only a fully paid-up member could act as a proxy for another member. However, Article 45 states that a proxy need not be a member.

The amendment will regularize the position.

Nominations for election to Council
At present the Council nominates members to fill vacancies that will arise on the following 31 December.

Members are then invited to make further nominations and if there are more nominations than available vacancies, a ballot is held.

The amendment provides that Council will notify the members of the vacancies that will arise and the membership will be invited to make nominations. Only if there are insufficient nominations by the membership to fill the vacancies will Council make nominations and these will only be sufficient to fill the available vacancies. No ballot will be held.

If, however, the members make more nominations than there are available vacancies then a ballot must be held.

The requirements for a member nominated for election on a zonal basis remain as before.

Scrutineers
Article 58 provides that ten scrutineers will be chosen at the AGM for the election that will take place a year later. Council is also required to select, by drawing lots, three of the ten—these three will then act as scrutineers.

The position can arise where the three names drawn by lot are not available a year later and there would therefore be no scrutineers.

The amendment will give the Council power to choose a panel of scrutineers without varying the requirements as to eligibility laid down previously.

Inspection of accounts and records
Article 81 provides for members to inspect, subject to certain restrictions, the records of the Society.

The amendment will bring the wording into line with Table C of the Companies Act 1948.

Accounts and audit
Article 82 ensures that accounts are laid before the members and that the auditors' report is available for inspection and is read at the AGM.

This article has now been shortened by making the last sentence (which deals with the auditors report) into a separate Article.

Notices
The period after which a notice becomes effective is fixed at 24 hours by Article 87. In view of the inclusion of notices in *Radio Communication* and the delay that second-class mail is subject to, the period will be extended to 72 hours.

Election of 1972 Council

Ordinary Elected Council Members

Messrs G. R. Jessop, G6JP, and G. M. C. Stone, G3FZL, who will have completed three years as members of Council, retire by rotation on 31 December next and are eligible for re-election. Dr J. A. Saxton, Immediate Past-President, also retires and is eligible for election.

In accordance with Article 52 of the RSGB's Articles of Association, the Council has nominated the following corporate members to be balloted for to fill the two vacancies on the Council caused by the above retirements:

Dr J. A. Saxton, BRS23361
Mr G. M. C. Stone, G3FZL

Not later than 10 October next any 10 corporate members may nominate any other corporate member to be balloted for to fill one of the two vacancies on the Council by delivering their nomination in writing in a single document to the general manager, together with the written consent of such nominee to accept office if elected Each such nominator shall be debarred from nominating any other person for this election.

Council Members Elected by Zones

Not later than 10 October next any 10 corporate members resident in each of the following zones: **Zone A** (Regions 1 and 2) and **Zone B** (Regions 3 and 4), may nominate any other duly qualified corporate member resident in the Zone concerned to serve on the Council by delivering their nominations in writing in a single document to the general manager, together with the written consent of such nominees to accept office if elected. Each such nominator shall be debarred from nominating any other person for this election.

The present Council Member for Zone A is Mr J. R. Petty, G4JW, and for Zone B, Mr J. Bazley, G3HCT, and both will retire from Council on 31 December 1971 and are eligible for re-election.

Election of Regional and Area Representatives for 1972-74

The terms of office of all present Regional and Area Representatives end on 31 December 1971, and elections have therefore to be conducted as shown below.

Regional Representatives

Not later than Thursday 21 October 1971 any five corporate members resident in a particular Region may nominate any other qualified corporate member resident in the Region for the office of Regional Representative by delivering their nomination in writing, together with the written consent of such person to accept office if elected, to the Membership & Representation Committee at RSGB headquarters. Each such nominator shall be debarred from nominating any other person for this election of Regional Representatives.

The names and addresses of the present Regional Representatives are given on page 591.

In the event of no nomination being received from the corporate members in any Region by 21 October 1971, the Council reserves the right to make an appointment.

The composition of each Region is:

Region 1 (North Western)	Cheshire, Cumberland, Lancashire, Westmorland, the Isle of Man.
Region 2 (North Eastern)	Durham, Northumberland, Yorkshire
Region 3 (West Midlands)	Birmingham (postal area), Hereford, Shropshire, Staffordshire, Warwickshire, Worcestershire.
Region 4 (East Midlands)	Derbyshire, Leicestershire, Lincolnshire, Northamptonshire, Nottinghamshire, Rutland.
Region 5 (Eastern)	Bedfordshire, Cambridgeshire, Hertfordshire (outside Region 7), Huntingdonshire.
Region 6 (South Central)	Buckinghamshire (outside Region 7), Gloucestershire (excluding Bristol), Oxfordshire.
Region 7 (London)	London postal districts, Middlesex, Surrey and all other territory within 25 miles of Charing Cross.
Region 8 (South Eastern)	Kent (outside Region 7), Sussex,
Region 9 (South Western)	Bristol, Cornwall, Devonshire, Dorset, Somerset.
Region 10 (South Wales)	Brecknockshire, Cardiganshire, Carmarthenshire, Glamorgan, Monmouthshire, Pembrokeshire, Radnorshire.
Region 11 (North Wales)	Anglesey, Caernarvonshire, Denbighshire, Flintshire, Merionethshire, Montgomeryshire.
Region 12 (North Scotland)	Aberdeen, Angus, Banff, Caithness, Inverness, Kincardine, Moray, Nairn, Orkney, Perth, Ross and Cromarty, Shetland, Sutherland.

Region 13 (East Scotland)	Berwick, East Lothian, Fife, Kinross, Mid-Lothian, Peebles, Roxburgh, Selkirk, West Lothian.
Region 14 (West Scotland)	Argyll, Ayr, Bute, Clackmannan, Dumbarton, Dumfries, Glasgow (postal area), Kirkudbright, Lanark, Renfrew, Stirling, Wigtown.
Region 15 (Northern Ireland)	Antrim, Armagh, Down, Fermanagh, Londonderry, Tyrone.
Region 16 (East Anglia)	Essex (outside Region 7), Norfolk, Suffolk.
Region 17 (Southern)	Berkshire (outside Region 7), Hampshire, Wiltshire, the Channel Islands, Isle of Wight.

Area Representatives

Not later than 21 October 1971 any five corporate members resident in an Area may nominate any qualified corporate member resident in that Area for the office of Area Representative, by delivering their nomination in writing together with the written consent of such person to accept office if elected, to the Membership & Representation Committee at RSGB headquarters.

An Area is a conveniently sized geographical district, town or group of towns which has at least 10 members.

In the case of London, Area Representatives may be nominated for groups of postal districts. In the case of certain other large towns, Area Representatives may be nominated on a geographical basis, eg North Birmingham, South-East Manchester.

Ballots

In the event of more than one person being nominated for a particular office a ballot will be conducted, details of which will be published in the November 1971 issue of *Radio Communication*.

Resignations

If, for any reason, an elected representative wishes to resign his office, he should notify headquarters who will advertise the vacancy. *Local members cannot automatically appoint another member to undertake the duties of a representative who has resigned.*

The Council reserves the right to call upon any representative to resign his office if, in their opinion, he is considered to be unsuitable or unsatisfactory.

OBITUARIES

Mr D. Bowers, BRS 26760
Douglas Bowers of Saltash, Cornwall, died on 10 July, aged 50. He was a member of the RAIBC and a founder member and former secretary of the Saltash and D ARC. He was well known for his work in the dx field.

Mr W. E. Thompson, G3MQT
Bill Thompson, a founder member and secretary of the former Hastings ARS, died on 20 July aged 63. A master of equipment design and construction, he was a frequent contributor of technical articles on amateur radio and an RAE lecturer at Hastings and Eastbourne.

Mr W. G. Bush, G3JWB
"Wally" Bush of East Ham died on 27 July. He was a prominent member of the original East Ham RSGB Group and took a keen interest in Field Day activities.

Mr L. E. Richards, BRS18552
Len Richards, of Falmouth, died in June at the age of 58. A swl on all bands, he also played a part in contests, and was a long-standing member of the Cornish ARC.

We have also been notified of the death of:
Mr C. W. Piercey, G8EDD, of High Wycombe, Bucks.

YOUR OPINION

The Editor
Radio Communication

Sir—Upon perusing the pages of the August *Radio Communication* my eye was attracted to Mr R. A. Ham's article, "The Solar Link", but I cannot agree with some of his statements.

For a start, the temperature of the photosphere is not six million degrees—if it were, it would make nonsense of the statement that follows, that the sunspots are 2,000° cooler. It is true that the umbrae of sunspots are about 2,000° cooler than the photosphere, but the photospheric temperature is not much more than 6,000°K.

Mr Ham further states that "very large flares are called prominences" and, while no one would deny that there are often strong associations between solar flares and sunspots, I would think that few specialists would accept that statement.

Lastly, without mentioning the chromosphere, Mr Ham went on to describe the corona "which extends a million miles into space". Here, I think, he is alluding to the corona that can be observed during eclipses; actually, depending on the activity of the sun, it envelops the nearer planets. Indeed, one theory states that the zodiacal cloud is part of the solar corona that can be seen in the earth environment.

Having said my piece, let me take this opportunity of congratulating Mr Ham on a very interesting piece of research, and I sincerely trust that his article will get other workers busy in the same field.

Yours faithfully,
T. W. Rackham, FRAS,
Director, The Planetarium, Armagh, NI.

The Editor
Radio Communication

Sir—Over the years I have followed with great interest the results of Mr R. Ham's experiments and have always been impressed with the painstaking care he takes over the analysis of his data. However, I feel that a couple of points in his latest thesis concerning the relationship between solar radio activity and disturbed weather conditions need clarification.

His figures show that the probabillity of the sun being active on any particular day is 0·574 and the probability of the weather being active on any particular day is 0·374. Thus the probability that on any one day both the sun and the weather will be active purely by chance $= 0{\cdot}374 \times 0{\cdot}574 = 0{\cdot}215$. Mr Ham's observed value of 0·238 can be shown statistically by a chi squared test to be insignificantly different from 0·215.

Thus the figures do not provide any evidence to support the hypothesis that there is a connection between an active sun and active weather.

Yours faithfully,
Martin J. Atherton, G3ZAY

Footnote: The RSGB Scientific Studies Committee would welcome other comments on this subject.

Mr R. A. Ham replies:

The Editor
Radio Communication

Sir—Further to my article "The Solar Link" in the August issue of *Radio Communication*, I would like to thank the readers who have written directly to me for their kind remarks about my article and the further interest that they have shown in my solar radio telescope.

I must apologize for typing the world **million** instead of **thousand** in my original manuscript when referring to the temperature of the sun's photosphere. This of course was a slip and should have read **six thousand.**

Like myself, many members of the RSGB will be pleased to know that *Radio Communication* has Dr Rackham among its eminent readers. I trust that he has realized that my references to the sun were very brief; it was my original intention to write in greater depth about the sun, but space in *Radio Communication* did not permit this.

Martin Atherton's letter has raised a valid point about my sun/weather figures being very close to those which can be statistically predicted. I trust that readers will have noted from the few factual examples that I gave that my main case rests upon the comparison between the prolonged solar noise storm and major weather disturbances.

It is satisfying to know that people like Martin have taken an interest in my work. Over the years I have presented my daily findings in a factual manner to the RSGB, BAA and SARA members to debate.

I thank Dr Rackham for his congratulations and I hope, as he does, that many more members will do experimental work in this field and so contribute to our better understanding of the sun's influence on the earth's atmosphere and consequently on our radio communications.

Yours faithfully,
R. A. Ham, FRAS

The Editor
Radio Communication

Sir—Although not involving the attentions of the PO, hi-fi breakthrough is no more welcome than tvi. A very interesting article on the subject which should be of use to members is "Breakthrough", by Gordon J. King, *Hi Fi Sound* October 1969, pp86–88.

A very important point is that this is an article in a hi fi magazine by a non-amateur, and so is most useful in persuading the hi fi enthusiast that the fault lies in his equipment. Certainly the article has solved at least one case of breakthrough amicably.

Yours faithfully,
B. Priestley, G3JGO

The Editor
Radio Communication

Sir—May I point out an error in the excellent article on mobile aerials by G6GR (*Radio Communication* July).

The electrostatic field strength is not proportional to the distance apart of two high potential points. Indeed the opposite is true: in the author's example 100V across 1m = 1V/cm, while 100V across 1cm = 100V/cm, a much more intense electric field.

Fortunately this does not affect the point G6GR is making. For effective transmission one would expect that the electric field must be spread out in space by having a long loading coil, rather than a very high field over a short distance. Indeed it is tempting to speculate that this accounts for the optimum coil length experienced by the author—too long a coil gives a weak field, too short a coil gives a short one.

Now may we have an equally excellent up-to-date article on fixed aerials? I am consumed with envy for the amateur whose aerial apparently stretches halfway across the Forth Bridge, but suspect there must be an easier way.

Yours faithfully,
Dr A. C. Carr, G3OSU

The Editor
Radio Communication

Sir—May I correct any misconception that only the 100 per cent housebound or bedfast are acceptable as members of the Radio Amateur Invalid and Bedfast Club. This might seem to be the case from reading G3ZLG's letter in the July *Radio Communication*. In fact, the RAIBC welcomes any licensed amateur or shortwave listener, anywhere, who is more than temporarily disabled or handicapped in any way.

After 17½ years the club has 388 such members and they would be the first to acknowledge that "cripple" is an ugly word which just is not recognized. A proportion live their lives in wheel-chairs or are dependent on artificial breathing-aids, but there are also a goodly number who, though they can get out and about and are indistinguishable from the more fortunate of us, are nevertheless still handicapped by less outwardly obvious troubles.

So let no one think that haemophilia or any other "hidden" disability will automatically bar them from RAIBC membership. A note, in confidence, to the honorary secretary, Mrs Frances Woolley, G3LWY, 331 Wigan Lane, Wigan, Lancs, will receive sympathetic consideration.

Yours faithfully,
Allan Herridge, G3IDG

Looking ahead

17 September—RSGB Dinner Club, Kingsley Hotel, London WC1.
19 September—Region 9 ORM.
3 October—Scottish VHF Convention.
23–24 October—Region 12 ORM.

RADIO AMATEURS' EMERGENCY NETWORK

by S. W. LAW, G3PAZ*

Raynet at Woburn

As these words are written just after the Woburn Mobile Rally we can only provide an individual report from the Raynet angle. Thanks to the willing co-operation of the Mobile Committee and the sterling work of Raynet members, the part of the site devoted to our activities was so crowded that our vehicles spilled over the allotted area. We made no attempt to estimate the number present. This will give some idea of the popularity of the conception of a Raynet section at the rally; the car next to our own had driven from Glasgow.

The Raynet tent, ably run by G3BPT and xyl Jane, never had a dull moment, and the 4m talk-in operators were kept very busy. A brisk trade was done in badges, armbands and stickers, to say nothing of the Raynet raffle tickets for members, and their friends and families; the winning numbers were 309, 91, 134, 176, 219 and 300. The caravans came in for a good deal of attention and interest; in fact we saw G3MBQ looking quite harassed at one time at the Manchester set-up.

It was very satisfactory to see the display of Raynet pennants on car aerials on all sides of our site, and G3GJW deserves our thanks for organizing this and other aspects of the smooth-running radio-controlled stewarding system. We saw many cameras at work and hope that some photographs may be suitable for publication later if space permits. Altogether an excellent turn-out and we hope that it will be possible to repeat it in the future.

Frequency list

At the Raynet Committee meeting on 10 July it was reported that despite appeals there were still over a dozen controllers who had not ratified the frequencies and modes used by their groups up to that date. Send complete details direct to the compiler, G3GJW, (QTHR) or via his Ansaphone number 01-407 4367 and get it on the tape.

The West Country

We hear of a possible further group formation down west, but would like to hear more. The stalwarts of Newquay are still going strong we understand, but they would be the first to welcome further activity in the west.

Southern vacancy

We are sorry that G3VK, many years controller and recently area controller for North Surrey, has regretfully had to resign the latter post owing to business commitments. Controller G3MFB hopes that a replacement can be found as soon as possible in the area.

P. Balestrini, G3BPT, chairman of the Raynet Committee, left; and T. I. Lundegard, G3GJW, at the Woburn Rally *Photo:* G3GJW

* 130 Alexandra Road, Croydon, Surrey. CRO 6EW.

NFD 1971 RESULTS

IN spite of indifferent weather and variable band conditions, NFD '71 attracted 118 entries from most parts of the British Isles. The number of double-station entries again showed a drop (of two) over the previous year, while the single-station entries have risen from 76 in 1970 to 92 this year. Thus there was an increase of 14 in the total number of entrants compared to last year and the HF Contests Committee welcomes this trend and hopes that it will continue. As seems to be the rule in recent years, the committee had to carefully check many logs before the leading positions were fairly and satisfactorily resolved.

The overall winner by a clear margin is the Croydon RSGB Group/Surrey Radio Contact Club, with a total score of 1,984 points. Their two stations, G3BFP/P and G6LX/P, were operated by G2PL, G3BFP, G3EUE, G3IAS, G3MXJ, G3SWV and G6LX, from Addington, near Croydon. G3BFP/P used a mixer-vfo transmitter with a 2E26 pa, an AR88D, a half-wave end-fed on 160m, a full-wave loop and two inverted-Vs on 40m, and a quad on 15m. G6LX/P had a similar transmitter, an SB301, a full-wave on 80m, a quad and an 8-el phased array on 20m, and another quad on 10m.

Runner-up in the double-station section is the Norfolk ARC with 1,919 points, and the club will be presented with the Gravesend Trophy. Located at Kelling Heath, it ran G3YIR/P operated by G3PZX, G3VYG and G3VZT using an SB401 with a 2E26 pa, an SB301, a centre-fed dipole on 160m, a sloping dipole and a 2-el wire beam on 40m, and a 4-el wire beam on 15m; and G3IOR/P keyed by G3IOR, G3LDI, G3MPN and G3ZQU with a modified "Anglian" transceiver, phased dipoles on 80m, a 2-el quad on 20m and a 3-el quad on 10m.

The Oxford & D ARS takes third place with 1,903 points.

The Stockport RS wins the Bristol Trophy for the leading single-station section. G6UQ/P, ably keyed by G3NOM and G3PEK, was located at Sponds Hill, near Stockport. A home-built crystal mixer/vfo transmitter with a 2E26 pa, a KW77 receiver, inverted-V dipoles for 80m and 40m and a ZL special on 20m made up the station.

Second place in the single-station section is taken by the Ariel Radio Group "1" (BBC) station, G3GDT/P, operated at Motspur Park in Surrey by G3COJ, G3KKQ and G3POI, and using a modified KW2000A (2E26 pa) with a 200Hz cw filter on the receiving side, dipoles on 80m and 40m and a 2-el quad on 20m.

The winner of the Scottish NFD Trophy is the West of Scotland Group with 1,136 points, scored by operators GM3AXX, GM3CFS, GM3CSM, GM3GIJ, GM3SSB, GM3TDS, GM3VIU and GM8MJ. Both GM3TDS/P and GM3VIU/P used modified KW2000 transceivers with a quad for 20m and dipoles or inverted-Vs for the other bands.

The second Scottish entry is the Ayrshire ARG which operated GM5KF/P, keyed by GM3MHG and GM3OYH, with a home-brew transmitter and an Eddystone 680X receiver; and GM3NYG/P, keyed by GM3HJB, GM3MQO and GM3XVJ, using another home-brew transmitter and an Eddystone 888A. Aerials included a G8ON for 160m, an inverted-V for 80m, a dipole for 40m, a V-beam and a vertical for 20m and a quad for 15m.

It is pleasing to note that the Scottish groups are still strongly supporting the double-station section—nearly 25 per cent of the entries in this section came from GM.

