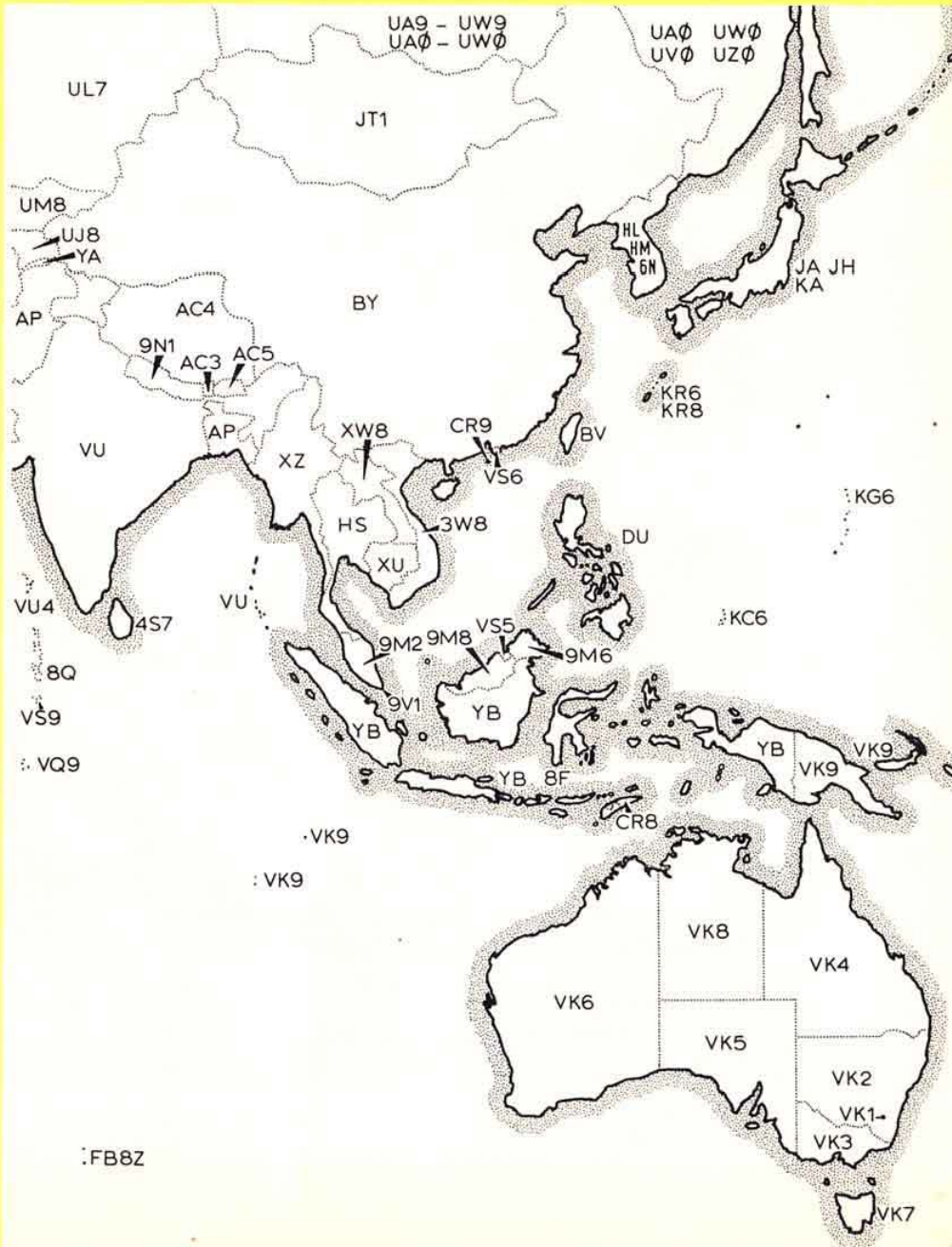
radio communication

July 1971

Journal of the Radio Society of Great Britain



July 1971

radio communication

Volume 47 No 7 Price 30p

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Radio Communication **(incorporating** *The RSGB Bulletin***) is published by The Radio Society of Great Britain as its official journal and is posted to all members of the Society on the first Tuesday of each month**

Contributions and all correspondence concerning the **content** of *Radio Communication* should be addressed to: The Editor, *Radio Communication*, 35 Doughty Street, London WC1N 2AE. Tel 01-837 8688.
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Advertising, other than Members' Ads, should be addressed to: Mrs P. D Harvey, Sawell & Sons Ltd, 4 Ludgate Circus, London EC4. Tel 01-353 4353.