1·8MHz

For the third year in succession the band award goes to the Coventry ARS (G2ASF/P) which topped the 55 logs with a checked score of 196 points. Its single-band effort was operated by G2DRW, G3RIR, GM3WDFand G3XWY using a Codar AT5 transmitter, an Eddystone EC10 receiver and a dipole aerial. Coventry's score came from a total of 110 contacts.

In second place is the Sutton and Cheam RS "A" station(G2XP/P) with 188 points from 81 contacts made by G3DCZ and G3LCH in a single operating spell from 1700 to 0100gmt. The equipment used was a KW2000 with a 2E26 pa and a "¾-wavelength Marconi with counterpoise".

Derby & D ARS "A" station (G3ERD/P) follow on Sutton and Cheam's heels with 187 points and 88 QSOs made between 1740 and 0100gmt. On this band G3ERD/P was operated by RSGB President G2CVV, G3FGY, G3HIS and G8QZ. The station consisted of a KW2000A (2E26 pa) and a dipole.

On the whole, conditions do not appear to have been too good; little dx outside the UK was worked and only a few contacts were made after 0100gmt.

3·5MHz

This band produced 108 logs this year, the highest number for some years. Although conditions were quite good throughout the 24-hour period, little dx was worked. The presence of numerous Continental portable stations made it easy to achieve a high scoring rate, particularly during the hours of darkness.

At the top of the logs for this band is the single-band entry of G8AB/P, the Loughton & D RS. Located at the "Rainbow and Dove", Hastingwood, operators G3BYW, G3CSS, G3TUC, G3TUM and G8AB keyed 224 QSOs to score 581 points using a home-brew transmitter with a 6AQ5 pa, an HRO, and three aerials: a dipole, a vertical and a 200ft wire.

The Cambridge & D ARC (G3IIT/P), another single-band entry, takes second place with an adjudicated score of 571 points from 231 contacts. The station consisted of a modified SB101 and an inverted-V dipole at 38ft in the centre. The operators were G2XV G3GGK, G3MBM, G3NAC and G3VCV.

Third highest scorer on 80m was the Guildford & D RS (G3KMO/P) with 560 points, and 216 contacts made by G3KMO, G3SYM, G3ZDD and G3ZFT.

Mansfield ARS (G3SIG/P) deserves a special mention as its 80m transmitter was simply a TT11 crystal oscillator; it brought the society 481 points and 8th place on this band.

7MHz

As usual on 40m the going was fast, the activity furious, and the QRM fierce. The general consensus of opinion is that conditions were very good, and this is confirmed by the high scores made and by the arrival of 99 logs for this band.

Top scorer is Salisbury (G3OBW/P) with 719 points from 237 contacts made by operators G2FIX, G3OBW, G3YHG and G3YHU. G3OBW/P was also equipped to work on 15m and 10m, but as conditions on these bands were so poor they stayed on 40m, with good effect! The aerials were two inverted-V dipoles at right angles, 35ft agl at the apex, with G2DAF type equipment at a somewhat lower height. The log includes a few contacts with N American stations.

Runner-up is the Leyland Hundred ARC (G3XII/P) whose operators, G3RFN, G3VAL and G3ZOQ, made 209 QSOs worth 639 points using a Vespa (2E26 pa), an FR100, and a single inverted-V dipole with the apex at 40ft.

Verulam ARC (G2AIA/P) takes third place with 626 points and 196 contacts. The station consisted of a KW2000A (2E26 pa) and a rotatable inverted-V dipole.

Needless to say, most entrants found it fairly easy to work the seemingly endless number of Continental portables on this band. Some dx was worked, including 9H1R, CN8, VP9BY/P, VE, and a

NFD Trophy

Croydon/SRCC — 1,984 points

Gravesend Trophy

Norfolk ARC — 1,919 points

Bristol Trophy

Stockport RS — 1,306 points

Frank Hoosen (G3YF) Memorial Trophy

Port Talbot — 815 points

Scottish NFD Trophy

West of Scotland — 1,136 points

Leading scores on individual bands

1·8MHz	Coventry ARS/G2ASF	196 points
3·5MHz	Loughton/G8AB	581 points
7MHz	Salisbury/G3OBW	719 points
14MHz	Port Talbot/GW4NZ	815 points
21MHz	Oxford/G2DU	161 points
28MHz	Croydon/G6LX	81 points

Overseas station giving most points to NFD entrants

EI9ONE/P

SINGLE STATION ENTRIES

Posn	Group	Callsign	1·8MHz	3·5MHz	7MHz	14MHz	21MHz	28MHz	Total
1	Stockport RS	G6UQ	—	342	550	414	—	—	1,306
2	*Ariel Radio Group "1" (BBC)	G3GDT	—	281	466	463	—	—	1,210
3	Bristol ARC	G4UZ	—	536	569	86	—	—	1,191
4	East Barnet ARCC	G6KQ	—	461	439	286	—	—	1,186
5	*Cannock Chase ARS	G3VCC	—	424	501	260	—	—	1,185
6	Cornish RAC	G3OHB	—	239	453	330	—	—	1,022
7	*North Bucks ARS	G4CK	—	341	461	205	—	—	1,007
8	Echelford ARS	G3UES	—	454	497	55	—	—	1,006
9	Chelmsford ARS	G3KRZ	—	425	460	100	—	—	985
10	*Maidstone ARS	G3TRF	—	269	310	375	—	—	954
11	*West Kent ARS	G3WKS	—	361	264	298	—	—	923
12	Gloucester ARS	G3MA	—	349	407	161	—	—	917
13	Cheltenham	G3CGD	176	362	372	—	—	—	910
14	Magnus GS RS	G3PAW	59	394	434	—	—	—	887
15	Southgate RC	G3SFG	—	427	448	6	—	—	881
16	Chippenham & D ARC	G3VRE	139	317	404	—	—	—	860
17	Liverpool & D ARS	G3AHD	—	447	253	155	—	—	855
18	Blackpool & Fylde	G8GG	—	392	297	162	—	—	851
19	Cheltenham ARS	G5BK	—	329	403	103	—	—	835
20	Bangor & D ARS	GI3XRQ	—	254	348	232	—	—	834
21	Racal ARC	G3RAC	—	308	287	226	—	—	821
22	*Leicester RS	G3LRS	—	314	425	75	—	—	814
	North Riding ARG	G2KK	159	353	302	—	—	—	814
24	Isle of Purbeck RS	G3WGV	113	343	353	—	—	—	809
25	Chingford	G8JM	—	325	404	77	—	—	806
26	*Horsham ARC	G3TNO	—	330	432	88	—	—	800
27	*Edgware	G3VW	—	509	288	—	—	—	797
28	Barnsley & D ARC	G5IV	—	304	391	96	—	—	791
29	Sunderland ARS	G3RDI	—	293	437	52	—	—	782
30	*Crystal Palace "A"	G3IIR	—	264	279	235	—	—	778
31	Torbay ARS	G3NJA	149	—	225	377	—	—	751
32	*Loose (Maidstone) Scouts	G3RCG	—	407	342	—	—	—	749
33	*Durham City ARS	G3TAK	—	320	345	76	—	—	741
34	Bury & Rossendale RS	G3BRS	—	257	391	84	—	—	732
35	Stevenage & D ARS	G3SAD	—	329	380	17	—	—	726
36	*Mid-Sussex ARS	G3ZMS	—	376	274	62	—	—	712
37	*Fareham & D ARC	G3VEF	—	314	389	—	—	—	703
38	Taunton & D ARC	G3XZW	110	294	298	—	—	—	702
39	*Southampton RSGB	G3SOU	—	316	341	44	—	—	701
40	Shefford & D ARS	G3FJE	177	272	229	—	—	—	678
41	Scarborough ARS	G4BP	—	309	354	—	—	—	663
42	Chiltern ARC	G3BXS	119	375	160	—	—	—	654
43	East Kent	G3LTY	152	343	132	—	—	—	627
44	Loughborough ARC	G3RAL	—	374	154	93	—	—	621
45	White Rose RS	G3XEP	159	295	163	—	—	—	617
46	City & County Bristol RSGB	G6YB	—	204	227	179	—	—	610
47	Chester ARS	G3GIZ	—	431	169	8	—	—	608
48	Swindon	G3FEC	—	342	262	2	—	—	606
49	Garendon School RC	G3MKX	15	344	238	—	—	—	597
50	Harlow & D RS	G6UT	—	—	467	95	27	—	589
51	Loughton & D RS	G8AB	—	581	—	—	—	—	581
52	Purley & D RC	G3GKF	—	211	183	182	—	—	576
53	Cambridge & D ARC	G3IIT	—	571	—	—	—	—	571
54	*Solihull ARS	G3GEI	74	431	—	58	—	—	563
55	Veteran Operators Club	G3VOC	—	—	562	—	—	—	562
56	*Hull & D ARS	G3AMW	91	375	—	92	—	—	558
57	Conway Valley ARC	GW3HGL	—	282	199	72	—	—	553
58	Nailsworth & D ARC	G4AAN	—	310	209	29	—	—	548
59	Clacton & D RC	G3CRC	—	319	209	—	—	—	528
	Grimsby ARS	G3YZI	—	528	—	—	—	—	528
61	Standard RC (Harlow)	G3NIS	—	276	214	21	—	—	511
62	Woodmansterne	G3KTA	112	209	184	—	—	—	505
63	North-East Essex TCRS	G3CO	—	306	197	—	—	—	503
	*Southdown ARS	G3WQK	—	286	215	2	—	—	503
65	Lincoln SWC	G4BU	—	305	143	50	—	—	498
66	Ainsdale RC	G2CUZ	113	341	—	43	—	—	497
67	Gt. Yarmouth RC	G3NHU	59	194	234	—	—	—	487
	Maidenhead & D ARC	G3WKX	50	437	—	—	—	—	487
	Stratford on Avon & D RC	G3RPJ	—	308	179	—	—	—	487
70	Ilford	G3XRT	138	274	69	—	—	—	481
	Mansfield ARS "B"	G3SIG	—	481	—	—	—	—	481
72	Southend & D RS	G5QK	86	285	88	—	—	—	459
73	Eccles & D RS	G3GXI	—	—	426	23	—	—	449
74	Bradford RS	G3NN	101	208	136	—	—	—	445
75	*ARC Nottingham	G3EKW	—	190	179	72	—	—	441
76	Havering & D ARC	G3TTB	52	344	29	—	—	—	425
77	Reading ARC	G3LFM	—	306	72	16	—	—	394
78	Mid-Herts ARS	G3WGC	101	238	—	49	—	—	388
79	South Dorset RS	G3EAT	39	197	131	—	—	—	367
80	Pontypool	GW3CDH	—	346	—	—	—	—	346
81	*Greenock & D ARC	GM3ZRC	—	—	173	108	24	—	305
82	Rugby ATS	G3GG	73	227	—	4	—	—	304
83	Chorley RSGB	G3DBY	168	112	—	—	—	—	280
84	Bromsgrove & D ARC	G3VGG	—	179	83	—	—	—	262
85	Chesterfield & D ARS	G3VKK	—	216	—	4	32	—	252
86	Mid-Lanarkshire RSGB	GM3XUV	—	—	38	138	43	—	219
87	*Ariel Radio Group "2" (BBC)	G3NTS	185	—	—	—	14	7	206
88	Newark ARCS	G3YCT	—	161	—	—	40	—	201
89	Coventry ARS	G2ASF	196	—	—	—	—	—	196
90	Mansfield ARC "A"	G3GQC	182	—	—	—	—	—	182
91	*Fareham Contest Group	G3XIV	152	—	—	—	—	—	152
92	*Crystal Palace "B"	G3VCP	129	—	—	9	—	—	138

Inspection carried out

TWO STATION ENTRIES

Posn	Band group	Group	"A" Station callsign	"B" station callsign	1·8 MHz	3·5 MHz	7 MHz	14 MHz	21 MHz	28 MHz	Total
1	(a)	*Croydon RSGB Group/SRCC	G3BFP	G6LX	152	420	603	610	118	81	1,984
2	(a)	Norfolk ARC	G3YIR	G3IOR	108	324	611	704	146	22	1,919
3	(a)	Oxford & D ARS	G2DU	G8IB	164	470	615	493	161	—	1,903
4	(a)	Maesteg Contest Group	GW3LEW	GW3SSK	139	275	607	772	58	13	1,864
5	(a)	Port Talbot	GW5VX	GW4NZ	50	315	558	815	102	—	1,840
6	(a)	Guildford & D ARS	G3IAF	G3KMO	118	560	565	404	115	22	1,784
7	(b)	*Verulam ARC	G2AIA	G3VER	181	557	626	303	79	—	1,746
8	(a)	*Radio Society of Harrow	G3EFX	G3HBR	173	409	586	470	33	20	1,691
9	(a)	*Leyland Hundred ARG	G3XII	G3GGS	134	360	639	315	23	—	1,481
10	(c)	Thames Valley ARTS	G8SM	G2NH	154	449	449	277	113	15	1,457
11	(a)	Derby & D ARS	G3ERD	G2DJ	187	464	516	245	18	—	1,430
12	(a)	*Reigate ATS	G3REI	G3FM	150	449	535	217	45	5	1,401
13	(a)	*Crawley ARC	G2DP	G3TR	122	365	485	361	53	11	1,397
14	(d)	Salisbury	G3FKF	G3OBW	114	413	719	79	—	—	1,325
15	(c)	Portsmouth & D RS	G3TVI	G3DIT	—	472	571	173	—	—	1,216
16	(a)	Wirral	G3NWR	G2AMV	162	396	304	258	58	—	1,178
17	(a)	Sutton & Cheam RS	G2XP	G8DF	188	444	532	—	—	—	1,164
18	(a)	West of Scotland	GM3TDS	GM3VIU	113	249	376	375	23	—	1,136
19	(a)	*Addiscombe ARC	G3UFY	G3SJX	125	325	293	264	75	23	1,105
20	(a)	Ayrshire ARG	GM5KF	GM3NYG	150	257	301	219	23	—	950
21	(a)	Clifton ARS	G3GHN	G3JKY	72	381	165	294	18	6	936
22	(e)	*Glenrothes ARC	GM3YOR	GM3OLK	178	63	122	483	72	2	920
23	(a)	Moray Firth ARS	GM3JGS	GM3TKV	80	329	167	274	—	15	865
24	(a)	Aberdeen ARS	GM3BSQ	GM3HGA	6	199	392	232	17	—	846
25	(a)	Dundee	GM3NHQ	GM4HR	—	157	506	162	—	—	825
26	(a)	Weston-s-Mare (RAFARS)	G5DV	G8FC	71	300	410	32	10	—	823

**Inspection carried out.*

Band groups. (a) 1.8, 7, 21. (b) 1.8, 7, 28. (c) 1.8, 3.5, 21 (d) 1.8, 3.5, 14. (e) 1.8, 21, 28

Entries disallowed

The following entries have been disallowed for the reasons stated:

Reason	Group	Callsign	1·8 MHz	3·5 MHz	7 MHz	14 MHz	21 MHz	28 MHz	Total
(1)	Hartlepools ARC	G3IDV	173	368	—	154	—	—	695
(1) (2) (4)	*Greenford ARS	G3MMQ	—	248	244	182	—	—	674
(2)	Bedford & D ARC	G3WTP	56	286	162	—	—	—	504
(2)	Worcester & D ARC	G3GJL	—	300	135	35	—	—	470
(3)	South Shields & D ARC	G3DDI	—	124	—	11	—	—	135

(1) Separate logs *not* submitted for each band.
(2) Late entry.
(3) No site NGR given.
(4) No operators callsign given against each contact.
The above are **claimed** scores only.
**Inspection carried out*

Check logs are acknowledged from: G3EJF, G3GMK, G3OIC, G3WOR/P.

Overseas check logs

Posn	Callsign	Points to G stations	Posn	Callsign	Points to G stations
1	EI9ONE/P	560	4	SM0BDS	88
2	†VK6II/P	384	5	YO3RF	24
3	EI4LRC/P	164	6	SK0CJ	20

†29 DX Club, Perth, WA. (Affiliated RSGB).

few eastern W/K call areas. The 29 DX Club of Western Australia commented that they heard about 30 G portables, but called in vain.

14MHz

While conditions may not have been up to last year's standard, some excellent scores were made among the 79 logs for 20m. The transatlantic path opened up between 2000 and 0600gmt and was particularly good during the hours of darkness with some stations exchanging 599/599 reports. Quite a few VK and ZL stations were worked on Sunday morning around 0400 to 0700gmt. During the day the European stations dominated the scene with the stronger N American stations re-appearing towards the end of the contest.

Repeating last year's success, Port Talbot (GW4NZ/P) again wins the Frank Hoosen (G3YF) Memorial Trophy with a band leader's score of 815 points from 266 QSOs. Operators GW3BQY and GW3MOP worked the band during the following periods: 1700-2300gmt; 0040-0812gmt; 1000-1300gmt; 1400-1500gmt; and 1600-1700gmt. GW4NZ/P employed a modified KW Vanguard, an RA17, a quad and a dipole.

In second place comes the Maesteg Contest Group (GW3SSK/P) with a score of 772 points from 243 contacts made by GW3NJW and GW3SSK using another modified Vanguard, an SB301E and a 2-el quad. They were on 20m from the start until 1300gmt on Sunday with just the odd short break elsewhere.

The 2-el cubical quad is still the favourite aerial among the leading stations. Oxford also had a 3-wavelength V-beam, while Guildford used a rhombic and Stockport a ZL special.

21MHz

NFD conditions on 15m can best be described as patchy, with occasional bursts of brilliance for the stations fortunate enough to be on the band at the right time.

The Oxford & D ARS is the band leader with 161 points from 52 contacts. The equipment used included a home-constructed transmitter and a Racal RA17—the aerial was a 2-el quad. Most of the action took place on Sunday with VE3, VP9 and east coast W districts forming the major part of the score.

Norfolk (G3YIR/P) takes second place with 146 points—much the same results as at Oxford, but with the addition of ZC4IK.

28MHz

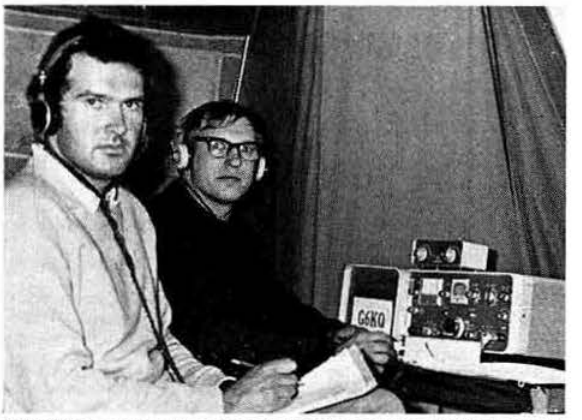
First place on 10m is taken by Croydon/SRCC (G6LX/P) which once again, (for the nth time!) wins the band leader's award with 81 points from 26 QSOs. With more than three times the score of its nearest rival, Croydon obviously took every opportunity which presented itself. Most of the contacts were Europeans but they worked 9J2XZ, 9HIR and ZB2A.

Norfolk (G3IOR/P) is in the second slot, keying 26 points from 9 contacts.

Quotes from groups

"Thick fog and rain, frequently heavy, throughout entire two days"—G2KK/P.
"Wind played havoc with aerials"—G3CRC/P.
"Kept the quad up despite a force 5 gale . . . . bringing cold weather and rain"—Norfolk ARC.
"Three primus stoves failed to break the ice at 0300!"—G8AB/P.
"Weather awful"—G3LRS/P.
"Weather perfect for the fourth year in succession"—Bangor.
"Where had all the dx gone?"—G2NH/P.
"20m seemed noticeably worse this year"—G6UQ/P.
"No lack of stations to work (on 40m), just a problem in sorting them out"—G3GHN/P.
"Tough going from Norfolk on 1·8MHz"—G3YIR/P.

Thames Valley ARTS's "B" station being worked by G3JEQ and G3GTX



G3SVK operating East Barnet ARCC's station G6KQ/P while G3RPB keeps the log

"Pump-up mast sprang a leak in the early hours and needed constant pumping to keep it up!"—Taunton & D ARC.
"First time we've got over 300 contacts—we'll soon be a force to be reckoned with!"—G3OHB/P.
"Bet we were the only entry to have police protection! Cheltenham was invaded by Hells Angels. . . . "—G5BK/P.
"Had a wonderful time again, see you from our new club call of G4AFN next year"—G4CK/P.
"Stations should send 'R' instead of 'QSL'. It's shorter"—Portsmouth & D RS.
"1971—the year of the British KLUB signals. . . . dozens of chirpy and T7 notes"—G3RPJ/P.
"No complaints!"—G3VEF/P.
"Operating standards very good, apart from one G station who refused to QSL our report to him of 587C"—G3ROG/P.
"Someone forgot to pack our magic wand, the gremlins moved in and chaos reigned supreme"—Port Talbot.
"For the fourth year running Harrow used only all-transistor, home-built transceivers at both stations"—G3HBW.
"Very pleased to work our first VK in 13 years of NFD"—G3JKY/P.
"Far too few stations on 160m"—G3CGD.

Comments from the HF Contests Committee

It still seems necessary to remind certain groups that they really ought to read the rules. The committee endeavours to accept all entries in view of the time and effort expended by entrants, but those that arrive when the checking is well under way simply miss the boat. The deadline for the posting of logs is clearly set out in General Rule 8(f), see *Radio Communication* January 1971 page 48.

Most groups take a certain pride in the appearance of their entries and send in neatly typed or carefully written log sheets. To these groups go the adjudicators' grateful thanks, for it is less tiring on the eyes and easier to read tidy, clear and uniform log sheets. The few groups who still persist in forwarding tatty, semi-illegible and tea-stained logs full of crossings-out and strange hieroglyphics should take note—before long the adjudicators' failing eyesight will classify these logs as being "illegible".

As usual many groups have had points deducted from their claimed score. Errors in reports and serial numbers received are the most common reasons for loss of points, but misread callsigns come a close second. For example, one G4-plus-three-letter portable station appeared in quite a few logs as a G4-plus-*two*-letter portable because operators tended to run together the last two letters of the callsign. Both stations lose points in such cases. Unmarked duplicate contacts abounded in some logs—attention is drawn to General Rule 11(e). One club's score actually increased because of an arithmetical error.

The use of QSL rather than R is adversely commented upon by some groups. To the committee, R seems preferable as it is shorter. Strictly, QSL means "I acknowledge receipt" and hence should be followed by what is being acknowledged, ie the received report and serial number. But perhaps R is no longer fashionable!

As G6LX is a member of the committee, it should be pointed out that as his group was among the leading entries when checking commenced he took only a minor part in the proceedings and was not present when the final placings were resolved.

Inspection

Representatives of the committee were again out in force inspecting many stations, and we are pleased to note the cordial welcome that they invariably received. The committee wishes to thank all those members who so kindly acted on its behalf as station inspectors. Thanks also to the many groups who sent in elaborate directions and detailed maps of their sites—their efforts were sincerely appreciated and saved the inspectors much time and effort.

In conclusion

The rules again came in for comment—both for and against—but let it just be known that the committee is reviewing the rules and has sent NFD questionnaires to all affiliated societies. If your club or group would like to complete a questionnaire, and has not yet received one, please write to the HF Contests Committee, c/o D. Thom, G3NKS, 6 Bracken Close, Copthorne, Crawley, Sussex, RH10 3QE, enclosing, if possible, a foolscap-size sae.

Thanks to all of those who forwarded check logs, both from home and overseas, including VS6AJ/P whose log was received as we closed for press. They were all most useful.

The committee thanks all contestants for providing a most enjoyable contest, and for the many appreciative comments added to the logs.

It hopes to see you all, and more, next year.

G3HBR operating and G3HBN logging at the Radio Society of Harrow's "B" station, G3HBR/P

CONTEST NEWS

Second 1·8MHz Contest 1971

1. **The General Rules for RSGB HF Contests,** published in the January 1971 edition of *Radio Communication*, will apply.
2. **When.** 2100gmt on Saturday 13 November 1971 to 0200gmt Sunday 14 November 1971.
3. **Contacts.** CW (A1) only in the 1·8–2MHz band. County code letters, as published on page 47 of the January 1971 issue of *Radio Communication*, must be sent after the report/serial number group; eg for a contact from Surrey, 579001 SY.
4. **Scoring.** Six points for each of the first six contacts with stations in any one country; three points for the seventh and subsequent contacts; six points for each contact with a station outside the British Isles.
5. **Logs.** Column (5) should be headed "County Code Letters Received". Entries should be addressed to: The HF Contests Committee, c/o D. Thom, G3NKS, 6 Bracken Close, Copthorne, Crawley, Sussex RH10 3QE.
6. **Awards.** The Victor Desmond Trophy will be awarded to the winning station. The Maitland Trophy will be awarded to the Scottish member with the highest aggregate number of points in this contest combined with the First 1·8MHz Contest 1972.

A certificate of merit will be awarded to the leading entrant whose 18th birthday falls on or after 15 'November 1971. Entrants wishing to compete for this award should state their date of birth on the contest cover sheet and mark clearly at the TOP of the cover sheet "UNDER 18".

432MHz Fixed Station Contest

2000–2400 clock time 30 October 1971 and 0800–1200 31 October.

All entries and checklogs must be sent to the adjudicator at: VHF Contests Committee, c/o 5 Birkdale Drive, Oakham Green, Tividale, Warley, Worcs.

The following general rules, as published in the January 1971 *Radio Communication*, will apply: 1, 2, 3, 4b, 5a, 6a, 7a, 8b, 9a, 10a, 11–24.

144/432MHz CW Contest

1900gmt 6 November to 1300gmt 7 November.

All entries and checklogs must be sent to the adjudicator at: VHF Contests Committee, c/o 14a Roman Way, Farnham, Surrey

The following general rules, as published in the January 1971 *Radio Communication*, will apply; 1, 2, 3, 4a, 5a, 6a, 7a, 8a, 9b,10a, 11–24.

Cray Valley RS 3rd SWL Contest

1. The contest will start at 1800gmt on 25 September and end at 1800 on 26 September. Up to 18 hours' logging may be done during this period. A six-hour rest period may be taken in not more than two sessions.
2. The contest is open to any swl in the world who wishes to participate.
3. The 3·7, 7, 14 or 21MHz bands may be used.
4. Stations may be logged using a.m. or ssb only.
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.
6. The object of the contest is to log as many countries as possible on each band and separate scores should be kept for each band. Each station logged will count *one* point plus *10* bonus points for the first station heard from each country on each band.
7. For the purpose of this contest the call areas of the USA, Canada and Australia will each count as a separate country ie W1 2 3 4 5 6 7 8 9 0, VO1 VO2 VE1 2 3 4 5 6 7 8 and VK 1 2 3 4 5 6 7 8. 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. /MM stations should not be included in entries.
9. A separate log should be submitted for each band. The final score will be the totals of 3·7, 7, 14 and 21 added together.
10. Log sheets are available from Mr R. A. Treacher who must be sent a large sae at the address below. It is desirable that entrants use official log sheets but entries on home-made log sheets will be accepted as long as sufficient details of QSOs are given.
11. Entries should be addressed to: Mr R. A. Treacher, 392 Rochester Way, Eltham, London SE9, England, *to arrive not later than 8 November 1971.*
12. Certificates of merit will be awarded to the overall winner, the runner up, and to the contestant in each country with the highest points total.
13. The decision of the society will be final.

June 1971 Microwave Contest Results

This year the Microwave Contest attracted only a total of 13 entries out of a field of 33 stations known to be active during the contest period. Five entries were submitted for 13cm and four for 3cm, but no contacts appear to have been made on 9cm.

Overall winner was the Mid-Essex Group operating from Walbury Hill in Berkshire. The station, G3LTF/P, was ably operated by Peter Blair and Doug Williams who used 23cm and 13cm only. Runner-up was G3RPE/P, operated by G3RPE, G3HBW and G3ZGO in Oxfordshire, which also used 3cm.

The best dx recorded was on 23cm. The QSO between G8ADP/P and G3TTV/P was made over 110km, well down on last year's 152km, illustrating how abysmal conditions were. Not only were conditions described as "flat" by most, but many of the less well engineered portable stations found the high winds difficult to cope with when using narrow beamwidth aerials.

Most stations used straight mixers for all bands, but three rf stages were in evidence, an improvement over last year. On the transmit side the 2C39 and many of its variants proved their worth on 23cm, although one DET24 and two BAY66 varactors were also used as final stages. On 13cm the line-up was: two varactors, one DET22, one DET29 and one EC157; while 3cm had a similar variety with two TWTs, one kylstron 2K25 and one Gunn oscillator. Aerials have now standardized on the parabola, and sizes varied from 18in to 6ft in diameter.

The winner, G3LTF/P, used a 3CX100A5 power amplifier on 23cm, with 25W cw or fm out, and on receive a KD5200 preamp. On 13cm a completely solid-state chain was used with 1·5W output; an MA451 mixer with a 2m i.f, and dual feed on the 4ft dish. Peter says a parametric amplifier and a transistor preamp were also available for experimental use on 23cm and 13cm respectively.

No adverse comments were received on the rules but G3RPE did comment that F2 and pulse should be allowed for all microwave contests. G5FK deplored the lack of activity on 3cm and Dain Evans would like to see a multiplier on this band "equal to the wind strength on the Beaufort scale".

Certificates of merit go to G3LTF/P and G3RPE/P.

Posn	Station	Total score	23cm Score	23cm QSOs	13cm Score	13cm QSOs	3cm Score	3cm QSOs	Cnty	ASL
1	G3LTF/P	2,924	2,042	14	882	4¼			BE	974
2	G3RPE/P	2,638	1,546	13	927	5	165	1	OX	647
3	G3BNL/P	2,406	1,166	9½	855	4	385	1	GR	1,080
4	G3THQ/A	2,396	1,050	9	801	5	545	2	OX	—
5	G5FK	1,442	785	11	657	4	0	0	MX	160
6	G2RD	1,282	1,282	12					SY	625
7	G3TTV/P	1,226	1,226	11					BS	850
8	G8DDC/P	1,191	1,191	11¼					BD	800
9	G8ADP/P	864	864	6½					GR	816
10	G3LTN	662	662	7					NR	500
11	G2WS	435	435	2¼					ST	300
12	G5UM/P	401	401	5¼					LR	700
13	G3XPT/P	290	290	1½					NK	280

1971 144MHz Open Contest Results

Entries for the July 2m Open Contest arrived in envelopes of all shapes and sizes, including one registered packet. Such concern for the secure transit of his logs proved justified, for the contents of the packet were worth the Mitchell-Milling trophy to GW3NUE/P. A record number of 429 contacts enabled G3NUE, G8BVP and G3WRA to pull 1,000 points clear of the runner-up, G3JYP/P, himself hotly pursued by GW8BHH/P. Similar circumstances prevailed in all three sections of the contest: an easy winner, with the rest far behind. A fine solo effort from G3JXN demonstrated by a margin of almost 750 points that it is still possible to win a vhf contest from London, and the Crawley Club's G3WSC led home an unusually large Section B.

Conditions were generally acknowledged to have been well above average, comments ranging from "fabulous" and "fantastic" to a conservative "fair". S9 reports were exchanged across the length and breadth of western Europe on the Saturday evening, several QSOs approaching 1,100km, but conditions slowly deteriorated during Sunday. Despite the excellent "tropo", local weather was often highly unstable. Violent thunderstorms forced more than one Welsh portable station to close down, and the resulting static crashes and charged rain troubled those who remained.

With so many stations on the band, whoever said that "the battle is not to the strong" was clearly not thinking of vhf contests, for there is a marked split in each section between those stations whose signals were always audible, and the remainder who had to make each contact through a barrier of QRM. Under such circumstances the use of a vfo can be a great advantage. Comments on this subject included "Oh, for a vfo!" (several times repeated), and the more positive "I am now building a vfo". Stations who used a vfo during the contest were often led to ask that others listen first on their own frequency; and that having netted on, called and worked a fixed-frequency station, the vfo station should vacate the channel—a matter of common courtesy.

Another effect producing strong signals, and much in evidence during this contest, was that of co-siting of stations. That this need not be a severe problem is demonstrated by G3ZPZ and G4AGE who live 400yd apart, and neither of whom have much cause to regret the outcome of the contest; likewise G3NEO and G3NHE. Fixed stations have ample opportunity to ensure that transmitters and receivers are above reproach, but portable stations arriving on the same site often suffer from spurious signals or from receiver overload—or both.

Subject to Council approval, the Mitchell-Milling trophy will be awarded to GW3NUE/P; and G3JXN, G8BCL, G3WSC, G3XEP/A and G3JYP/P will receive certificates of merit.

SECTION A

Posn	Callsign	Points	QSOs	County	Best dx	(km)	Power
1	G3JXN	1,965	223	LD	HB9AAI/P	775	90
2	G8BCL	1,217	107	YS	DJ9DL	—	40
3	G3ZPZ	1,054	157	DY	GM8AZS/P	410	25*
4	G4AGE	1,042	146	DY	PA0WJG	462	80
5	G3NEO	1,037	100	YS	F1AVK/P	810	150
6	GD2HDZ	1,010	107	IM	PA0VV	620	80
7	G3NHE	959	136	YS	PA0VVH/P	503	17
8	G3ZMD	765	134	BD	F2QZ/P	669	30
9	G8CUT	677	107	EX	GD2HDZ	443	75
10	G8DTQ	629	133	SY	G3JYP/P	395	25
11	G8CUO	593	100	NM	G3WKF/P	380	16
12	G8EGS	576	95	NR	——	—	45
13	G8EBJ	546	139	LD	F1SA/P	440	24
14	G3OHH	545	81	SD	F1BHL/P	480	90
15	G3WHK	498	127	SY	G3JYP/P	395	12
16	GC2FZC	470	54	GY	G8CYD	336	60
17	G8CRN	433	73	CE	G3WKF/P	362	40
18	G8BZR	371	84	EX	G3JYP/P	375	150
19	G8AKH	333	81	EX	PA0CKV/P	340	17
20	G8DHA	304	59	GR	GD2HDZ	290	15
21	G8BKR	278	67	GR	G8DML/P	316	15
22	G3THY	274	60	EX	PA0VVH/P	405	90
23	G8AMG	273	46	LD	ON5EW/A	420	100
24	G8CTT	265	79	KT	G3JYP/P	410	20
25	G8DBW	261	41	GR	G3NWU/A	319	140
26	G3BPM	260	63	MX	PA0CNS/A	415	15
27	G3XTT	256	56	NR	ON5OT/P	380	25
28	G8BXJ	253	57	GR	HB9RO/P	823	30
29	G5UM	184	31	LR	GM3LTW/P	370	21
30	G3UFY	159	46	SY	GW3UCB/P	324	35
31	G8BOA	148	32	LR	F1AGY/P	325	18
32	G8DFO	115	28	LN	GM8AZS/P	—	18
33	G8CBZ	100	20	DN	PA0WKY	620	30
34	G8CDW	94	30	MX	GW4ABR/P	235	24
35	G3MWZ	64	14	LN	G3WSC	—	4
36	G4AGQ	57	22	YS	G3OUR/P	202	20
37	G3LCH	29	23	LD	G3EFX/P	70	10

SECTION B

Posn	Callsign	Points	QSOs	County	Best dx	(km)	Power
1	G3WSC	1,596	223	SX	HB9IR/P	775	100
2	G3XEP/A	1,273	172	YS	F0UJ/P	510	25*
3	G8DQK	1,236	144	NK	GM8AZS/P	520	40
4	G3MAR/A	1,084	165	SD	PA0WTA/P	537	55
5	G4AAR	975	156	KT	PA0DML	460	100
6	GW3ITZ	731	124	FT	PA0VV	502	30*
7	G3YZS/A	613	131	EX	——	—	50
8	G4ABX	593	119	WR	HB9RO/P	850	120
9	G8CXK	592	104	NM	PA0NJH/P	350	25
10	G3UHF	527	126	LE	F6BEG/M	395	60
11	GW8EQH	514	101	FT	PA0CML	—	30
12	G8BRR	250	66	WR	GM3LTW/P	402	25

SECTION C

Posn	Callsign	Points	QSOs	County	Best dx	(km)	Power
1	GW3NUE/P	3,883	429	BR	HB9IR/P	987	30*
2	G3JYP/P	2,883	274	WD	——	—	25
3	GW8BHH/P	2,827	307	RN	HB9IR/P	1,037	100
4	GW4ABR/P	2,479	303	RN	HB9IR/P	1,028	45
5	G3ZXR/P	2,196	283	HE	HB9IR/P	—	50
6	G8AUN/P	2,192	235	NK	DL8KV	515	60
7	G3SLJ/P	2,153	273	HE	F6KBT/P	735	25
8	G8DXQ/P	1,900	219	YS	DK1KN	560	36
9	GW8CKT/P	1,818	209	RN	F6AHK/P	1,100	80
10	G3EFX/P	1,799	249	SX	HB9IR/P	756	25
11	G8BQX/P	1,696	213	SX	F6AHK/P	767	20*
12	GW3OXD/P	1,591	203	RN	DJ9DL	713	60
13	G3ILO/P	1,407	248	GR	——	—	30
14	G3UES/P	1,389	233	HE	F6KBF/P	740	75
15	G3XAC/P	1,353	185	YS	——	—	50
16	G3YZN/P	1,200	171	SX	HB9AAI/P	714	30
17	G3WKF/P	1,183	110	CL	HB9IR/P	1,020	140
18	G3WIR/P	1,163	205	OX	GM3LTW/P	470	45
19	GW8AWQ/P	1,142	155	BR	HB9IR/P	—	25
20	G8CFZ/P	1,057	144	SX	HB9RO/P	610	28
21	G8CUB/P	1,006	110	KT	F1UB/P	510	30
22	G8DNF/P	1,004	170	EX	GM8BDX/P	455	40
23	GW3ZSS/P	978	158	DB	PA0PVW	620	30
24	G3REI/P	959	198	SY	F2QZ/P	600	7
25	G4AEP/P	907	164	WR	DJ9DL	645	25
26	G8DHT/P	905	145	LE	F5NS	520	100
27	G8DML/P	873	105	CD	G8BQX/P	455	5*
28	G3OUR/P	832	156	BS	GM8AZS/P	587	15
29	G5PI/P	818	139	EX	GD2HDZ	380	12*
30	G8AWV/P	813	142	WR	HB9RO/P	820	12
31	G3SFG/P	810	177	BS	GM8AZS/P	570	15
32	G8DJT/P	773	135	YS	PA0VVH/P	512	25
33	HB9XUH/P	722	41	—	G8AOB/P	1,011	40
34	GM3LTW/P	696	62	AY	G3WSC	542	100
35	G8DYG/P	687	89	DT	HB9AAI/P	936	25
36	G3WOI/P	673	139	BE	——	—	25
37	GM8AZS/P	650	63	KE	ON5OT/P	612	25
38	G3WOR/P	638	97	SX	G3JYP/P	430	25
39	G8EIK/P	633	134	BS	GM8AZS/P	560	80
40	GM8BDX/P	611	66	BW	——	—	30
41	F0UJ/P	368	56	—	G3JYP/P	485	30
42	G8EAB/P	338	72	ST	HB9RO/P	775	10
43	G3WFK/P	317	65	DY	PA0VV	450	10
44	G3VPR/P	297	59	LN	PA0WLB	347	12
45	G3THX/P	221	50	LN	——	—	8
46	G3XJH/P	212	15	DN	HB9RO/P	840	20
47	G8CLW/P	68	30	SX	GW3NUE/P	188	25

Late entry: G8BLM/P, claimed score 1,863. *Output power

Check logs from G2HH/A, G3NYY/P, G8ERS/A and GW8AZU/P-G8AZU/M are acknowledged with thanks.