THIS IS ANTENNA MONTH!

(We have good stocks but make sure that you're not the unlucky one!)

NEW . . .

NOW A GREAT NEW WIDE BAND VERTICAL for 10—80m, SELF SUPPORTING

HY-GAIN'S 18AVT/WB

Take the wide band, omni-directional performance of Hy-Gain's famous 14AVQ/WB, add 80 meter capability plus extra-heavy duty construction—and you have the unrivalled new 18AVT/WB. In other words, you have quite an antenna.

- ★ Automatic switching, five band capability is accomplished through the use of three beefed-up Hy-Q traps (featuring large diameter coils that develop an exceptionally favourable L/C ratio).
- ★ Top loading coil.
- ★ Across-the-band performance with just one furnished setting for each band (10 through 40).
- ★ True 1/4 wave resonance on all bands.
- ★ SWR of 2:1 or less at band edges.
- ★ Radiation pattern has an outstandingly low angle whether roof top or ground mounted.

CONSTRUCTION . . . of extra-heavy duty tapered swaged seamless aluminium tubing with full circumference, corrosion resistant compression clamps at slotted tubing joints . . . is so rugged and rigid that, although the antenna is 25' in height it can be mounted without guy wires, using a 12" double grip mast bracket, with recessed coax connecter. (Delivery in August)!

Hy Gain (ex-stock carriage extra)

Vertical	12 AVQ, 10-20m ..	**£16.00**	LC80Q, 8m coil	**£6.70**	Hy-Tower, 10-80,m	**£90.00**
	14AVQ, 10-40m ..	**£19.00**	18AVT/WB, 10-80	**£33.00**	18v, 10-80m	**£10.00**
Tri-Band Beams	TH6DXX. 10-20m 6 ele	**£85.00**	TH3M 3 10-20m 3 ele ..	**£68.00**		
	DB10-15, 10-15m 3 ele	**£51.00**	HYQUAD, 10-20m 2 ele	**£62.00**	TH3Jnr, 10-20m 3 ele	**£47.00**
Mono Band Beams	103BA, 10m 3 ele ..	**£14.50**	203BA, 20m 3 ele ..	**£67.00**	BN86, Balan	**£8.00**
	153BA, 15m 3 ele ..	**£33.00**	204BA, 20m 4 ele ..	**£69.50**	LAI	**£14.50**
Mosley	TA33 Jnr.	**£31.50**	Mustang	**£38.00**	Atlas Vertical 10-40m	**£19.00**
(exstock carriage extra)	TA32 Jnr.	**£22.00**				

Newtronics. Hustler Mobile 10-80m antennas in stock. Prices on application

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.

Type S. 500 watts **£11.50**, Type HP for 1 kw p.e.p. **£13.50**
Type P with a special copper/terylene braid element for ease of coiling up.
Supplied with winding spools and 70' co-ax **£14.90.**

***New! Gem Quad** (from Canada) 10-20m 2 ele fibreglass kit with balan **£65.00.** This may be converted to a 3 or 4 element. version. Details are in catalogue.

Rotators (exstock carriage indicated)

AR10	**£18.00** (40p)	TR44	**£40.00** (75p)	HAM-M, ...	**£70.00** (80p)
AR22R	**£25.00** (65p)	HY-Gain 400 available August	**£98.00** (80p)		

New 1971 Catalogue. You ought not to be without your copy listing Towers, masts, rotators, antennas, Yaesu/Sommerkamp equipment and a host of extra items. Send 15p. only (no s.a.e. requested).

Hours of business Mon-Fri. 9-1pm. 2-5.30pm. Sat by appointment.

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Features.

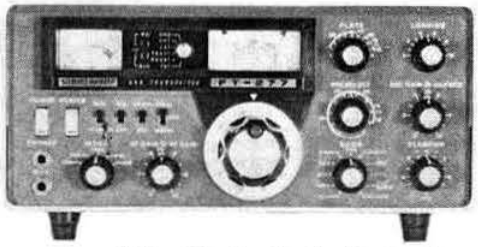
- Accurate Nixie-tube display
- 500w p.e.p. blower cooled.
- Built-in noise blanket
- External V.F.O. can be displayed on counter
- Incremental receiver tuning
- Separate A.C. or A.C./D.C. power supply units

Send S.A.E. for specification sheet.

Price: DIGITAL 500 with DP300 speaker /AC supply
£298 carriage paid

The DIGITAL 500 Transceiver is a highly advanced high power transceiver using semi-conductors and tubes. There are 26 ic's and 10tr. in the counter unit alone. Receiver RF, Mixer and transmitter mixer, driver and P.A. are tubes.

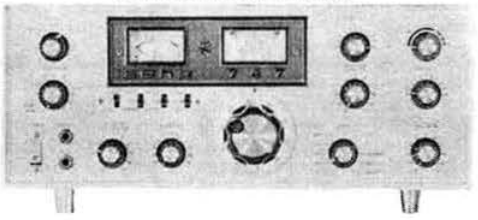
FT 277



- 10 FET's 3 IC's, 31TR and 38 diodes.
- Highly advanced computer-type plug in modules.
- 240w. p.e.p. 3.5-30MHz.
- 12v. D.C. and 100/240v A.C. supplies built in
- Break-in c.w. keying (180 w.)
- Dual gate mosfet's for 0.3μV sensitivity for 10dB S/S & N ratio

★ **Noise Blanker is standard** ★ **Built in WWV band** ● **Built-in speaker** ★ **25 and 100 xtal calibrator**
All this for our Low Price of £230.00 (carr. £2.00)

AND THE FT747
(WITH JUMBO JET POWER!)



- ★ 560w p.e.p. input 3.5-30MHz.
- ★ Built-in 100/240v A.C. supply.
- ★ SSB with 1.6:1 filter shape factor
- ★ Break-in CW (CW filter available)
- ★ Excellent 100kHz dial mechanism.
- ★ Built-in WWV band and 25/100 kHz calibrators
- ★ Sensitivity: 0.5μV for 20dBS/S & N
- ★ Excellent value at **£195.00** (carr. **£2.00**)

★ NEW. Ameco (USA) Pre-amplifier 160-6m. For transceiver use.
★ NEW. FL2500 Linear amplifier 160-10m 2kW p.e.p. **£118.** (£2 carriage)
★ NEW. SP101 Matching speaker available ex-stock for our FT101 owners **£10.**
★ NEW. 160 metre conversion available for our FT747 owners or will fit for you.

Summerkamp (Yaesu) Equipment (all items EX-STOCK)

FT101/FT277, Transceiver Ex-stock	**£230.00**	DC200, DC Supply	**£45.00**	FT560/747, Transceiver ..	**£195.00**
FV101/FV277, Remote VFO ..	**£38.00**	FR400/500, Receiver	**£120.00**	FT560/747 & CW filter ..	**£215.00**
SP101, Speaker	**£10.00**	FR500S, Receiver	**£145.00**	FL2000B, 1200w. linear ..	**£130.00**
FT200/250, Transceiver ..	**£132.00**	FL400/500, Transmitter ..	**£130.00**	FT2F, 2m. FM Transceiver ..	**£80.00**
FP200/250, AC Supply ..	**£36.00**	SP400, Speaker	**£10.00**	FF50DX, Low Pass Filter ..	**£6.20**
FV200/250, Remote VFO, ..	**£38.00**	FV400S, Remote FO	**£38.00**	YD844, Table microphone, ..	**£11.00**
		FL2500 2kW. Linear	**£118.00**	YD846, Hand Microphone ..	**£5.00**

USED EQUIPMENT. KW2000A and PSU **£160**, SX111 **£60.00**, Osker Power Meter *with plugs* **£18.50** (30p), Caslon 602 Clocks, **£18.50** (30p)

CATALOGUE. Details of the items are included in our catalogue (15p). Our showroom has all the items on display or contact Roger, G3XFA, on 01-845 6290 after 6.pm. Stephen-James Ltd, J & A Tweedy Ltd and Derwent Radio also have items in stock.

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

NEW EQUIPMENT

Yaesu Musen

FT-101 260W p.e.p. mobile or fixed station transceiver. A speaker and both A.C., D.C. power supplies built in. Complete with PTT mike. £230.