1971 144MHz Listeners' Contest Results

The good conditions prevalent during the 144MHz Open Contest produced an entry of 10 for the Listeners' event. The winner was Joe Skidmore of Belper, Derbyshire, followed by Terry Cooper who is a regular entrant in listener contests from his Storrington, Sussex, QTH. Some entrants lost a lot of points because they failed to log all the QTH information sent. It is realized that the listener cannot ask for a repeat of missing information, and the procedure in such cases is to claim full distance points, some of which will be deducted by the adjudicator.

Posn	BRS or A No	Points	QSOs	County	Best dx	(km)
1	BRS26431	793	130	DY	F6AHL/P	900+
2	BRS28005	703	100	SX	HB9AMH	780
3	BRS32525	390	127	LD	HB9AMH	685
4	A6758	368	65	NM	PA0CKV	430
5	A6729	316	67	NR	ON5EW/A	538
6	A6178	234	23	WK	——	—
7	A7167	173	67	LD	——	—
8	BRS32643	150	41	WE	——	—
9	A7413	116	49	LD	PA0FHV	245
10	A7511	25	11	LE	GW8BHH/P	190

1971 Summer Top Band Contest

There were 40 entries in this year's event, compared to 56 in 1970 Although a few entrants complained about the lack of overseas stations to work, quite a number reported contacts with USA, Canadian and European stations during the contest. A listener report from SWL George Allen in Perth, Australia (via G3IGW), lists G3RPB, GW3XJC, G3IGW and several non-entrants as being heard. A similar report from R/O Peter Willis on a tanker in the Persian Gulf shows that he heard GW3WRE, G3RPB, GW3XJC, G3IGW, G3PDL, G6BQ and G6LX.

There was a very closely fought battle for first place with GW3WRE, G3RPB, GW3XJC and G3IGW all claiming scores within a point or so of each other. All four stations lost a few points in checking and GW3WRE emerged the winner with a one point lead over the other three who tied for second place.

The standard of logkeeping was generally very good, but a number of stations lost points because they did not make sure that the station being worked acknowledged receipt of the report, number and county code. In some cases this resulted in the loss of eight points for the contact (being the only station worked in that county). The HF Contests Committee has to take the view that an uncompleted contact shall not count for points for either of the stations in contact. Several entrants did not appear to know their correct county code, and some logs had to be rescored as insufficient, or too many bonus points were claimed.

Three of the four leaders used home-built transmitters and half-wave aerials, G3RPB was the odd-man out with a quarter-wave Marconi, while GW3XJC used a DX100 transmitter.

The committee would like to thank those entrants who sent comments with their logs. While a few would like the date changed so as not to conflict with the 144MHz Open Contest, the majority seem satisfied with the arrangements and the rules.

Posn	Callsign	Points	Posn	Callsign	Points
1	GW3WRE	521	21	G3XDY/P	356
2	G3RPB*	520	22	G3VIP	355
	GW3XJC		23	GW3RTR/A	354
	G3IGW		24	G3WDF/A	341
5	G3XTJ	455	25	G3XWZ	336
	G3PDL		26	G3XTT	333
7	G6BQ	451	27	GM3YOR	326
8	G4AR	437	28	G3ZJK	299
9	G3OZF	422	29	G3XJM	298
10	G3BFP	417	30	G3LLK	289
11	G3UFY	411	31	G3FJE/A*	288
12	G3YMH	405	32	G3ZOH	276
13	G3GMK	397	33	G3DBF	275
14	G6LX	396	34	G3UQW	264
15	G3BRK*	390	35	G3IQF	263
16	G3ZTJ	378	36	G3IRS	257
17	G3SKC	370	37	G3ZYW	235
18	G3WTA	369	38	G3LCH	186
19	G3WSN/P	366	39	G3ZQX	179
20	G3OVL	357	40	G3ZXD	111

(* multi-operator entry)

Slade DF Qualifying Event

Posn	Competitor	Club	Time of arrival "A" Stn	Time of arrival "B" Stn
1	B. Bristow	Oxford	1423	1452
2	B. Mahoney	Rugby	1421	1456
3	A. Simmons	Oxford	1426	1518
4	M. Hawkins	Chelmsford	1451	1526
5	A. Hitchcock	Derby	1432	1527
6	E. L. Mollart	Oxford	1546	1431
7	W. T. North	Chiltern	1547	1452
8	I. Butson	Chelmsford	1547½	1447
9	J. Drakeley	Slade	1531	1553
10	P. T. Tyler	Oxford	1459	1537
11	R. Pierce-Boby	Oxford	1501	1557
12	D. Newman	Rugby	1507	1558
13	M. Gee	Oxford	1502	1601
14	G. Whenham	Coventry	1500	1605
15	T. Gage	Oxford	1539	1608
16	J. R. Vickers	Stratford	1502	1616
17	J. E. Smith	Slade	1618	1446
18	O. L. Harding	Lincoln	1624	1525
19	G. T. Peck	Chiltern	1629½	1537
20	M. Hughes	Slade	—	1558
21	D. C. Holland	South Manchester	Were unsuccessful in finding either transmitter	
22	M. K. Edwards	Chippenham		
23	I. Cobbold	Stratford		
24	Mr Reed	Derby		

Twenty-four teams foregathered at the Motor Transport Park at Whittington Barracks, near Lichfield, on Sunday 25 April to compete in the first RSGB DF Qualifying Event of 1971 organized by Slade Radio and Scientific Society.

Station "A", manned by Bert Simmonds (G3XRH) operating on 1,920kHz and using the society's callsign of G3SRS/P, was sited on Cannock Chase in the Rugeley area. Although it was approachable by several paths, many of the competitors did it the hard way by climbing straight up the hill. Station "B" was manned by Derek Pearson using his own callsign of G3ZOM/P and operating 1,850kHz. It was sited in a wood near Hoar Cross.

Nineteen teams found both transmitters, one found Station "B" only, and four teams were unsuccessful in finding either. Brian Bristow and Brian Mahoney, the first and second competitors home respectively, who qualify to go forward to the Final, found both transmitters in very quick time. Brian Bristow was so keen that he was nearly successful in getting through the back of the tent at "B" with disastrous results to the "camouflage".

Grimsby/Scunthorpe DF Qualifying Event

A fine sunny day, 27 June, was enjoyed by the 13 teams from all parts of the country competing in this event. At the starting point strong signals were received from Station "B", but Station "A" was not heard by 50 per cent of the competitors and, in accordance with Rule 5, they were held back at the start and given an approximate bearing five minutes later.

Station "A" (G3XDY) was located on the River Ancholme and had the transmitting aerial rigged diagonally over the river. The transmitter team enjoyed watching nearly all competitors arriving at the wrong end of the wire and being faced with nearly a mile treck over the nearest bridge to reach the hidden station on the other side. It seems that we shall have to think again about hidden stations on rivers in the future because one competitor arrived at the opposite bank to the station, sized up the situation, returned to his pick-up, pulled out an inflatable dinghy and paddled across!

Station "B" (G3HTI) was hidden in a wood close to Scunthorpe with 400ft of very thin wire hidden in the trees. For a time they enjoyed watching the competitors following up false trails which had been laid in the undergrowth but not for too long; these df chaps have a real nose for picking the right bush once they are in the area.

While Grimsby ARS is to be thanked for providing the hidden stations, Scunthorpe ARS arranged an excellent tea for the 31 competitors at their headquarters and should be congratulated on its first venture in a national df event.

Posn	Competitor	Club	Time of arrival "A" Stn	Time of arrival "B" Stn
1	B. Bristow	Oxford	1420	1459
2	P. M. Williams	Slade	1517	1449
3	B. Mahony	Rugby	1432½	1520
4	W. North	Chiltern	1439	1520½
5	J. Drakeley	Slade	1423	1521
6	T. Gage	Oxford	1528	1500
7	I. Butson	Chelmsford	1533½	1446
8	D. E. Newman	Rugby	1537	1459½
9	B. Reid	Derby	1442	1546
10	A. Simmons	Oxford	1547	1459½
11	P. Crossley	Grimsby	1555	1501
12	G. T. Peck	Chiltern	1515	1614
13	J. Carter	Grimsby	—	1626

Contests calendar

11 September—BARTG VHF RTTY Contest (Rules in August issue)
11-12 September—WAE phone
12 September—80m FD (Rules in August issue)
19 September—DF Contest Final
19 September—BARTG VHF RTTY Contest (Rules in August issue)
25-26 September—Cray Valley RS 3rd SWL Contest (Rules in this issue
2-3 October—UHF/SHF NFD (Rules in June issue)
2-3 October—VK/ZL/Oceania phone
2-3 October—IARU Region 1 UHF/SHF
9-10 October—21-28MHz Telephony (Rules in May issue)
9-10 October—VK/ZL Oceania CW
13 & 27 Oct—70MHz Cumulative (Rules in August issue)
23-24 October—7MHz (cw)
24 October—Welsh 80m Contest
30-31 October—432MHz Fixed (Rules in this issue)
30-31 October—CQ WW DX phone
6-7 November—144/432MHz CW (Rules in this issue)
6-7 November—7MHz (phone)
6-8 November—CHC/FHC (phone and cw)
14 November—OK Contest
13-14 November—2nd 1·8MHz (Rules in this issue)
27-28 November—CQ WW DX CW
5 December—144MHz Fixed

RSGB SLOW MORSE PRACTICE TRANSMISSIONS

These slow morse practice transmissions are sponsored by the RSGB. Alterations and additions to this list should be sent to the honorary organizer, Mr M. A. C. MacBrayne, G3KGU, 25 Purlieu Way, Theydon Bois, Essex.

Clock time	Callsign	MHz	Town
Sundays			
1000	G3WNR	1·920	South Shields, Co Durham
0930	G3HZL	1·940	Isleworth, Middlesex
0945	G3YRO	1·860	Fareham, Hants
0945	G3USK	1·975	Mablethorpe, Lincs
1000	G2FXA	437·000 to north	Stockton-on-Tees
1015	G3CGD	1·875	Cheltenham
1030	G2FXA	437·000 to south	Stockton-on-Tees
1030	G3NPB	1·875	St Ives, Cornwall
1030	G3ZNW	144·520 to east	West Molesey, Surrey
1030 †Alternately	G3YPG / G3XOQ	1·965	Horley, Surrey / Redhill, Surrey
1100	G2FXA	1·900	Stockton-on-Tees
1100	GW3UMB	1·880	Colwyn Bay
1130	GW3VPL	1·918	Porthcawl, Glam.
1200	G3HVI	1·890	Stoke-on-Trent
1200	G3GNS	1·910	Weston-super-Mare
1330	G3FWW	1·880	Burnham-on-Sea, Soms.
1330	G3XDV	1·190	Canterbury, Kent
1330	G3WDS	1·975	Carlisle
1400	G3XWQ	1·975	Canterbury, Kent
1400	G3XGJ	1·830	Huddersfield, Yorks
1930 †Alternately	G3YFO	144·19 to south	Burnham, Bucks
Mondays			
1800	G3SWR	1·980	Birmingham
1830	G3NCZ	1·920	Blackburn, Lancs
1830	G3RXH	1·910	Skipton, Yorks
1900	G3WGU	1·880	Bispham, Lancs
1900	GC2FMV	3·600	Jersey, CI
1900	G3YJA	1·920	Coventry, Warks
1930 †	G3WFY / G3YEI	1·850	Thornton Cleveleys / Fleetwood, Lancs
1900 †	G3YED / G3YEE	145·640	Leeds, Yorks. / Bradford, Yorks.
1930	G2ABC	144·050 omni-directional	Woodford, Essex
2000	G3XWZ	1·910	Mansfield, Notts.
2000	G3KAN	1·990	Northampton
2000	G3IBJ	1·910	Southampton, Hants
2015	G3YMH	1·845	Wraysbury, Middlesex
2030 †	G3YEB / G3PRN	1·915	Harlow, Essex
2030	G3JHM	70·050	Worthing, Sussex
†Alternately			
Tuesdays			
1100	G2EBU	1·952	South Woodham, Essex
1800	G3XDV	1·910	Canterbury, Kent
1900 †	G3UFO / G3XAM	1·980	Wirral, Cheshire
1900	G3XWQ	1·975	Canterbury, Kent
1930	G3SWP	1·850	Doncaster, Yorks
1930	G3WGU	433·500 to south-east	Bispham, Lancs
1930 †	G3XUD / G3YEE	1·910	Leeds, Yorks. / Bradford, Yorks.
1930	G3ZUM	144·144 to south	Iver Heath, Bucks
2000	G3TUW	145·200 to south-east	Banbury, Oxon
2000	G3UPA	1·850	Meriden, Warks
2000 †	G3TIK / G3KSS / G3OVT	1·980	Stevenage, Herts
2000	G3FWW	1·880	Burnham-on-Sea, Soms
2000	G3WGD	1·860	Leicester
2000	GM3PIP	3·590	Mintlaw, Aberdeen
2030	G3HZL	1·845	Isleworth, Middlesex
2030	G3YMJ	1·915	Harlow, Essex
2030	G3RB	1·975	Whitley Bay, Nth'land
2045	GM3CRY	3·590	St. Andrews, Fife
2100	G4RS	1·865	Blandford, Dorset
2200	G3HZM	1·925	Manchester
†Alternately			

Clock time	Callsign	MHz	Town
Wednesday			
1830	G2FXA	1·900	Stockton-on-Tees
1900	G3YPZ	28·700	Harlow, Essex
1930	G3WGU	433·500 to south-east	Bispham, Lancs
1930	G3YFO	144·19 to north	Burnham, Bucks
1930	G3UJD	1·825	Farnborough, Hants
2000 †	G3AJX / G3TWP / G3YSK	1·925	Winchester, Hants
2000	G8QU	1·970	London, N22
2000	G3JHM	70·050	Worthing, Sussex
2000	G3XGY	144·054	Weston-super-Mare
2015	G3UNV	1·845	Ashford, Middlesex
2030	G3KGU	1·915	Theydon Bois, Essex
2100	G3HVI	1·890	Stoke-on-Trent
†Alternately			
Thursdays			
1800	G3SWR	1·980	Birmingham
1830	GW3VBP	3·590	Barry, Glam
1830	GW3UMB	1·880	Colwyn Bay
1830	G3NC	1·968	Swindon, Wilts.
1900 †	G3WFY / G3YEI	1·850	Thornton Cleveleys / Fleetwood, Lancs
1900	G3WGU	1·880	Bispham, Lancs
1930	G3GNS	1·910	Weston-super-Mare
1930	G2ABC	145·500 omni-directional	Woodford, Essex
1930	G3ZNW	144·520 to north	West Molesey, Surrey
2030 †	G3SJE / G3GC	1·875	Harrow, Middlesex
2030	G3RSF	1·915	Harlow, Essex
2100	G4RS	1·865	Blandford, Dorset
2100	GW3XNI	1·930	Crosskeys, Mon
†Alternately			
Fridays			
1800	G3XDV	1·910	Canterbury, Kent
1830	G3NCZ	1·920	Blackburn, Lancs
1900	G3NPB	1·875	St Ives, Cornwall
1930	G3PQF	1·825	Farnborough, Hants
1930	G3ZUM	144·144 to south	Iver Heath, Bucks
2000	G3EEL	1·980	Peterborough
2000	G3WGD	1·860	Leicester
2000 †	G3KEP / G3WTF	1·910	Bingley, Yorks / Bradford, Yorks
2015	G3SAZ	1·845	Ashford, Middlesex
2030	G3JHM	70·050	Worthing, Sussex
†Alternately			
Saturdays			
0930	G3UNV	1·935	Ashford, Middlesex
0930	G3YZZ	3·590	Maidenhead, Berks
1000	G3PLE	1·820	Stourbridge, Worcs
1100†	G3ZOQ / G3ZRE	28·350	Leyland, Lancs
1300	G2FXA	1·900	Stockton-on-Tees
1400	GC2FMV	3·600	Jersey, CI
1730	G3TNF	1·980	Gateshead
1930 †	G3ZEN / G3ZRR	1·915	Mitcham, Surrey / Thornton Heath, Surrey
2000	G3KPO	1·980	Peterborough
†Alternately			

G3BZU morse proficiency transmissions at 20, 25, 30, 35 and 40wpm are made at 1900 gmt on the first Tuesday of each month on a frequency of 3·520MHz. For 100 per cent copy at 20wpm a certificate is awarded, and endorsement stickers are available for 100 per cent copy at the higher speeds. A charge of 10p or two IRCs is made for the basic certificate, and 2½p or one IRC for each endorsement sticker claimed. All claims should be sent to—The QRQ Manager, RNARS, HMS *Mercury*, Leydene, Petersfield, Hants.

CLUB NEWS

Items for inclusion in this section should be sent to regional representatives on the first of each month for inclusion in the following month's issue. They should not be sent direct to the editor.

The date of publication of the following month's issue, first Tuesday in the month, should be borne in mind so that events are not, in fact, history when the details are published. While regional representatives are pleased to receive clubs' events calendars for several months ahead, they still require monthly events lists so that entries can be confirmed or amended.

REGION 1 **RR B. O'Brien, G2AMV**

Merseyside Luncheon Club—First Monday in each month, 1230 for 1245, HMS *Landfall*. Please advise G3VQT or G2AMV if you wish to attend.

Ainsdale (ARC)—Members should contact N. Horrocks, G2CUZ, QTHR, for details of the changed meeting arrangements.

Allerton (Liverpool) Scout ARS—North West Region—Thursdays, 8pm, 1st Allerton Group Headquaters, Aigburth Vale, Liverpool 17. All Scouts interested in amateur radio are welcome.

Blackburn (East Lancs ARC)—First Thursday in each month, 7.30pm, Edinburgh House, Shearbank Road, Blackburn. Further details from G4JS.

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

Bolton (B & DARS)—Local members should note the new meeting place as from the first Wednesday in August: Bolton Recreation Club, Kensington Place, Bolton. Other arrangements remain the same, eg discussion night on the first Wednesday, principal meeting on the third Wednesday. The Society has recently taken part in exhibitions, one during Bolton's wakes weeks and the other to support the local branch of the British Legion on its gala day. On the latter occasion torrential rain caused somewhat watery signals. Further details from G3ZQS.

Bury (B & RRS)—A great discovery was made recently when one of our members wrote an historical account of the club activities as a handout at a special event station. It would appear that this year is the club's Silver Jubilee, having obtained the callsign G3BRS in 1948, and all thoughts are now concentrated on a way of celebrating this occasion.
14 September (Swl Stan Parker will give a talk on his experiences with heating systems), 12 October (Junk sale), 8pm, George Hotel, Market Street, Bury. Hon secretary, G3VVQ, 411 Holcombe Road, Greenmount, Bury.

Carlisle (C & DARS)—Mondays, 7.30pm, Currock House, Lediard Avenue, Currock. Hon secretary, G3FZG, QTHR.