FT-200 260W p.e.p. As with all Yaesu transceivers it has VOX, PRT and RIT. £132.

FTdx400/560 560W p.e.p. fixed station transceiver. Built-in A.C. p.s.u. £195.

FRdx400 Receiver Covers all bands from 160 to 2m. Four *true* mechanical filters for CW, SSB, AM and FM. FM discriminator, notch filter, 100 and 25kHz calibrator, squelch, etc. £160.

FLdx400 Companion 260W p.e.p. transmitter. £140.

FL-2000B Companion linear, 1200W p.e.p. to a pair of 572B's. £130.

FL-2500 Grounded grid, built-in L.P. filter and SWR meter, twin fans, five 6KD6's for 2kW p.e.p. top band (Good Grief!) to 10m. £105.

FT-2F 2m FM transceiver (similar to the popular Inoue IC-2F) £80.

Optional Extras External VFO's available for all transceivers at £35. Matching speakers available for all models. £10. CW filters for the FT-101, FTdx400/560. £20. Yaesu desk microphone YD844. £10.

Inoue

IC-700R Solid state Rx, wide use of FET's, 9MHz crystal filter. Very popular Rx held in high regard by many people who know what they're talking about. £85.

IC-700T Companion transmitter. Pair of 6146B's run very conservatively with only 500v on the plates for 120W input to give an exceptionally clean signal. £80.

IC-700PS Companion power supply/speaker £30.
As a package deal, we offer the IC-700R. IC-700T and IC-700PS complete with microphone at £160.

IC-2F 25W all solid state 2m FM mobile transceiver. £80.

Frontier

FE-600 200W all band transceiver with all the usual gubbins, RIT, VOX, calibrator, etc. £160.

Digital 500 We don't like the lack of adjustable temperature compensation on the VFO—have suggested to Mr. Hirakawa that he incorporate it. When he does, and not until, we'll flog it at about £300.

2m men: Get together and put in a group order for IC-2F's or FT-2F's. We will give a 20% discount on orders of 4 or more. This offer is only good for a limited period.

Owners: We have VFO's available and a simple mod. for AM. Give us a yell if you want dope. We have a beam up 60' now and are monitoring channel 1, do give us a yell if you're in the area.

Spares for new equipment: We have approximately £4,000 worth of spare parts for the new equipment that we handle. Our workshop contains the very best in test gear (well over £6,000 worth!) and we are very good at repairing stuff. So what? Nothing, really, except that if your Yaesu gear ever does break down, you'll be jolly glad you got it from us.

SECOND-HAND EQUIPMENT

Receivers:

Eddystone 388A £60.
Trio JR310 fitted with optional Kokusai filter. List £92, our price £70.
Davco £100.
Racal RA17 *mint* £225.
AR88LF £35
Collins 51J4 £275
Collins URR 390 £285
National NC190 £40
Heathkit SB301 plus extra CW filter £95
Heathkit RA1 £25
Collins URR 391 (390 with autotune) £250

Transmitters:

Sommerkamp FL1000 £70.
Heathkit DX100 £35.
Vanguard I £25.

Transceivers:

Inoue IC-700 £130.
KW2000A less p.s.u. £135
FE Super 600 demonstrator £130

Sundries:

CT212 sig. gens (85kHz to 32MHz AM/FM) £29.50
BC221's, several from £10-£20
Rohde & Schwarz noise generator £65
U.S. Signal Corps TS-39/TSM-1 oscillator £8
Cossor ganging oscillator £4.50
Frequency shift converter CV-116/URR 8RTTY men—the last word!!) £75
Valve tester TC-2C/V (a snorter) tests 6146's, 829'Bs, etc. £35
Frequency shift converter CV89A/URA-8A £60
Marconi TF1331 scope £75
Hickok scope with 50MHz dual trace plug-in £350
Carriage extra on the above—usually £1.

Mikes, keys, low voltage regulated p.s.u.'s, keyers, monitors, headsets, VTVM's, mobile antennas (Tavasu), intercomms, S.W.R. bridges, components, etc., etc.

Please drop us a line enclosing a large s.a.e. and we will let you have all sorts of guff.

Hours: Tuesday to Saturday 9-5.30 (closed for lunch 1-2 and all day Monday).

73 de Alan and Bill

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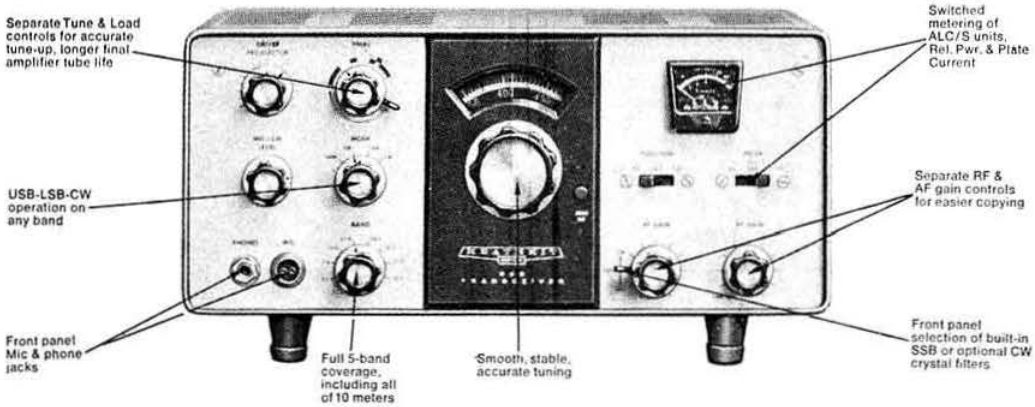
High performance and reliability at a price that you can afford*

HEATHKIT HW-101



Compare the Specifications

RECEIVER-Sensitivity: Less than 0.3 microvolt for 10 dB signal plus noise to noise ratio for SSB operation. SSB Selectivity: 2.1 kHz minimum at 6 dB down, 7 kHz minimum at 60 dB down (CW filter optional extra). Image and IF rejection better than 50dB. TRANSMITTER-DC Power Input: SSB, 180 watts PEP. CW, 170 watts. RF Power Output. 100 watts on 80-15 metres; 80 watts on 10 metres. Output Impedance: 50 ohm to 75 ohm. Oscillator Feedthrough or Mixer Products: 55 dB below rated output. Harmonic Radiation: 45dB below rated output. Transmit Receive Operation: SSB, PTT, or VOX, CW, provided by operating VOX from a keyed tone, using grid block keying. Unwanted Sideband Suppression: 45 dB down from single tone input at 1000 Hz reference. Third Order Distortion: 30dB down from two tone input. GENERAL-Frequency Stability: Less than 100 Hz drift per hour after 30 minutes warmup. Less than 100 Hz for + 10% line voltage variations. Modes of Operation: Selectable upper or lower sideband and CW. Dial Calibration: 5 kHz divisions. Calibration: 100 kHz crystal. Bandspread: 35½ revolutions for 500 kHz. Power Requirements: 700 to 850 volts at 250 mA, 300 volts at 150 mA. —115 volts at 10 mA. 12 volts AC/DC at 4.76 amps.

HW-101 Kit Transceiver	£125.00 carr 0.60	**HP-13A Kit DC PSU**	£ 36.00 carr 0.40
HP-23A Kit AC PSU	£25.00 carr 0.60	**SBA-301-2 CW Filter**	£11.00 carr 0.20

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QTC

AMATEUR RADIO NEWS

Certificate information

Please note that orders for the *Directory of Certificates* published by K6BX can no longer be accepted by G2BVN. Future orders for the directory and the News Letter should be sent direct to the publisher.

A *Certificate Handbook* is to be published in October 1971 by O. Timmerman with the approval of the Belgian Society, UBA. This handbook will be in English and orders placed before publication date attract a price of 225 Belgian francs. After publication date the price will be 275 francs. At the present rate of exchange £1 sterling is equivalent to 120 francs. Payment for the handbook should be made to O. Timmerman, E. de Jansstraat 30, 8200 Brugge, Belgium. From the preliminary announcement of this book it appears that the information therein will be for both the licensed amateur and the short wave listener.

Reciprocal licensing

All enquiries regarding reciprocal licences in the Federal Republic of Germany should be sent to: D. Burberg, DJ2YE, 4020 Mettmann, Breite Str 3, German Federal Republic.