Cheshire (Mid-Cheshire ARC)—Wednesdays, 7pm, Technical Activities Centre, Winsford Verdin Grammar School, Grange Lane, Winsford. All meetings start with a morse class, main feature at 8pm. The AGM starts the club activities in September after the shack visits undertaken during summer vacation. This active club has a 2m transmitter building project going at the moment and the acquisition of a 16mm projector along with tape, slide and live lectures promises continued activity during the winter months. Visitors always welcome.

Chester (C & DARS)—Tuesdays, except for the first Tuesday in each month which is net night, 8pm, YMCA, Chester. Further details from G8AYW, QTHR.

Crewe—Local members continue to meet at the QTH of R. Owen, 10 Circle Avenue, Willaston, Nantwich from whom further details may be obtained.

Douglas (IOM) (D & DARS)—Every Monday and Thursday 7.30pm, rear of Douglas Holiday Centre, Victoria Road. Douglas. Club callsigns is GD3ZCM. Hon secretary, J. Parnell, Cronkbane, Quines Hill, Port Soderick IOM.

Eccles (E & DRC)—Tuesdays, 8pm, Bridgewater School, Worlsey, Lancs. Thursdays: club Top Band net, 2030gmt.

Leyland Hundred Amateur Radio Group—Net nights: Thursdays at 2000gmt on 1915kHz. Saturdays at 1900gmt on 145.8MHz.

Liverpool (L & DARS)—Tuesdays, 8pm, Conservative Association Rooms, Church Road, Wavertree. Secretary, K. Wood, G3WCS, 90 Childwall Valley Road, Liverpool 16.

Liverpool (NLRC)—10, 24 September, 8 October, 8pm, Labour Party Headquarters, 13 Crosby Road South, Liverpool 22. Hon secretary, M. Graham, G3XMG, 14 Albert Road, Waterloo, Liverpool 22.

Manchester (M & DRS)—Wednesdays, 7.30pm, 203 Droylesden Road, Newton Heath, Manchester 10. Hon secretary, G3IOA, QTHR.

Manchester (SMRC)—Meets every Friday, 3 September (Talk on fsk), 10 September ("Operation of the Heathkit HW17", by Tim Winter, G8DLD), 17 September ("Single sideband simplified", by M. Barnsley, G3HZM), 24 September ("More on contest operating", by G3FNM), 1 October ("Constructional Techniques", by D. Holland, G3WFT). Club meets on Fridays, 8pm, Sale Moor Community Centre, Norris Road, Sale, Cheshire. VHF/UHF activity night on Mondays, operation of G3UHF from the club shack at 8pm, "Greeba", Shady Lane, Baguley, Manchester 23. Visitors are welcome on both Mondays and Fridays.

Manchester University (ARS)—Please contact G3ZNS or G8BVF for details of activities. The shack is on the third floor in the Union building.

Preston (PARS)—2, 16, 30 September, 14 October, 7.30pm, Windsor Castle (private room), St Paul's Square. Hon secretary, G. Windsor, 26 St Gregory's Road, Preston.

Salford (Dial House RS)—A society of PO Engineers who meet on Wednesdays, 6pm, 8th floor (river end) Dial House, Chapel Street, Salford 3. Further details from the secretary at same address.

Stockport (SRS)—Second Wednesday in each month—discussion night; fourth Wednesday—lecture night. 8pm, Blossoms Hotel, Buxton Road, Stockport. Hon secretary, G8BCG.

Thornton Cleveleys (TCARS)—First and third Wednesdays in each month, 8pm, St John Ambulance Brigade Hall, Fleetwood Road North, Thornton, Blackpool. Hon secretary, G3YWH. ASR, G3ZBO.

Warrington (Culcheth) (CARC)—Fridays, 7.30pm, Chat Moss Hotel, Glazebury. All visitors welcome. Hon secretary, K. Bulgess, 32 Hendon Street, Leigh, Lancs.

Westmorland (WRS)—Members will be contacted when a new meeting place is arranged. Meetings are likely to be once a month. The new chairman is G3UEC. Hon secretary, E.P. Goonan, Jnr, "Longridge", Storth, Nr Milnthorpe, Westmorland.

Windscale (Cumberland) (WAR & ES)—Fridays, 7pm, c/o Falcon Club, Falcon Field, Egremont. Further details from N. Ramsden, G3RHE.

Wirral (WARS)—First and third Wednesdays in each month 7.45pm, Boy Scout Headquarters, Harding House, Park Road West, Claughton, Birkenhead. Hon secretary, G3WSD, 34 Glenmore, Road, Oxton, Birkenhead.

Wirral (Wirral DX Association)—Last Thursday in each month at members' homes. Further information from the hon secretary, G3OKA, 219 Prenton Dell Road, Prenton, Birkenhead. Visitors are welcome.

REGION 2 **RR K. Sketheway, BRS 20185**

Barnsley (B & DARC)—Summer recess. 10 September (AGM), 24 September, 7.30pm, King George Hotel, Peel Street, Barnsley. *G3LRP*.

Fulford (York) (FARS)—Tuesdays, 7.30pm, Scout HQ, 31 George Street, York. *G5KC*.

Halifax (NHARS)—1 September (Pea and pie supper), 4-5 September (Vhf/uhf contest), 8 September (Committee meeting), 15

Region 9 ORM

Assembly Hall, Technical College

Sea front, Weston-super-Mare

19 September 1971

Talk-in stations will be operational from 10am on 1,980kHz and 2m.

The meeting will open at 2.30pm and will be followed by a technical lecture. A raffle will be held by Weston-super-Mare Radio Society.

A trade exhibition will be open all day in the main hall, and a museum of radio gear will be on view.

Light refreshments will be available all day at the college and there are ample restaurant facilities nearby.

Car parking at the college is limited but several corporation car-parks are close by.

Preliminary notice

Region 12 ORM

Beach Ballroom, Aberdeen

23-24 October 1971

Activity will commence at 11am when the exhibition will be opened. At 2pm there will be a lecture by Mr M. C. Hateley (GM3HAT), and this will be followed by tea at 3pm.

At 3.30pm the ORM will commence, and Mr F. C. Ward, President of RSGB, and Messrs E. G. Ingram and A. W. Smith, Council members, will be present.

There will be a programme for the ladies during the afternoon, and a dinner and social in the evening. Details of the Sunday programme will be published later.

Early booking by intending visitors is requested and must be received not later than 10 October by Mr G. M. Grant, GM3UKG, Easter Bogs, Buckie, Banffshire AB5 2EL, from whom full details of the event and overnight accommodation may be obtained by sending an sae.

September ("Hi-fi", by Dr A. R. Bailey, G3IBN), 29 September (Visit to Yorkshire Television Studios, Leeds), 7.45pm, Peat Pitts Inn, Ogden. Bookings still taken for the W1BB lecture Mk 1 "Dxing on Top Band" and Mk 2 "Dxing the hard way". *G3MDW*.

Hartlepool (HARC)—Mondays, 7.30pm, Middlegate Rooms, Borough Buildings, Hartlepool. Visitors always welcome. Future activities include a visit to Radio Teesside. *BRS7323*.

Hull (H & DARS)—3 September (Preparation for 2m field day), 10 September (Preparation for 1971-2 RAE classes), 17 September (Technical talk on local radio stations by representative of the local radio station BBC Radio Humberside), 24 September (Swl night), 1 October (Musical evening), 7.45pm, 592 Hessle Road, Hull. *M. Longson*.

North Riding (NRARG)—Now meets at the Railway Hotel, Seamer Road, Scarborough. Details from the secretary, J. E. Agar, G8AZA, 88 Rothbury Street, Scarborough, Yorks. *G8AZA*.

Scarborough (SARS)—Thursdays, 7.30pm, c/o RAF Association, 3 Westover Road, Scarborough. Club callsign, G4BP. Hon secretary, J. Cutter, G3VAN. *G8KU*.

South Shields (SS & DARC)—Fridays, 17 September (AGM), 8pm, Trinity House Social Centre, Laygate, South Shields.

Sunderland (SARS)—Meetings on the first and third Tuesday in each month, 7pm, Sunderland Polytechnic. *G3XID*.

York (YARS)—Thursdays, 7.30pm, The British Legion, 61 Micklegate, York. *J. A. Rainbow*.

REGION 3 — RR R. W. Fisher, G3PWJ

Birmingham (MARS)—21 September ("A/TV", by H. Parker, G6RKU/T), 8pm, Midlands Institute, Margaret Street, Birmingham 3.

Coventry (CARS)—3 September (VHF NFD preparations), 10 September (Club night on the air), 17 September (Junk sale), 24 September (Club night on the air), 1 October (AGM), 8pm, City of Coventry Scout, HQ, 121 St Nicholas Street, Radford Road, Coventry.

Dudley (DARC)—14, 28 September, 8pm, Central Library, St James' Road. *G3PWJ*.

Leamington Spa (MWAE & RS)—The autumn/winter programme will commence on Monday 13 September, 8pm, 28 Hamilton Terrace, Leamington. *G3ZCG*.

Redditch (RRC)—9, 23 September, 8pm, The Old People's Centre, Park Road, *G3EVT*.

Solihull (SARS)—21 September ("Computer aided design of electronic circuits", by G3KWK), 7.30pm, The Manor House, High Street, Solihull. 5 October (Informal meeting), Malt Shovel, High Street, Solihull. *G3ZXO*.

Stourbridge (STARS)—7 September (Talk by Dr Peter Sugden), 5 October, 7.45pm, Longlands School, Stourbridge.

Stratford (SoA & DARC)—3 September (Vhf project), 17 September ("Semiconductors", by J. Moulton), 1 October ("Air traffic control", by G3III). *G3OOQ*.

Sutton Coldfield (SCRS)—13 September (Film and talk by Strumech Engineering Co. Ltd.), 27 September (Natternight), 8pm, Sutton Town FC, Coles Lane, Sutton Coldfield. *G8CZM*.

Worcester (W & DARC)—Third Saturday in each month, 8pm, Crown Hotel, Broad Street. *G3WUI*.

REGION 4 — RR T. Darn, G3FGY

Derby (DADARS)—8 September (Demonstration of the latest hi-fi equipment by T. Darn. Ladies are invited to this meeting). 15 September (Df practice event), 22 September ("Tape recorders" by T. Darn), 29 September (RSGB tape lecture "Anthology of sounds", by A. O. Milne, G2MI). Club meets on Wednesdays, 7.30pm, 119 Green Lane, Derby. Members of the Derby Society recently held a bring and buy sale at the RSGB Mobile Rally at Woburn and over £40 was raised towards RSGB funds. *G2CVV*.

Lincoln (LSWC)—Every Wednesday evening, 7.30pm, at their new HQ situated off Westcliffe Street, off Burton Road, Lincoln. Visitors are always welcome.

Loughborough (LARC)—Club meets every Friday evening, 3 September (Visit), 10 September (Talk on rtty), 17 September (Short wave listeners night—any questions ?), 24 September (Film show), 8pm, club HQ by the side of the former Tax Office, near Bedford Square, Loughborough.

Worksop (NNARS)—Please note that from Thursday 23 September the club nights will be on Thursdays at 8pm. Friday 10 September (Preparations for 80m field day), Sunday 12 September (80m field day—site to be announced), Thursday 23 September ("Linear amplifiers", by G3RZP). Club meets at the Kilton Youth Centre, Longfellow Drive, Worksop. RAE classes on alternate Thursdays.

REGION 5 — RR S. J. Granfield, G5BQ

Bedford (B & DARC)—Thursdays. 2 September (Speech compressors), 9 September (Junk sale—"Flogger" Bevan, G3XKB), 16 September ("Equipment analysis techniques", by G3SME), 23 September (RSGB tape/slide lecture—"World at your fingertips"), 30 September ("Digital frequency meter using ICs", G3CWV). Club meets at The Dolphin, Broadway, Bedford.

Cambridge (C & DARC)—Fridays. 3 September (VHF NFD preparation), 10 September (VHF NFD post-mortem), 17 September (Film evening), 24 September (Quiz or tape lecture), 1 October (Informal). Club meets at Club HQ, Victoria Road, Cambridge.
Cambridge University (CUWS)—12 October (Lecture on loudspeakers by Dr A. R. Bailey, to be held in King's College, 8.15pm). The new academic year begins on 5 October. Prospective new members should visit our stand at the societies' fair, or contact either N. Kingsbury (King's College), or D. I. Field, G3XTT (Selwyn College).
Shefford (S & DRS)—Thursdays. 9 September (VHF field day post-mortem), 16 September (Morse quiz—G3VMI), 23 September (Any questions?), 30 September ("Electricity supply distribution systems", by G3RPL). Club meets at the Church Hall, Ampthill Road, Shefford.
Stevenage (S & DARS)—Meetings are held at Hawker-Siddeley Dynamics Ltd, Gunnels Wood Road, on the first and third Thursday in the month. 2 September (Discussion of winter programme), 16 September ("Home-built transistorized gear—transceiver and test equipment", G3JXF).

REGION 6 — RR L. W. Lewis, G8ML

Cheltenham (RSGB Group)—First Thursday in each month, 8pm, "Royal Crescent", Clarence Street, Cheltenham. *G2FWA.*
Gloucester (GRS)—First meeting of new season Thursday, 2 September (AGM), RAFA Club, Spa Road, Gloucester. *G3MA.*
South Bucks VHF Club—7 September (Talk on radar), 5 October (Talk on uhf equipment), 8pm, Bassetsbury Manor, High Wycombe.

REGION 7 — RR P. A. Thorogood, G4KD

Do not forget to send a card to G3FZL saying "Yes" or "No" to a two-day VHF Convention. See *Radio Communication*, August 1971, page 549.
Acton, Brentford & Chiswick (ABCRC)—21 September (Members' holiday reports), 7.30pm, Chiswick Trades & Social Club, 66 High Road, Chiswick.
Addiscombe (AARC)—Second and fourth Tuesdays, 7.30pm, Prince George Hotel, High Street, Thornton Heath.
Ashford, (Echelford ARS)—Second Monday and last Thursday in each month, 7.30pm, St Martin's Court, Kingston Crescent, Ashford, Middlesex.
Barking (BR & ES)—Thursdays, 7.30pm, Gascoigne Recreation Centre, Gascoigne School, Morley Road, Barking.
Bexleyheath (NKRS)—Second and fourth Thursdays. 9 September (W1BB tape on Top Band), 23 September (Discussion on members' club project). 7.30pm, Congregational Church Hall, Chapel Road, Bexleyheath.
Cheshunt (CDRC)—First Friday in each month, 7.30pm, Methodist Church Hall, opp. Theobalds Station, Cheshunt.
Chingford (RSGB Group)—Fridays, telephone 01-524 0308.
Chingford (SRC)—Fridays, 7.30pm, Friday Hill House, Simmons Lane, Chingford, E4.
Croydon (SRCC)—Third Tuesday in each month, 7.30pm, Swan & Sugarloaf, South Croydon.
Crystal Palace (CP & DRC)— Third Saturday in each month. 18 September ("Mullard ICs", by C. H. Jones). 8pm, Emmanuel Church Hall, Barry Road, SE22.
Dartford Heath DF Club—Now meets at 8pm, Broomhill Road, Dartford.
Dorking (DR & DRS)—Second and fourth Tuesdays, 8pm, "Wheatsheaf", Dorking.
Ealing (E & DARS)—Tuesdays, 7.30pm, Northfields Community Centre, Northcroft Road, W13.
Edgware & Hendon (E & DRS)—Second and fourth Mondays in each month, 8pm, St George's Hall, 51 Flower Lane, Mill Hill, NW7.
Farnham, Bucks (Burnham Beeches RC)—Fortnightly on Mondays, Buffaloes Hall, Victoria Public House, Victoria Road, Farnham Common.
Gravesend (GRS)—Mondays, 8pm, Northfleet Recreation Centre, Springhead Road, Northfleet, Kent.
Greenford (GARS)—3 and 17 September, Greenford Community Centre, Oldfield Lane.
Guildford (G & DRS)—Second and fourth Fridays, 8pm, Guildford Engineering Society, Stoke Park.
Hampton Court (TVARTS)— First Wednesday in each month, 8pm, The Three Pigeons, Portsmouth Road, Long Ditton.
Harlow (DRS)—Tuesdays (General and cw practice); Fridays (Junior), 8pm, Mark Hall Barn, First Avenue.
Harrow (RSH)—Every Friday. 10 September (Practice and Bring and Buy Sale), 17 September (Talk on PLA radio by P. Balestrini, G3BPT), 24 September (Practical), 1 October (VHF dxpeditioning by G3BA and G3BHT). 8pm, Harrow County School for Boys, Sheepcote Road, Harrow.
Havering (H & DARC)— Fortnightly, 8pm, British Legion House, Western Road, Romford.
Hemel Hempstead (HH & DARS)—First and third Fridays, 8pm, "Addmult" Sports Club, Hemel Hempstead.
Heston (BEA ARS)—Newly formed amateur radio section of London Silver Wing Club. Secretary, David Evans, G3OUF; contact 01 SKY 3131, extn 255, A. Bano, G3PCR. Meets on last Wednesday of month at BEA Training Centre, Southall Lane, Heston.
Holloway (GRS)— Mondays (RAE), 7pm; Fridays (Morse, 7.30pm), (Lectures, 8.30pm). Club reopens 17 September, note new times. Archway School Annex, Whittington School, Highgate Hill, N19.
Ilford—Every Thursday, 8pm, 50 Mortlake Road (off Ilford Lane) Ilford.
Kingston (K & DARS)—Second Wednesday in each month. 8 September ("SSB", by G. W. Alderman, G3JXA). 8pm, Penguin Lounge, 37 Brighton Road, Surbiton.
Loughton—Fortnightly on Fridays, Loughton Hall, Rectory Lane (near Debden station).
New Cross (CARS)—Every Wednesday and Friday. 10 September (25th AGM). 8pm, 225 New Cross Road, SE14.
Paddington (P & DARS)—Wednesdays, 8pm, Beauchamp Lodge, 2 Warwick Crescent, W2.
Purley (P & DRS)—First and third Fridays, 8pm, Railwaymen's Hall, side entrance, 58 Whytecliffe Road, Purley.
Reigate (RATS)—First Wednesday in each month, 7.45pm, George and Dragon, Cromwell Road, Redhill.
Romford (R & DRS)—Tuesdays, 8.15pm, RAFTA House, 18 Carlton Road.
Scouts (ARS)—Third Thursday in each month. 7.30pm, Baden Powell House, Queensgate, South Kensington, SW7. Scout net: Saturdays 0900, 3,740MHz.
Sidcup (CVRS)—First and third Thursdays. 16 September (Natter night), 7 October ("30MHz and above", C. Whitmarsh, G8CIU). 8pm, Congregational Church Hall, Court Road, Eltham, SE9.
Southgate (SRC)—Second Thursday in each month. 9 September (Junk sale). 7.30pm, Civil Defence Hut, Bowes Road, N11.
St Albans (Verulam ARC)—18 September ("Transistorized ssb transmitter", by C. L. Desborough, G3NNG). 7.30pm, Town Hall St Peter's Street, St Albans.
Sutton & Cheam (SCRS)—Third Tuesday in each month. 21 September ("Submarine telephone cables", by Alan Keech). 19 October (Visits to Croydon Computer Centre and Lotts Road Power Station. Notify organizers now). 8pm, The Harrow Inn, High Street, Cheam.
Welwyn (Mid-Herts ARS)—Second Thursday in each month. 9 September ("Moonbounce", by G3LTF), 14 October (AGM). 8pm, Welwyn Civic Centre, Welwyn.
Wimbledon (W & DRS)—Second and last Fridays, 8pm, St John Hall, 124 Kingston Road, South Wimbledon, SW19.
Wembley (GECARS)—Thursdays, 7pm, c/o GEC, Hirst Research Centre, Wembley HA9 7PP, Middlesex. (This club is open to non-GEC employees by invitation; contact Dain Evans, G3RPE, telephone 01-904 1262, for details.)