URE Convention

As mentioned last month, the Spanish Amateur Radio Society, URE, is holding a convention in Bilbao from 22-23 September. We have since been advised by Iberia Airlines that 15 or more people from Britain travelling as a group to the convention can achieve a substantial saving on the inclusive travel, hotel and convention fee. Further details are obtainable from Mr F. Gonzalez at Iberia Airlines, 169 Regent Street, London W1R 8BE, telephone 01–734 6351, who will facilitate bookings.

The G3TBS digital clock

Mr R. Wilson, G3TBS, author of the article "A 24 hour digital clock" which appeared in the April issue advises the following errors: R1 in Fig 1 should be 6·8kΩ; Pin 10 of IC9 should be at 0V; the pins for the Nixie were for B4998, the correct values for B59956 are

Pin		Pin	
1	Anode	8	4
2	0	9	3
3	9	10	2
4	8	11	1
5	7	12	decimal point
6	6	13	IC
7	5	14	IC

The author apologizes to readers for these errors.

Cheshire Homes Amateur Radio Network Fund

The draw in connection with this fund was made in The Cann House Cheshire Home, Tamerton Foliot, Plymouth, on 3 May, supervised by G5ZT and assisted by Mrs R. D. Balkwell, a member of the house committee, and H. Montgomery, BRS30645.

There were 59 prizes, and the star prize was won by SWL Mr D. Armstrong, of Beverley, Yorkshire; space does not permit the full list of winners to be printed here but all prizes have been sent to winners.

As a result of this effort a total of 5,974 tickets were donated for, despite the postal strike, producing a total of £297·05. Since no further Homes seem to be interested in receivers, the committee have decided to wind up the fund, and a full report together with the balance sheet will be published in a future edition of *Radio Communication*.

Thanks are extended to all the firms who contributed the prizes and to the many helpers who did a fine job indeed in collecting donations and assisting in other ways.

Stolen property

The premises of Trident Electronics, Shoeburyness, were broken into last month and the following items were stolen:
Advance TC13 counter, serial number 0028;
Salford Electrical Instruments Selectest Super 50, serial number 13179;
Heathkit transistor tester;
A large quantity of integrated circuits Types SL403D, SL62IC and SL641C.

Information leading to the recovery of this property would be appreciated.

During the night of 7–8 June the Telecommunications Laboratory of Weston-super-Mare Technical College was broken into and the following items of equipment were stolen

KW2000B transceiver, serial number B1193; KW loudspeaker and power unit, serial number PA1636; KW E-Zee aerial matching unit, serial number S1168; SWR bridge, serial number MV796.

Anyone acquiring knowledge of this equipment is asked to inform Weston-super-Mare Police Station, tel 25411, or any police officer.

"Amateur Radio Techniques"

RSGB publications are regularly reviewed in technical magazines and journals all over the world, and members may be interested in some extracts from recent reviews of the third edition of *Amateur Radio Techniques*, culled from journals published in Europe, America, Africa and Oceania.

"Packed with odd, interesting, useful ideas . . . no nonsense or glitter, just good solid ideas and applications . . .

AFFILIATED SOCIETIES

Call Book entries

Will secretaries of all RSGB affiliated societies please advise Mr A. W. Hutchinson, editor, at RSGB headquarters of any omissions from, or any amendments, to the list of affiliated societies in the current edition of the *RSGB Amateur Radio Call Book* for inclusion in the 1972 edition which is now in course of preparation.

definitely one to add to your library . . . a compilation of the curious, the wise, the uniquely useful, the new in amateur radio and in experimental techniques generally" (*The Australian EEB*).

"The information, particularly on semiconductors, is a most valuable reference and source of study for those who may be just entering the field. The rest of the chapters . . . are a source of ideas for all technically minded amateurs . . . if you do not have a copy, then I suggest you get one without delay" (*Electronics Australia*).

"The book has within its covers an incredible amount of information on ideas suggested, tried and tested by amateurs throughout the world . . . in every shack there should be a copy of a book unique in amateur radio literature" (NZART's *Break-In*).

"An up-to-date mine of information, suggestions and ideas, and provides a refreshing change from standard text-book presentation. Particularly to be commended are its considerable detail and accuracy." (*Radio Constructor*).

"Once again a worthwhile addition to the amateur book-shelf . . . 208 pages of useful information . . . this book is highly recommended." (*Radio-ZS*)

"An ample stock of ideas, all practicable, all authentic. The publishers of *ham radio* distribute this book in the United States. If you can't find one locally, you can get it from them. And it's a darn good buy!" (W5JJ in *The Oscillator*)

Seen near headquarters . . .

Large shiny motor car wrapped round traffic island—Registration No? RST 111!

Pirates caught

As a result of Post Office enquiries into the suspected unlicensed use of wireless telegraphy transmitting equipment, the following convictions have been obtained for using wireless transmitting apparatus without the appropriate licence, contrary to the provisions of Section 1 of the Wireless Telegraphy Act, 1949:

Mr R. Harston, 6 Bruce Grove, London N17, at Tottenham Magistrates' Court on 16 March 1971. He was fined £25 on each of two charges, plus £10 costs.

Mr M. J. Woods, 117 High Street, Brentwood, Essex, at Brentwood Magistrates' Court on 17 February 1971. He was fined £20, plus £5 costs.

Mr J. D. Morgan, 149 Kings Road, Brentwood, Essex, at Brentwood Magistrates' Court on 17 March 1971. He was fined £28, plus £5 costs.

Mr W. S. Rollins, Acorn, Alpha Road, Point Clear, St Osyth, at Clacton (Tendring) Magistrates' Court on 15 March 1971. He was given a conditional discharge for 2 years, plus £20 costs and forfeiture of equipment.

RSGB NATIONAL MOBILE RALLY

Woburn Abbey, Bedfordshire

Sunday 8 August 1971

Talk-in stations GB2VHF, G3VHF and GB3RS on 2m, 4m and 160m.

Attractions will include a large trade exhibition, tv demonstration, Raynet get-together, grand raffle, and bring-and-buy sale. Please price equipment for sale before putting it on display; a deduction of 10 per cent will go towards rally funds.

Woburn Abbey park opens at 11am and its grounds of over 3,000 acres include the Wild Animal Kingdom with more than 2,000 animals; children's playground; pets corner; boating lake; amusement park and fun-fair. There will also be children's sports and lucky dip. Visits may also be made to Woburn Abbey's state apartments, and there are restaurants and snack bars.

Car parking in a specially reserved car park

Organized by the Radio Society of Great Britain.

Use of Woburn Abbey by kind permission of His Grace the Duke of Bedford.

Mr M. Bancroft, Westfield, Towngate, Southrowam, Halifax, at Brighouse Magistrates' Court on 19 March 1971. He was fined £20 on each of two charges, plus £25 costs and forfeiture of equipment.

Mr M. D. Kennedy, 9–10 St Saviours Road, St Helier, Jersey, at St Helier Magistrates' Court on 12 February 1971. He was fined £6, plus £6 compensation.

Mr P. Barnet, 2 Avondale, Sherwood Hall Road, Mansfield, at Mansfield Magistrates' Court on 10 March 1971. He was fined £5 on each of two charges, plus £10 costs and forfeiture of equipment.

Mr T. F. Gregg, 12 Fairfield Parade, Cheltenham, Gloucestershire, at Cheltenham Magistrates' Court on 1 April 1971. He was fined £25, plus £10 costs and forfeiture of equipment.

Mr R. Kiesa, 143 Chesterton Road, Cambridge, at Cambridge County Magistrates' Court on 22 April 1971. He was fined £15 on each of four charges, £12.50 costs and forfeiture of equipment.

Mr M. Bellars, Atlast, Parkclose, Paxton Park, St Neots, at Cambridge County Magistrates' Court on 22 April 1971. He was fined £15 on each of three charges, plus £12·50 costs and forfeiture of equipment.

Mr P. E. Balaam, 36 Princes Avenue, London N22, at Tottenham Magistrates' Court on 13 May, 1971. He was fined £15 on each of three charges, plus £10 costs and forfeiture of equipment.

Mr K. R. S. Holwell, 57 Sherwood Avenue, London SW16, at Camberwell Magistrates' Court on 20 April 1971. He was fined £40, plus £20 costs and forfeiture of equipment.

Mr R. Norquet, 4 Heybridge Road, Ingatestone, Essex, at Chelmsford Magistrates' Court on 13 May 1971. He was fined £15 on each of three charges, plus £10 costs.