REGION 8 — RR D. N. T. Williams, G3MDO

Canterbury (EKRS)—23 September (Design of transistors), 21 October (Junk sale).
Dover (SEKYMCAARC)—Meetings held every Thursday, YMCA, Leybourne Road, Dover.
Eastbourne (SARS)—Meetings held on the first Monday in each month, Victoria Hotel, Latimer Road, Eastbourne.
Horsham (HARS)—1 September (Junk sale, to be held at "Swan", West Street), 4-5 September (VHF field day), 15 September (Informal), "Star", Roffey. Further details from the hon secretary, R. Polley, G3PYC.
Maidstone (MYMCAARS)—Club shack open Tuesday nights. Starting 3 September on the first and third Fridays in each month, 7.30pm. CW practice under G3ORH, 8pm; Basic radio theory by G3XUN and G3ORP. 10-24 September ("Contest operating procedure", by G3ORP).
Mid-Sussex (MSARS)—9 September (Slides and lecture by G3SYS). Meetings at Marle Place, Leylands Road, Burgess Hill.
Thanet (TRS)—17 September ("GM Dxpedition", by G3ZBF), 24 September (Mobile rally discussion), 1 October (Bring and buy sale).

Worthing (W & DARC)—Autumn season starts on 31 August at Rose Wilmot Youth Centre, Littlehampton Road, Worthing. Further details from G6KFH/T.

REGION 9 — RR J. Thorn, G3PQE

The AGM of the Royal Air Force Amateur Radio Society will take place on Saturday 18 September at RAF Station, Locking, Weston-super-Mare, in the Assembly Hall No 3 (T) Block at 2pm. The school training blocks will be open for viewing and refreshments will be available. The headquarters station G8FC will be operational from noon as a talk-in station and will also stage displays and demonstrations.

Have you a fire extinguisher in your shack? Think of the value of your gear to you, contact G3LVY for advice in this field.

Many other clubs and societies not listed below meet in Region 9 but no information is forthcoming on their events. If you have a PRO give him the job of notifying your events each month to the RR by the 1st of the preceding month.

Bristol City & County (RSGB Group)—27 September ("DX working", by E. Chambers, G2FYT), 7.30pm, Becket Hall, St Thomas Street, Bristol 1. *G3ULJ.*
Burnham-on-Sea (BOSARC)—For future programme contact J. Robertson, G3ZOR, 31 Lynton Road, Burnham-on-Sea, Somerset. Tel 2333.
Exeter (EARS)—14 September, Club HQ, Community Centre, St David's Hill, Exeter.
North Devon (NDRC)—8 September (Technical talk), 22 September (Natter night), "Grinnis", High Wall, Sticklepath, Barnstaple. *G4CG.*
Plymouth (PRC)—Tuesdays. 7, 21 September, Virginia House, Batter Street, Bretonside, Plymouth.
Saltash (S & DARC)—3 September (Technical talk), 17 September (Technical talk), Burraton Toc H Hall, 7.30pm. It is with great regret we record the death of our founder member and secretary for three years, Doug Bowers, BRS26760. He achieved great results with dx tv in the amateur field. *G3XWA.*
Torbay (TARS)—Meetings every Tuesday and Friday. 25 September (Technical talk "Frequency standards", by H. Green), Club HQ, G3NJA, Bath Lane, rear of 94 Belgrave Road, Torquay. *G3NQD.*
Weston-super-Mare (WSMRS)—3 September (Technical talk/film at Weston-super-Mare Technical College, Ground Floor Lecture Theatre, 7.30pm), 19 September (ORM in Main Hall).

REGION 10 — RR D. M. Thomas, GW3RWX

Blackwood (ARC)—Fridays, 7.30pm, Oakdale Community Centre, Mon. It is hoped that this, the start of a new session for the club, will see the return of many old friends and will become the focal point for new enthusiasts. *GW3TUG.*
Barry College of Further Education (ARS)—Thursdays, 7pm, Barry College of Further Education, Colcot Road, Barry. *GW3VKL.*
Cardiff (RSGB Group)—13 September, 7.30pm, BBC Social Club, Llandaff, Nr Cardiff. *GW3GHC.*
Glamorgan Raynet Group—Details of meetings and activities available from GW3ZFG. Tel Cardiff 62411.
Haverfordwest (ARS)—Tuesdays, 7.30pm, HQ Rosemary Lane, Haverfordwest, Pembs. Club callsign is GW3XZT. Hon secretary, GW3YBB.
Hoover (ARC)—Mondays, 7.30pm, Hoover Social Club, Pentrebach, Nr Merthyr, Glam. Hon secretary, Mr F. E. Tribe, c/o Club HQ.
Port Talbot (ARC)—Second Tuesday in each month, 7.30pm, Trefelin Club & Institute, Trefelin, Port Talbot, Glam. *GW5VX.*
Pontypool (ARC)—Tuesdays, 7pm, Educational Settlement, Rockhill Road, Pontypool, Mon. This club is extremely active and covers all aspects of the hobby, lectures, constructional projects and RAE. *GW3JBH.*
Pembroke (ARC)—Last Friday in each month, 7.30pm, Defensible Barracks, Pembroke Dock. Capt G. Courtney Price, TD, President of the club, has been licensed almost fifty years and the callsign GW2OP may be heard daily on one band or another. *GW3LXI.*
Sully & District Short Wave Club—Tuesdays, 7pm, The Annexe, Sully Bowls & Social Club, 59 South Road, Sully, Glam. Hon secretary, Mr Glyn Maggs, 3 Thorley Close, Cyncoed, Cardiff.
Rhondda (ARS)—16 September ("Two metre converters", by J. Ludlow, GW3ZTH, to be held at 8pm, Rhondda College of Further Education. Full details from GW3PHH). Club meets at Rhondda Transport Employees Club & Institute, Porth, Rhondda, Glam.
Swansea Telephone Area (ARS)—Tuesdays, 7.30pm, Telephone Engineering Centre, Gors Road, Swansea. Morse practice precedes the meeting at 8pm. Hon secretary Mr D. E. Connor, 7 Glanmon Road, Sketty, Swansea, Glam.
University College, Cardiff (ARS)—New students should contact the secretary at the Students Union during the first week of term.
University College, Swansea (ARS)—New students should contact the secretary of the radio society via the Students Union, University College, Swansea.

REGION 12 — RR G. M. Grant, GM3UKG

Special regional event—23-24 October, Official Regional Meeting, Aberdeen Beach Ballroom.
Aberdeen (AARS)—Fridays, 7.45pm, 6 Blenheim Lane, Aberdeen. *GM3HGA, telephone Aberdeen 33838.*
Inverness (IRS)—Thursdays, 7.45pm, 4 Falcon Square (nr Railway Station), Inverness. Miss A. Veith, Kilmichael, Drumnidrochit, Inverness.
Lerwick (LRS)—Thursdays and Tuesdays, 8pm, Annsbrae House, Lerwick. *GM3XPO, telephone Bixter 249.*
Lhanbryde (MFARS)—Wednesdays, 7.45pm, St Andrew's School, Lhanbryde (nr Elgin), Morayshire. *GM3UKG, telephone Clochan 225.*
Thurso (CARS)—Second Tuesday in each month. *GM3JUD.*

REGION 14 — RR N. G. Cox, GM3MUY

Ayrshire (AARG)—27 September, 7.30pm, YMCA, Howard Street, Kilmarnock.
Ayrshire (Ardeer Recreation ARC)—7, 9, 14, 16, 21, 23, 28, 30 September, 730pm, Ardeer Recreation Club, Amateur Radio Section, Stevenston. Details from J. F. McCreight, GM3DJS, 10 Auchenharvie Road, Stevenston, Ayrshire.
Falkirk & District RSGB Group—10 September, 7.30pm, Temperance Cafe, Lint Riggs, Falkirk.
Glasgow University (GURC)—Closed for summer vacation, see October issue for details.
Greenock & District (G & DARC)—3, 10, 17, 24 September, 7.30pm, James Watt Library, Union Street, Greenock.
Mid-Lanark RSGB Group—17 September, 7.30pm YMCA, Brandon Street, Motherwell.
West Scotland (ARS)—3, 10, 17, 24 September, 7.30pm, 81 Virginia Street.

REGION 16 — RR W. J. Green, G3FBA

Club secretaries are reminded of the general notes at the head of Club News regarding items for inclusion.

Ipswich (IRC)—Last Wednesday in each month, 7.30pm, Gippeswyk Hall, Gippeswyk Avenue, Ipswich. October meeting (Morse practice). *G3YWM.*
Lowestoft (LDARC)—8pm, YMCA Park Road, Lowestoft. Visitors especially welcome. *G3GNK.*
Norwich (NARC)—6 October (Demonstration of rtty by Roger Cooke, G3LDI), 13 October (Quiz—Quizmaster, Pat Gowen, G3IOR), 20 October ("Travelogue", by Bill Higgins, G3PNR, and Ken Brickham, G3RQY), 27 October (Demonstration by Tektronix Ltd (to be confirmed)), 7.30pm at the new headquarters, Crome Community Centre, Telegraph Lane East, Norwich, NOR 36T.

REGION 17 — RR C. Sharpe, G2HIF

Basingstoke (BARC)—Meetings on the first and third Saturdays in each month, 7pm, Chineham House, Shakespeare Road, Popley, Basingstoke Hants. *G3CBU.*
Fareham (FDARC)—Meetings each Sunday, 7pm, Porchester Community Centre, Fareham, Hants. *G3XIV.*
Maidenhead (MDARC)—6 September (Informal), 21 September (to be announced), 7.30pm, Victoria Hall, Cox Green Lane, Maidenhead. *G3VMR.*
N Berks (AERE, Harwell, ARC)—4-5 September (VHF NFD), 21 September (to be announced), Social Club, AERE, Harwell, Didcot, Berks. Also informal meetings each Friday lunchtime. *G3NNG.*
Reading (RDARC)—4-5 September (VHF NFD). 14 September (Every member bring a new member), 7.45pm, The Victory, The Meadway Precinct, Tilehurst, Reading, Berks. *G3NBU.*

MEMBERS' ADS

These advertisements are accepted free of charge as a service to members of RSGB. They must be submitted on the Members' Ads order form printed on the penultimate page of each issue of *Radio Communication*, or on a postcard similarly laid out. Each **must** be accompanied by a **recent** *Radio Communication* wrapper addressed to the advertiser, as proof of membership.

The closing date for each issue is the 7th 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 and should not be resubmitted.

Trade or business advertisements, even from members, will not be accepted for Members' Ads but should be submitted as classified or display advertisements in the usual way. The RSGB reserves the right to refuse advertisements, and accepts no responsibility for errors or omissions or for the quality of goods offered for sale.

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

No correspondence concerning this free service can be entered into.

See the current order form for further details.

FOR SALE

Lafayette KT320 gen cov rx (bfo req slight attention), £23.50. Grundig TK30 tape recorder with mic, £21.50. Stabilized psu, 200mA at 250V (variable) + 6·3V at 5A, £4.80. Pref buyer insp but would del locally. G4AFQ, 11 The Drive, Ashford, Middlesex. Tel Ashford (Middx) 54307 after 7pm.

Quality grey/green louvred 16swg steel equip cab, 26in tall, 15½in deep, 14in wide, £3. Mains trnsfmr 2040–0–2040V, 1500mA, ceramic terminals + usual primary, £3, or £5 the pair. Buyer coll or carr extra. Lepper, 128 Sheephouse Hill, Fauldhouse, West Lothian, Scotland. Tel Fauldhouse 433.

200 new 1% and 2% resistors, 5p ea or £2.75 the lot. Post free. Mann, 45 Old School Lane, Milton, Cambridge.

CR100/7 rx fully served and aligned, £17.50. Cossor 1035 DB scope, exc cond, £19. TF144G sig gen, 85kHz–25MHz, £17.50. RCA audio freq meter, 5Hz–50kHz, carr extra. Will del reasonable distance. Homer, 32 Ironmill Lane, Crayford, Kent. Tel Crayford 24625.

Heath vfo VF1U, 160–10m, £10. Wanted: Heath psu HW17–1 or sim. G3XBF, QTHR. Tel High Wycombe 29317.

R1155N rx, ok on phones but spkr op stage, needs attention, £3 Pyatt, 23 Arundel Drive, Orpington, Kent. Tel Orpington 20281.

KW2000A with ac psu, exc cond, not used, /M, £160. Can del 100 miles. Wanted: 9MHz xtal filt KVG XF913 or sim. G3XKA, QTHR. Tel Woking 3620.

Pair aluminium cubical quad boom end X arms £4. Pye PTC704 100–185MHz, tx/rx base stn and hndbk, £12. Heathkit HW100 hndbk, unused, 40p. Two pairs HRO i.f. trnsfmrs, 50p pair. G3MQY, QTHR.

Creed teleprinter desk grey steel single pedestal with drawer for psus, £10. G3UFU, QTHR. Tel 01-994 6931.

Heathkit aircraft vhf monitor rx, Model GR–98–L23·90, purchased late 1970, £18 ono. Set as new. Dawbarn, "Hellor", 8 Datlesford Close, Parkstone, Poole, Dorset. BH14 8DT. Tel Parkstone 3735.

Bound vols, several yrs RSGB Bull, *SWM, Wireless World, Practical Wireless, QST, 73, Electronic Engineer, Science Journal, Industrial Electronics*, best offers. G3LRM, QTHR. Tel Paulerspury 651.

SR550 rx, 160–10m, am/ssb/cw internal xtal calib, £25 ono. AR77E with manual, £15 ono. All letters answered, many other items, sae for list. Wanted: Creed 7B comp stn 45·5/50 bands. Also HP13A, 12V dc + VE earth or sim psu. G3ZMF, QTHR.

Hammarlund HQ180 rx, with integral 24hr clock, exc cond, £75. Woden 1200–0–1200V 300mA trnsfmr, £4. UTC Varimatch modulation trnsfmr, type VM3, 250W, £3 carr extra. G5BM, QTHR. Tel Gloucester 25415.

UNR–30 general cov rx, Codar PR30X preselector, both £14 ono, or sell sep. Issues of *Practical Wireless* from 1966, *Practical Electronics* from 1965 any offers? Can del rsnble distance. Horton, 3 Buncer Lane, Blackburn, Lancs. Tel 57981.

Star SR700A in brand new cond with manual + orig crate, £70. G2UZ, QTHR.

Heathkit 10-12U scope, £23. Buyer to coll. Rawlings, 7 Winchcombe Road, Twyford, Reading, Berks. Tel Loddonvale 5046.

/P Xray, demountable for car transport. Exch com rx or sell. Garex (new) 2m fet convtr with xtal. KW Top Band tx, mint cond, offers. Wanted: Heathkit vfo for DX40. G3FK, QTHR. Tel Broadstone 2631.

Endless tape unit, approx 250ft, tape recording head in metal case approx 4in by 6in by 3in, unused, 75p. Carr 36p. Kenny, 66 London Road, Kingston, Surrey

6 brand new bases for 3–20s or 6–40s, 35p ea. Also 4 Imhof 19in cabs, 15in high, £3 ea. Pref buyer coll. G8CIT, QTHR. Tel 01-979 3241, after 7pm.

Vanguard tx, 80–10m, needs alignment only. Full wiring circ and manual, £22, buyer coll. G3BU, 15 Abbeymead Road, Leicester. Tel Leicester 64265.

2m tx, 6W output, comp with psu, valves, xtal, £5. Valve voltmeter SE1 type BW211B with circ, needs adjustment, £2. Buyer coll or carr extra. Hughes, 22 Hall Park Street, Bilston, Staffs. WV14 ONG.

Oscilloscope CT52, 2½in tube, single beam exc cond, £10. Y amp 25Hz–1MHz, time base free running + single sweep etc. G3RCE, QTHR.

KW2000 ac/dc psus, alc, 400Hz mech filt for cw, 6146B, 2-speed agc + extra 21-28MHz xtals added, vgc, bargain, £125. G3LHZ, QTHR. Tel 01-352 0013.

AR88LF, vgc with manual + spare valves, £30 ono. Will del 50 miles from Wolverhampton. Cockrill, 39 Glen Court, Avenue Road, Wolverhampton. Tel Wolverhampton 29840.

Shure 444T, new, £12. Star SR700A rx, £70. 6AC7 + 6AG7 ,12½p ea. DA41 Osram, new, 50p. Stamp rely. G2UZ, 2 Cliff Road Gardens, Leeds. LS6 2EY.

NCX 5 Mk 2, mint cond, one owner and little used, £175. Morris, 3 Astley Road, Harwood, Nr Bolton, Lancs. Tel Bolton 52384.

2m omni vee, £3. Tunable field strength meter, £2 ono. Collaro turntable, 50p. G8DHO, QTHR. Tel 01-977 8888 extn 128.

AR88D + S meter and manual, mint, £40. Buyer coll. G3RNV, QTHR.

14AVQ vert trap aerial, almost new + radials and 100ft low loss 52Ω coax, £10 the lot. Fay, 14 Buttermere Drive, Allestree, Derby. DE3 25N.

Two steel lattice towers ex US army, one 28ft, £25; one 30ft, £35. Both in two sections ready to take away, galvanized self-supporting. Photo on request. G5DF, QTHR. Tel Reading 27876.

Panda Cub, £20. Heathkit scope OS1, £15. UHF valves QQVO6–40, C178A, QQVO3–20A, DET29, KS9–20A, CV2666, CV228 + base chimney for 4X150 series. Also 2in scope tube 2BP1, no rsnble offer refused, G3NXK, QTHR. Tel Tiptree 6265.

Heath SB200. Hammarlund 170A, factory fitted, 160m band, 24hr clock. Both mint cond, offers. G3TLC, QTHR. Tel Norwich 45244.

Three new 832As, £1pp. One 3BP1 tube + base, mu metal screen, 60p pp. 5ft by 19in mod rack on castor trolley with drawer + table, £6. Buyer coll. G3YPS, QTHR.

EA12, £150. Solartron CD711S lab scope with comp photocopy of manual, £80. Both items perf cond. Old Avominor, dc ranges OK, rest nbg, £2. Part exch or swops welcome. All del free. GW3UCJ, QTHR. Tel Briton Ferry 2376.

Property of late G3NKC: KW201, £60. Vanguard, £25. AR22, £15. Heathkit rc bridge, £5. 70cm convtr, £5. Z match with swr bridge, £5. Carr extra. Sae for full list. Eley, 1 The Uplands, Upper Gungate, Tamworth, Staffs.

BIAC KW2000A + ac psu, first offer over £140 accepted. GW3RVF, QTHR. Tel Cardiff 68166.

KW Viceroy Mk 4M, extra half lattice filt, new 6146B, built-in aerial relay DXCC, mint, £90. G3LWH, QTHR.

Electronic organ Selmer Minster, single manual, valve, oak cab, £75 or why. G3ZBZ, QTHR. Tel 061-437 1734.

HRO MX, gd cond, 6 general cov coils + bandspread coil for 160m, 6BW6 output with psu and l/s, £20. Pref buyer coll. G3XPV, QTHR. Tel Brentwood 7294.

Wayne Kerr sig gen, as new with calib sheets, model CT53 10–300-MHz, £12, inc carr UK. Hill, 19 Station Road, Tadcaster, York. Tel Tadcaster 2253.

Both units G2DAF/Squires Sanders Type. Rx no rf but 7360 mixers, tx table, 6hf5 final stage + rf speech processor. Above professional engraved panels. Buyer coll. £100 ono. G3HJK, QTHR. Tel 061-437 3045.

Tv aerial, band 1H, band 32 × 6ele yagis (Haywards Heath area). Mast, chimney lashing; coax, 3/5in copper tube (plumbing). Ritchie, The Old Cottage, New Place, Lingfield, Surrey. RH7 6EF.

Trio JR500S, mint cond, 6mths old, little used, £50. G3PNI, 17 Durban Road, Margate, Kent.

One to several min fifth overtone xtals, range between 58-87MHz. G3HUL, 45 Crown Road, New Costessey, Norwich, NOR 09K. Tel Costessy 3646.

Heathkit DX4OU with VF1U, vgc with manuals, £20. Also amateur bands minimitter MR44 rx, £22. All carr extra. G8WN, QTHR.

Eddystone 888A with mtchg S meter, spkr, hdpns, joystick, exc, £55 ono. Buyer must coll. Copping, 29 Sandygate Close, Marlow, Bucks. Tel Marlow 2815.

KW201 rx in mint cond, less than 25hrs use, £85 cash. Will despatch by Securecor, 48hrs del service. G3VUC, QTHR.

KW Victor, 10–80m, 120W am/cw, little used as new, £40 ono. Wilcox Gay vfo or QRP tx with manual, £3.50 + carr. G2FST, QTHR.

Solid state modules 2m convtr, 9-11MHz i.f., £10 ono. G8BKR, QTHR. Tel 0272 621498.

Swan 350, BC221-T with stab psu and charts, £145 the lot. Buyer coll. G3BZZ, 8 Derwentwate Gardens, Whickham, Newcastle on Tyne.

Heathkit GR78 rx, 3wks old, built as holiday task, perf aligned by freq meter and gen, cost £68, accept £60. G3XGP, 23 Chantry Road, Moseley, Birmingham 13. Tel 021-449 1048.

2m Pye base stn tx 6-40A pa, EL34 mod, £17.50. Trio JR60 gen cov rx with integral 2m convtr, £20. G8BPK, QTHR. Tel Aston Clinton 600.

Chesterman Vernier calipers, 7in by ·001in ·02mm, as new. Also 2C1 and homebrew 2m tx gear. G2CD, QTHR. Tel 01-590 4855.

Codar CR70A rx, mod bfo and S meter. HP1AM Bantam tx on 2m, rx needs aligning. 200W isolation trnsfmr. Electroniques gen cov valve quoilpax + i.f. trnsfmrs, etc. X79 valve. Offers. G8BZR, QTHR. Tel 01-504 4984.

New Sony video recorders with accessories, two only, £120. Rangers 6W and 15 W, £7.50. 2m txs, 30W rf output, ptt mike, attractive styling, fully metred, your choice xtal, £75. G3CXI, QTHR. Tel Bishops Cleeve 3834.

Trio JR310, extra 10AZ filt, SP5DS spkr, mint, £55. AR88D, vgc, £25. Grundig Satellit amateur 210, mint, £60. BC221 stab psu, correct book, £20. Bartlett. 5 Folly Square, Bridport, Dorset. Tel Bridport 2700 (evenings only).

Marconi rf sig gen type TF390F, £12.50. Pye fm uhf base stn tx, 70cm less QQVO2-6, £17. R1392 rx (with circ + modification det for 2m), £5. All plus carr. G8EBM, 31 Ellesmere Road, West Bridgford, Notts. Tel Notts 231933.

500V + 300V dynamotors with all cables to suit, 12V input, £4 pair brand new, ideal for vhf/P or field day, coll or + carr. Wanted: 144MHz convt 4–6MHz i.f. Sparks, 30 Withycombe Road, Penketh, Warrington. Tel Penketh 2044.

22 dural mast sections, 5ft by 2in ferruled, inc 13 brand new in canvas bags; six 2ft dural stakes, two dural base plates, £15. EDC rotary convtr in silence cab, dc/ac, 200W 230-240V, offers. Glenister, 37 Ashcombe Gardens, Weston-super-Mare, Somerset. Tel 28717.

W/S 29A and B s/u, never used, offers. Sutcliffe, 24 Medfield Street, Roehampton. Tel 01-789 4979.

14MHz ssb trnscvr, xtal filt, chassis, comps, 85 per cent built, see *SWM* Feb 1961, £7.50. 14MHz full-size 2ele beam, twin boom, robust, gamma match, with coax, £12 + carr. G3AIZ, QTHR. Tel 01-554 0984.

Telequipment 405 line tv waveform generator WG/44, £10. G3ZLJ, QTHR. Tel Wolverhampton 61339.

Selling Trio JR-500S comm rx covers 10-80m, exc cond £53 ono. Whitaker, 21 St Ronans Road, Harrogate, Yorks. Tel 86186.

Selling cheap: base for 813. 32MHz wideband i.f. strip for microwave rx. Heavy duty smoothing chokes. Instant heat soldering iron, as new. Wanted: Coax c/o switch for dc operation. G3KH 133 Station Road Cropston Leics. LE7 7HH.

Moving QTH: B40C, £18. EMI labscope, bargain, £30. G & D 2m cnvtr £7. D265W 2m cnvtr (needs attention), £5. Trnsfmrs rxs sae full list. Swop lot for HW17A or £60 ono. G3ZTS WSRS, 68 Grand Avenue, Worthing, Sussex. Tel Worthing 45010.

38ft sectional alloy mast, £12. Mast rotator, Selsyn indicator wall mounting bracket cables, £15. Heathkit gdo, £8. BC221 mains psu, £12. Part built psu, suit Heathkit trnscvr, £8. SWR bridge, £4. G3UBL, 7 Beamish Drive, Busheyheath, Herts.

Exceptional 813 tx, 150W, cw/am, 5ft 6in rack. Vfo/fds gang tuned, £20 ono. Del rsnble distance. GM2HCZ, QTHR. Tel Moniaive 345.

Panda Cub tx, 160–10m, gd cond for age, £23. G3VEH, QTHR. Tel Cambridge 58068.

EA12, £150. Solartron CD711S lab scope with manual, £80. Both in exc cond, del free. GW3UCJ, QTHR. Tel Briton Ferry 2376.

Sky Rover sw rx, suit swl, hardly used, £8. G8BPH, QTHR.

Heathkit DX100 and SB10 sideband adaptor fitted 160m low-power conversion, £60. Heathkit HW12A 80m trnscvr with dc psu, £65. KW77 ham-bands rx, £65. All absltly mint and ono. Would separate. G3SEL, "Wits End", Lower Odcombe, Yeovil, Somerset. Tel West Coker 712.

Labgear 160m twin tx, 1·8-2MHz am/cw £9. Gibson "Suvorov" Bush Dungannon N. Ireland.

Circ notes and diags for R1475, 75p + large sae. R1392 psu and af amp £10. Buyer coll. G3ZZY, 61 West Street, Tavistock, Devon. Tel 2827.

25W boot mounted Pye Ranger 6/40A final wkg on 70·26MHz, comp with control unit, cables, ptt mic, xtals etc, £15. Also TW 2m convtr (valved), £7.50p. G3UUM, QTHR. Tel Nelson 63018.

Heathkit DX100U and SB10 with manuals, £55. DX4OU, vgc, £15. K102 bug key, £2.50. Pair of new 4CX250B 2C39 valves, offers. Wanted: KW1000 linear. G3XVF, QTHR. Tel Norwich 56782.

AVO 8 Mk 3, cost £36 mint, offers. Coil 15yds 75Ω twin feeder. Heathkit HM11U power meter. 7MHz xtals. Hallicrafter R-47 spkr. Sae details. Offers. G3BRT, 10 Burlington Road, Bristol 6.

Base for 813, 75p. Silicon coax diodes for microwave rx. 32MHz wideband i.f. strip. Wanted: coax c/o switch. New 4CX250B. G3KH, 133 Station Road, Cropston, Leicester LE7 7HH.

KW2000B ac psu, immac, used, only 3 mths, £195. Could del. Collins mech filt, 250/6·7, £4. Mains isol trnsfmr, 200W, £5. G4AAS, ex BRS22950, Sungalow, Lindale, Grange-o-Sands, Lancs. Tel Grange-o-Sands 3081.

80-10m tx, 120W, am/cw, sim to Vanguard, t/top with sep psu (5 meters in all), £18. 160–80m tx in case, £5. Quad spider, rotating base pole, £5. Umpteen comps, cheap. G3VFG, QTHR. Tel Leeds 57692.

HRO 11 coil packs, inc 4 bandspread packs, stab psu, spare set of valves, vgc, £23. B44 Mk 3 on 4m, tunable rx, £7. All ono. G8EEJ, 51 Bridge Court, Edgewood Close, Old Hill, Warley, Worcs.

HW100 trnscvr, £90. Homebrew psu for HW100, £10. 50 core telephone cable useful for hook-up wire 7p per yd. Carr extra. Wanted: HW17 or 17A or sim, wkg or faulty. G3RUD, QTHR. Tel Coleshill 62222.

B40, fair cond, £12. 52 Set, psu, manual + spare valves. £7. Hamgear PM2, new, £4. Wanted: S meter for AR88D 5mA zero deflection to the right, your price. Bovingdon, 6 Roberts Lane, Chalfont St Peter, Bucks.

KW2000A, mint cond, recent realign by makers, psu, spkr, £160 no offers. G3DRF, QTHR. Tel Byfield 464.

KW2000A, dc psu 12V, chassis, with circ, £25 ono or exch with vhf equip. G3XXN, QTHR. Tel Worksop 730128.

R298 rx, gd cond range 10-160m in 3 steps, 6V dc or 240V mains,

comp with batt lead and spare valves, £10. Rutland, 23 Farndale Crescent, Greenford, Middx. Tel 01-578 3672.

Trio 9R59DE rx, vgc, £35. Oscilloscope 1mV sensitivity X, Y, Z mod, £10. Hammersley. 5 Rymers Green, Formby, Liverpool. Tel Formby 75988.

SX 28 rx, 550kHz to 43MHz, clean cond, gd order with some spare valves + manual, £15 buyer coll. Clinch, 29 Forster House, Whitefoot Lane, Bromley, BR1 5SD.

Rotator or prop pitch motor. *SWM* July 1946, Jan 1952. *Bulletins* 1943-60. Class D wavemeter, modified ac, less xtal. Many tx bottles and various xtals. Sae for list—all cheap. G3FRB, QTHR. Tel Swanley 4625.

Creed 7B, overhauled, perf with loop supply, £15 ono. G3VNC, QTHR. Tel Hertford 5515.

KW2000B with ac psu and 1pf ptt mike, £175. Buyer coll. G3TUX, QTHR. Tel 01-428 4481.

BC221-AK modulated, carrying case, manual, psu, immac, £23. Frequency meter W1191A, uncnvrtd, £3. Telephony Vol 1, Vol 2, £1.50 ea. Transistors Kinver, £1.50. All items + carr. Wanted: Q mult noise blanker suit Drake 2C. GW3ZNN, QTHR.

Eddystone 888A rx + KW Viceroy Mk 3A tx, offers. Buyers coll. G3TGK c/o IBM I.S. Ltd, Dept 5301, PO Box 11, Havant, Hants.

HA350, mint cond, £40. Will exch Cossor 339 db scope for Avometer types 40, 7 or 8. G2HFI, 18 Newlands, Langton Green, Tunbridge Wells, Kent. Tel Langton 2647.

Trnsfmrs, mains input 14V 12A twice, £2 ea. Selenium rectifiers 12/24V, 50p ea. Collect. Wanted: Command rx BC455 any cond. G3BSW, QTHR. Tel Ascot 20992.

CV2160 rectifier 40kV 350mA, £2. RF24B, 20, 15, 10m cnvtr + circ diag, £1.50. Transistors: 2G302, 10p; 2N1100, 50p; V30/ 20p-50p. Transducer IT1-4F, -7·5-+7·5G, £2. 500V ac meter, new, 75p. Vhf atu No 6, exc cond, £2. Valves DF91, DAF91, 12J5, 15p. EL91, 6C4, 20p. 9D6, DL92, 25p. EL42, DL94, 30p. 832, £1.50. Manuel, 1 Wilmington Avenue, Orpington, Kent. BR6 9BJ.

Empty tobacco tins 3¾in by 2¼in by 1in, 4p ea post pd. Airmec 830 scope, £5 ono. Buyer coll. G3UNU, QTHR. Tel 0602 56101 extn 2851.

Murphy TR821 2m trnscvr, integral transistorized psu, 12V ps/neg earth, single channel xtal with simple convrsn to 5 channel, wkg order with spare mic, ideal /M /P RAEN, £20 ono. Hyde, 20 Avenue Road, High Kelling, Holt, Norfolk. Tel Holt 2192.

HA350 with calib xtal, gd cond, £35. G2HKW, QTHR. Tel Chandlers Ford 5566.

50W a.m. prof 2m + 4m txs, mains operated in 19in cab, comp with mike, vgc £50 ono. Levell 1·5Hz-150kHz generator TG150M, £12.50 ono. Parry, Chadwich Heights, Chadwich, Bromsgrove, Worcs. Tel 021-453 3693.

Exciter for 80, 40, 20 cw tx. G5RV with masts, stanchions, atu, morse oscillator, relays, trnsfmrs, chokes, keys, *SWMs*, books. G3VDG, QTHR. Tel 0922 51377.

2m tx, 25W am, £17. HRO + psu, bandspread coils, £22.50. Three 19in cabs, part exch for /M rx. Pref buyer coll but will del rsnble distance. Wanted: af sig gen. G8EDN, 24 Sunnybank Avenue, Coventry. CV3 4DQ. Tel Coventry 301494.

Practical Wireless, Dec 1943 to Aug 1970; *Bulletins*, March 1958 to date. Almost complete runs. Offers. Wadhams, 40 Oakway, Grays, Essex. Tel 0375 71386.

4X150A + base and chimney, £6. QQVO3-20A, brand new, £1.25. Pair 10m trnscvrs, range im, mint cond, £10. Eddystone 898 drive, £3.50. Oscilloscope crt, type 3RP7A, £2. GI3YMY, QTHR. Tel Belfast 56034.

Yaesu FT200 trnscvr with mike and extra xtal for 28MHz, used 6hrs only £125 ono. Pair 1·4MHz usb and lsb xtal filts with carrier xtal, £10. G3NGK, QTHR. Tel Beaconsfield 3109.

Murphy B40C hndbk hdphns spkr, gd cond, £25. Buyer coll. Cleaver, 86 Main Road, Dovercourt, Harwich, Essex. Tel Harwich 2195.

CR100/8/mod S meter, noise limiter, £18. G3USZ, QTHR. Tel Upminster 23699.

4X150As, £1.50 ea, four for £5. Set of 7 Fibreglass ST-6 boards 170/850Hz, £4 per set (with constrctnl det). G8DJF, QTHR. Tel 0494 30043 (after 7pm).

Top Band /M tx/rx, psu etc, £6.50. G3SIK, QTHR. Tel 01-803 3111.

KW Valiant, psu (mains). CR100 + extras. Offers to sell together or sep. GW3YVQ, QTHR. Tel Cardiff 561577.

Trnsfmr 30V 3A + 10V 2·2A, tapped primary 240V, brand new £1.25. Geared motor Parvalux, 240V 200rpm with pullies for lowering speed for beam rotator, £1.50, compact, brand new. G3YYG, QTHR. Tel Hemel Hempstead 57547 (after 6pm).

BC342N rx in gd cond but requ external psu, £12 ono. Pref buyer coll. Also six transistor two waveband radio with leather case, gd cond,£3 ono. G3ZDG, 28 Silver Birch Road, Kingshurst, Birmingham 37. Tel 021-747 3513.

2m 14ele parabeam, unused, £8. 10m + 4m convtrs, 2MHz i.f., £2 and £4. Large mains Variac, £2.50. Xtals: 1841, 1962·5, 50p ea. Valves: HK54, 813, TT15, £1 ea. G6NB, QTHR. Tel Whitchurch, Bucks 508.

Kelvin Hughes psu, 18 valves, outputs 350V, 500V, -150V stabilized. Trnsfmrs 920-0-920, 630-0-630, 35-0-350 high current rating. Several 6·3 2A o/ps 19in rack mounting totally enclosed. As new with circ, £15, pref buyer coll. G3WWL, QTHR. Tel 021-373 2121 extn 2635 wkg hrs.

70cm hi power pa, blown cavity, wkgs with 10W mod drive hi volt supply not inc, but otherwise comp with valve, £18 or swop 70cm cnvtr. G3OWB, QTHR. Tel 0223 59127.

KW2000B fitted 6146Bs + prof aligned, mint cond, £195 cash. Buyer must insp and coll. No offers. G3VFO, QTHR. Tel B'ton 684659.

Cossar 343 wobbulator with manual, £4.50. Hustler 4BTV 5 band vertical comp with radials, £22.50. 30ft sectional tubular steel mast, £4.50. 2 MU22806 magslips, £2.75. Del Kent, Surrey, Sussex. Offers consd. G3AFC, QTHR. Tel Longfield 2691.

Creed 7B teleprinter, £10. Terminal unit RB/150/2, £15. HRO mx with 9 gc coils, rebuilt, £25. KB tape recorder, as new, £18. All are ono and in gd cond. Callers after 6.30pm. Eccleshall, 73 Piggotts Way, Bishop's Stortford, Herts.

Codar CR45, rsnble cond with coils, hdphns, ldspkr, no exact vfo but has spares. Will del within 30 miles. Wivell, "Greycote", Eleventrees, Keswick, Cumberland. Tel 0596 72400.

Klystron CV323, £2. G-whip, 180-80, £5. Codar 12m/s, £7. 12/RC, £1.50. *SWM* June 1965, Oct 1970; *Radio Communication* July 1966, Dec 1970; *73* April 1970, Jan 1971. Offers. G3WGF, QTHR. Tel Hastings 7493.

Walther 22 match rifle, KKM model, 4lb trigger, quick change 12oz new sights, £40 or exch EC10 or built Microwave Modules 2m ssb tx. Why, vhf or uhf. G8CBZ QTHR.

Adni unit radio altimeter, £1.50, scanner type 83, 10cm 24V drive motor, 75p. Tx No 18 Mk 3, 50p. No 19 Set tx/rx with control unit less phns and psu, £2.50. Clubb, 38 Clunie Road, Dunfermline, Fife Scotland. Tel Dunfermline 0383 22664.

B40, vgc, £16.50. Solartron D300 scope, £15. Marconi pict + waveform monitor BD627, £6. Psu to suit, 300V at 500mA stabilized + heaters, £5. Labgear modulator, pair 807s, £4. Strobe unit, £5. G8AYN, 32 Ironmill Lane, Crayford, Kent. Tel Crayford 24625.

AR88D orig S meter, micro to keyer teleprinter gear. Sae details. G3LDI, QTHR.

UM3 modulation trnsfmr, £5. 1600-0-1600 300mA trnsfmr, £5. Two 813s and bases, £2.50 ea. Rf choke, 1A £1. Comps for linear, £1. 2,500V 1μF capacitors, 40p ea. Buyer coll pse. G3ZOJ, 54 Nightingale Place, Woolwich, London SE18.

Heathkit sig gen RF-1U, factory aligned with manual, new, £10. Class D wavemeter, phones and manual, £5. Buyer coll. Wanted: HE30 rx or sim, fb cond essential, will coll 20 mile radius. G3WXT, QTHR.

Minimitter top 2-7 tx, perf cond, covers 1·8, 3·5, 7MHz cw/am, £15. Set of five panel mounting meters, two each 0-10mA 0-200mA, one 0-10V ac, £2.50. Many other items, list available. G2DC, QTHR. Tel Ringwood 3962.

Quad for twenty only, comp with 8ft boom, bamboo spreaders, fits 2in mast, complies NFD rules. Buyer coll or carr extra, £12 ono. G8CSC, 23 Aldersmead Road Beckenham, Kent. Tel 01-778 9290.

Heathkit RA1 rx with product detector, covers 180-10m with 1·6MHz i.f., £25. G3ZRD, 30 Merlin Grove, Beckenham, Kent. Tel 01-650 7801.

G3IAS type electronic key with built-in psu and new Japanese paddle, £7.50. Yashica D camera with case and filt, as new, £18 or

exch 2m gear. Selling xtals, sae list. G3AUU, QTHR. Tel Taunton 83816.

Heathkit GC1U Mohican 3 yrs old, little used, £25, telephone only. G3MYY, QTHR. Tel Farmland 2841.

150W a.m. tx, mod, psu, filt, freq meter, control unit, Top Band rig, 100kHz unit and other gear, many valves etc. Best offer over £10. G3KIA, 1 Springfield Road, Holcombe Brook, Ramsbottom, Tel Tottington 2297.

KW Vespa Mk 2 6LQ6 alc, 1st class cond, £90. Two Hitachi 6LQ6, £4.50 pair. Sae spare valve lists. KW 201 rx, £75 ono. G3YBK, QTHR. Tel Exeter 78710.

Minimitter tx. HRO comp bs psu with preamp, instrctn book, spare valves + extras, two spkrs, all wkg well, WAC etc, £70 or offer, would split. Going abroad, must sell. G2AKT, QTHR. Tel 01-445 4860.

CR100/2, gd cond, pvc wired, resprayed, £14, + £1 carr or coll. Also small homebrew ic el bug with iambic facility, £8.50. G3WXS, QTHR. Tel Andoversford 439.

JXK 70cm cnvtr bi-polar type, 12-14MHz out, hardly used, £10. G8ATC, 29 Blenheim Gardens, Southampton. Tel 59122 extn 2268.

40ft tower, f and l pitch prop motor, cowl gill motor and Selsyns Hammarlund exciter, HX-Fifty 160–10m power amp. G6VX, QTHR. Tel Painswick 3285.

Quality recording tapes, seven 5½in reels of 1200ft lp and 15 5in reels of 900ft lp, £8 or offers. Carr extra. Shirley, 22 West Heath Drive, Golders Green, London NW11 7QH. Tel 01-458 6577.

Trio JR310 rx, 2·7kHz filt, xtal marker, Top Band, £65. Morse records, £2. RSGB 450ft morse tape, 50p. Alexander, 52 High Street, Bottisham, Cambridge. Tel Bottisham 404.

Minimitter tx, 10-80m, £17.50. Will del 40 miles. South Manchester Radio Club, c/o 16 Tanyard Drive, Haze Barns, Altrincham, Cheshire.

Woden 1500V ct and 650V ct trnsfmrs. 2·5V 10A fil trnsfvrs. Woden chokes. 2500V smoothing condensers. Rack tx 6V6–807–811s and vfo. Large number valves inc 811s, 807s, 866s, RG240As. Psus and misc equipment. First offer over £50 secures the lot. G5BZ, QTHR.

G2DAF type rx, cw mech filt, £12.50. HB ssb tx, 50W 160m/10m transistor except pa, £10. Xtals: 59·8725, 46·7, 41·11, 39·74, 23·458, 14·429, 14·1, 12·645, 10·821, 8·782, 8·771, 8·375MHz, 30p ea. G3WFM, QTHR.

Codar CR–70A homebrew Q mult, PR30 preselector, £18 the lot + carr. Also PR30X self-powered version of PR30, £5 + carr. Chapman, 36 Ploughmans Lea, East Goscote, Leics. LE7 8ZR. Tel Syston 4652.

Taylor 45A valve tester with instrctns, convtd for 7 and 9 pin valves, 31 Set trnscvr, 39-48MHz batt operated, £1.50. 38 Set trnscvr with 12V /M psu, 7-9MHz, £1. All gd cond. G3YYG, QTHR. Tel Hemel Hempstead 57547 (after 6pm).

Lafayette HE30 rx, £20. G2DAF tx, £35. Marconi CR300 rx, £20. Trnsfmrs, capacitors, chokes, valves, xtals, spkrs, shelving, coax, aluminium tubing, Lektrokit audio filt etc, all going cheap. Buyers insp and coll. G3VUT, QTHR. Tel 01-550 9300.

Bendix RA1B comm rx, 6 w/bands, 150kHz-15MHz, compact and in exc cond, £10. Det sae. G2CST, 5 The Ashes, Glossop, Derbys.

Codar CR70A comm rx, covers 540-10m, comp with spkr in cab, 11mths old, £18 ono. Penton, 1 Oaks Drive, Cannock, Staffs.

Class D wavemeter, mains, hndbk, £6. GEC miniscope, hndbk, £10. GDO TE–15, new, £11 boxed. GEC miniature xtal calib, £6. Hammarlund rx, 1004, fair, psu, £7.50. Post free sent, or coll. G8DVZ, QTHR.

Radio Communication Aug to Dec 1969 inc + *Practical Wireless* Jan 1970, 75p, post inc. GI3YMT, QTHR. Tel Belfast 644688.

A.M. tx with 813 pa, Labgear and Woden comps, comp with mod and psu, no rsnble offer refused. Pair Selsyn type motors, suit for ant beam rotator, £5. G3FDS, QTHR. Tel Epping 3128.

Pye Rangers, Hudson AM108s, hi band, unmod, from £4. Assorted equip, spares. Sae list. G3VZI ex G8BVI, QTHR. Tel Cheddington 684.

New cable, 12-way 1A (for Ham-M), 20p per yd. 75Ω unused heavy coax, 8p per yd. 14g bare copper wire from aerials, 50p per lb. Sae for samples. Willcox-Gay vfo, £3. Pse add for post. GD3TIU, QTHR. Tel Marown 442.

Heathkit ssb adaptor SB-10U, fully operational, comp leads + instruction manual, £18. Garrard record player deck mod 301, transcription motor with manual, template + strobo patterns 33·45·78, vy fine cond, £4. G3UVS, QTHR, Tel Yelverton 2986.

AR88LF in wood carry-case, gd wkg order, matched spkr, phones, circ diag, £18. Buyer coll. G8BNA, 30 Harlow Avenue, Harlow Hill, Harrogate. Tel 3802.

Nixie tubes, end read-out, four for £2. G3WMS, 266 Brockles Mead, Harlow, Essex.

WANTED

Info (circ and mods) on rx Type R209 Mk 2, post pd + costs met. Tanton, 65 Edmund Road, Hastings, Sussex.

Instruction book for Marconi rx type AD888 2B. G3DTB, QTHR.

Hndbk or circ for Hallicrafters rx type SX16 (Super Skyrider). G4ADJ, 1 Marlborough Street, Worcester, WR5 2JS. Tel Worcester 22089.

Purchase manual for Cossor 1035 Mk 2 scope. For sale: Pye reporter, high band, comp with hndbk, £10. Heathkit oscilloscope, £10. G8DJX, QTHR.

Borrow or buy April-May 1967 *Radio-tv experimenter*, USA mag. Locke, 97 Snoots Road, Whittlesey, Peterborough, PE7 1NU. Tel Whittlesey 3447.

Manual on Murphy Admiralty type B40, purchase or borrow to copy, also 500kHz xtal for calib. Smith, Ravenscourt, Sawyers Hall Lane, Brentwood, Essex. Tel Brentwood 270.

Manual/circuit or any info on BC625A (T5017), buy or borrow. Dunnett, 7 Weston Avenue, Leighton Buzzard, Beds. LU7 8QY.

EC10 for rebuild, must be mechanically complete with rf tuning comps. Why. (cheaply). G8DMN, QTHR. Tel 01-904 7807.

Service sheets + circ diags for Marconi CR300/1. State price. Robertson, 48 Bunbar Road, North Berwick, East Lothian. North Berwick 2334.

Electroniques i.f. amp modules, types Mk 1 and 2. Baxter, 71 Long Grove, Baughurst, Basingstoke, Hants.

Buy or borrow January 1968 *QST*. Laverty, 231 Connaught Road, Luton, Beds. LU4 8ET.

Cathode ray tube E-4103-B4 for GEC miniscope. G3AOK, QTHR. Tel 01-644 3545.

Hi-band Ranger, cnvrtd for 2m or not, but must be cheap, for student. Also 6ele beam. G8DRJ, QTHR. Tel 066-574 615.

Gearbox for AR88. G3UPC, QTHR.

March 1964 *QST* or borrow to copy and return. Will pay up to 50p. Smith, 46 Evington Parks Road, Leicester. LE2 1PR. Tel 737977.

Electroniques i.f. module type IFA/1.6/ssb, Mk 2. G3TNB, QTHR.

Manual for AR88LF, buy or borrow. Info on rx R4178. Xtal for low band Ranger tx section. G4ADE, 276 Oxford Road, Gomersal, Cleckheaton, Yorks. Tel Cleckheaton 5016.

23cm cnvtr, gd price pd for efficient instrument. Nicholls, 1 Alford Road, Brislington, Bristol BS4 3HS. Tel 0272 77348.

HRO comp with coils for all bands, also AR88D rx in gd wkg order. All band am/cw tx either commercial or gd homebrew. Collection probable. G5YV, 8 Ashfield Avenue, Morley, Leeds. LS27 OQD. Tel Morley 7412.

Circ diag of Hallicrafters S27. Paxton, 112 Hiltingbury Road, Chandlers Ford, Hants. Tel 04215 5015.

Tops CW Club newsletter *QMF*, any before June 1950 and quarterly issues, May and Sept 1951 and Jan and May 1952. Buy or borrow for copying. G3IDG, 96 George Street, Basingstoke, Hants.

Buy or borrow manual or circ for Furzehill 1684N scope. Collins, 65 Bodmin Road, Springfield, Chelmsford, Essex. Tel Chelmsford 50877.

Damaged DX1OOU or parts any tx or rx, any cond, anything useful for school club stn—must be cheap. Field, 2 Hobbes Walk, Dover House Road, Roehampton, London. SW15 5AQ.

Sphinx, Cannonball, Vespa, or any ssb tx with 160m. Det pse. Kenyon, 6 The Avenue, Knaresborough, Yorks. Tel Knaresborough 2715.

HW17A cw dc psu. HW32A cw dc psu. G3ZZS, 148 Churchway, Weston Mill, Plymouth, Devon. Tel Plymouth 31707.

Ac psu type 6211/A for Redifon radiotelephone GR410 (service type SR C14). State price. Capt Taylor, G SD Branch, HQ 1 (BR) Corps, BFPO 39. Tel 01049-5202 3124.

Bandspread and If coils for HRO also two new 813s. G3MPN, QTHR. Tel Wym 3382.

2 6C26 and one 5763 valves to comp 2m tx. G8DZH, 9 Albion Hill, Loughton, Essex. Tel 01-508 3434.

Five American tubes (valves) type UV201-A and or C301-A. Top price paid or swop for WW1 gear. Also rx circa 1923-4 and horn spkr. £5 offered for bound *WW* 1922. Neale, 11 Pine Drive, Wokingham, Berks. RG11 3LD. Tel Eversley 2626.

TA33jr also buy or borrow to copy hndbk etc for Cossor scope Model 1039M, Mk 2. Dobson, 29 Hobgate, York. YO2 4HE. Tel 0904 78409 (after 6pm).

T1154 tx, unmod pref with connectors, det and price to Dunsmore, 2 Glenmavis Drive, Bathgate, W Lothian.

Buy or borrow service manual for Cossor tx/rx CC14PBW6. Clark, 31 Barnhill Gardens, Marlow, Bucks.

Hndbk for W1191A wavemeter, also xtal for same. Need mech filt for 690kHz 2·4kHz or why. G3KBI, 12 Skelton Road, Brotton, Saltburn by Sea, NE Yorks. Tel Brotton 312.

75Ω swr indicator meter by KW or Heathkit, in gd wkg order. GW8CGH, 2 Penprisk Road, Pencoed, Glam. Tel Pencoed 444.

BC342, Heathkit HW17A, also manuals for 80W 1/w charging set. Pye T/R 2102 and *Ham Radio* Feb 1969 to photo and quick return with post refund or buy. G8AAG, QTHR. Tel 0734 883611.

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Bulletin October 1967, gd price pd for a clean copy. G3YJI, QTHR. Tel Walton on Thames 23228.

Burgess silence cover for Creed 7B teleprinter. G8DDW, QTHR. Tel 01-858 3921.

Alignment details for Interceptor rx. Biddick, 7 Harrow Drive, Brooklands, Sale, Cheshire. Tel 061-962 6634.

HRO in gd cond, state price and coils. GC2FZC, QTHR.

Practical Wireless Jan, Feb 1966, Oct 1968; *Practical Electronics* May 1965, Sept 1966, Jan, June 1967; *SWM* Jan—June 1967, Nov 1970; *Radio Communication* March, May 1968; *Practical Television* Feb—Dec 1968, Sept 1969, May, Dec 1970. Tanswell, 5 Cavendish Close, Hayes End, Middx. Tel 01-561 7205.

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Info or circ for Ekco tx/rx, type CE63, small qty WG16 waveguide. G3THW, 19 Rosemary Cresc West, Goldthorn Park, Wolverhampton WV4 5AP, Tel W'hampton 33686.

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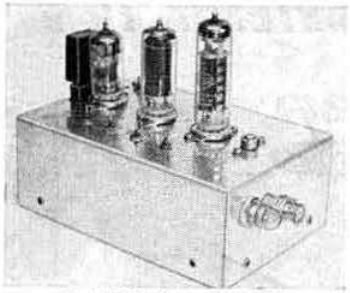

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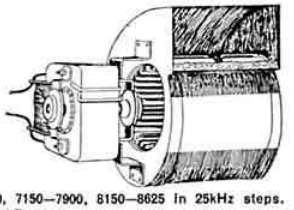

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CRYSTALS	8002, 8002·08, 8002·16, 8081·25, 6001, 6009, 6016, 6024, 6031, 6039, 6046, 6054, 6076, 11764, 8820, 8837, 7816, 7833, 7850, 7002, 7005, 7010, 7017, 7032, 7047, 7054, 7077, 7092, 7099, 7127, 7129, 7270, 8007·4, 8007·69, 8029·4, 8035·3, 8045, 8090·7, 8105·45, 6010, 6021, 7060, 7080, 7090	each **£1**

BAGINTON ELECTRONICS

(G3TFC)

MARKET CORNER, BAGINTON, WARKS. CV8 3AP

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CLASSIFIED ADVERTISEMENT ORDER FORM

Advertisements should be prepaid. Private rate 5p per word, minimum £1. Box no. 15p extra, which includes forwarding replies.

Words comprising name and address or callsign should be counted for advertisements not requiring a box number.

Trade advertisements should be submitted by letter.

Remittance £.....

Classification (for sale etc)

.....

Box No. Yes/No

Please insert this advertisement in Radio Communication. **(BLOCK CAPITALS PLEASE)**

				£1 (min)
				£1·20
				£1·40
				£1·60

NAME .....

ADDRESS .....

.....

.....

DATE..... *SIGNED*.....

POST TO SAWELL & SONS LTD., 4 LUDGATE CIRCUS, LONDON, EC4

MEMBERS' ADS ORDER FORM

Please type or print in block letters

Tick classification

For Sale ☐

Wanted ☐

Callsign | **QTHR** |

or Name and address

Telephone number

Date..... *Signed*..... *Callsign, BRS or A No*.....

The number of words in each advertisement must not exceed 32 not including name and address or callsign and QTHR or telephone number. Four pages of each issue are allocated to Members' Ads at present, and in order to include as many advertisements as possible licensed members are requested to give their callsign and QTHR instead of their name and address. (QTHR means: "My address in the current call book is correct"). Also to conserve space, please keep advertisements as brief as possible. They will be edited to conform to a set style of abbreviations, so it is unnecessary to submit them in abbreviated form.

Conditions under which Members' Ads are accepted are published on the first Members' Ads page of each issue. Do not forget to enclose a wrapper as proof of membership.

POST TO MEMBERS' ADS, RADIO COMMUNICATION, 35 DOUGHTY STREET, LONDON WC1N 2AE

INDEX TO ADVERTISERS

Radio Society of Great Britain

FOUNDED 1913
INCORPORATED 1926

PATRON H.R.H. THE PRINCE PHILIP
DUKE OF EDINBURGH, KG

APPLICATION FOR CORPORATE* OR ASSOCIATE* MEMBERSHIP

RADIO SOCIETY OF GREAT BRITAIN,
35 DOUGHTY STREET,
LONDON WC1N 2AE
Tel 01-837 8688
Giro A/C No 533 5256

* I hereby apply for election as a Corporate Member of the Society and enclose a remittance for £4 being the amount of my first annual subscription.

* Being under 21 years of age and not holding a current Amateur Radio Transmitting Licence I hereby apply for election as a Non-Corporate (Associate) Member of the Society and enclose herewith a remittance of £2 being the amount of my first annual subscription.

, the undersigned, agree that in the event of my election to Membership of the Radio Society of Great Britain, I will be governed by the Memorandum and Articles of Association of the Society and the rules and regulations thereof as they now are or as they may hereafter be altered; and that I will advance the objects of the Society as far as may be in my power; providing that whenever I shall signify in writing to the Society addressed to the Secretary that I am desirous of withdrawing from the Society I shall at the end of one year thereafter after the payment of any arrears which may be due by me at that period be free from my undertaking to contribute to the assets of the Society in accordance with Clause 8 of the Memorandum of Association of the Society.

Date _____ Signed _____

PERSONAL DETAILS TO BE COMPLETED BY APPLICANT

SURNAME (BLOCK LETTERS) _____

CHRISTIAN NAMES (IN FULL, BLOCK LETTERS) _____

ADDRESS FOR ALL CORRESPONDENCE (BLOCK LETTERS) _____

_____

NATIONALITY _____ *AGE (IF UNDER 21)* _____

CURRENT CALLSIGN (IF ANY) _____

DETAILS OF PREVIOUS MEMBERSHIP (IF ANY) _____

DETAILS TO BE COMPLETED BY THE PROPOSER†

I WISH TO PROPOSE _____ *FOR *CORPORATE/*ASSOCIATE MEMBERSHIP*

PROPOSER'S NAME (BLOCK LETTERS) _____

ADDRESS (BLOCK LETTERS) _____

CALLSIGN (OR BRS NO.) _____

SIGNED _____

* Please delete where inapplicable.
† If the applicant is not acquainted with a Corporate Member willing to propose him for election he may submit a suitable reference in writing as to his interest in Amateur Radio.

The first subscription should be enclosed with this application to avoid delay.

FOR OFFICE USE ONLY

APPROVED BY COUNCIL _____ *BRS OR A No. ISSUED* _____ *FIRST SUB. PAID* _____

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RSGB

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VHF Manual	£1·38

CQ

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Antenna Roundup Vol. 1	£1·46
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RSGB De-Luxe Log	£1·41

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QRA Locator Map (Western Europe) *(on card)*	10p
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MEMBERS ONLY

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Car badge (RSGB or RAEN)	70p
Callsign car badge (RSGB) *	£1·25
Callsign car badge, de-luxe (RSGB or RAEN) *	£2·19
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Tie bar (RSGB emblem)	28p
Radio Communication Easi-binders	£1
Car window sticker (RSGB or RAEN). (No adhesive required)	9p
Member's headed notepaper (50 sheets) quarto	33p
octavo	20p

*delivery 4 to 6 weeks.

Prices include postage and packing except where stated. Stamps and book tokens cannot be accepted.

35 DOUGHTY ST.,
LONDON, WC1N 2AE

Printed in Great Britain for the RADIO SOCIETY OF GREAT BRITAIN, 35 Doughty Street, London WC1N 2AE
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