Mr N. Catford, 77 Burleigh Road, Sutton, Surrey, at Epsom Magistrates' Court on 17 May 1971. He was sentenced to three months imprisonment (suspended for two years), plus £25 costs and forfeiture of equipment.

The practical design of mobile aerials

by E. L. GARDINER, BSc, G6GR*

A GREAT deal of scattered information has appeared from time to time both in this country and in America in relation to the practical effectiveness of numerous types of aerial system when used on moving vehicles. In this article the author will attempt to correlate these views both with his own experience over a number of years on the road, and with that of numerous other mobile amateurs whose signals are heard consistently at exceptional distances. It is hoped that this survey will help newcomers to the mobile field to avoid some of the common pitfalls, and that others having wider experience may find at least a few pointers which will assist them in improving performance. At the same time a review of the systems in general use may suggest a few new lines for experiment which can be expected to yield worthwhile results.

Consideration of true mobile operation from vehicles in motion, as opposed to the related fields of portable, "static-mobile," and /A operating, suggests the following fundamental requirements which must be met:

(*a*) Since the vehicle is continually changing its position in relation to other stations, the aerial system should be essentially non-directional. Any directional characteristics, however slight, may be expected to increase fading and variations in received signal strength.

(*b*) Much mobile communication is by ground-wave at comparatively short ranges, and in this sphere as well as that of ionospheric reflection, low-angle radiation is perhaps as important as at the home station.

(*c*) Since the power of mobile installations is necessarily limited by considerations of power supply and battery capacity, efficiency in the aerial system and in the transfer of energy to it is of prime importance.

(*d*) The aerial should be so positioned on the vehicle as to pick up the minimum of electrical interference both from the car itself, and from any passing traffic. It should be clear of avoidable screening, and as remote as possible from surrounding objects which can detune the aerial and absorb valuable power.

(*e*) In addition to the above requirements, the mobile aerial must be mechanically safe and sound in design. It must be strong enough to withstand high cruising speeds, have low wind resistance, and either be *resilient* in itself, or *resiliently* mounted to withstand accidental impacts. Preferably, it should be neat in appearance and easily removable for parking and garaging. If in addition to these factors is added the facility for remote tuning, and perhaps frequency change, from the driver's seat, it will be clear that any successful design is certain to include a strong element of compromise, and is in fact a major exercise in engineering skill.

Further consideration of the amateur wavebands available for mobile use suggests that there is a natural line of demarcation which occurs at the frequency where a half-wave dipole becomes comparable to the length of the vehicle, namely in the region where hf merges into vhf, particularly the 10m band. From the earliest days of mobile working there has been a widespread, although not inevitable, choice of the vertical radiator, as this fits naturally into most of the requirements listed. At 30MHz a quarter-wave whip aerial is approximately 8ft in length, and approaches the maximum which can be carried safely. At all higher frequencies a resonant aerial becomes small in relation to the vehicle, so that there is a wide choice from among many of the established vhf designs, many of which can be carried on a car if they are thought suitable. A simple quarter-wave vertical is not out of the question for the 21MHz band, but from this frequency downwards it becomes characteristically necessary to load the aerial electrically in order to achieve resonance in a structure small enough to be carried safely. Thus, in mobile operation the amateur bands fall into two classes, namely the hf bands upon which dx working is to be expected, and characterized by the necessity for loaded aerials; and the vhf bands upon which true dx is the exception, and characterized by the use of unloaded, and possibly more complex aerial systems.

The first section of this review will discuss vhf mobile aerials, perhaps the simpler of the two classes, if the broader in scope. Commercial users of vhf radio appear to have little doubt that the system best suited to their needs is the quarter-wave vertical rod, mounted at or near to the centre of the metal roof of the vehicle, and the author cannot recall having ever seen any important departure from this practice. However, the commercial user has the advantage of wishing to communicate, in the vast majority of instances, with only one, or at most a few fixed stations. These invariably employ stacked vertical systems erected at great heights in carefully chosen locations. The mobile amateur, on the other hand, may wish to communicate with all and sundry other amateur stations, most of whom use horizontal polarization, in addition to other mobiles in his area; and this complication gives rise to a great deal of hard thought and discussion.

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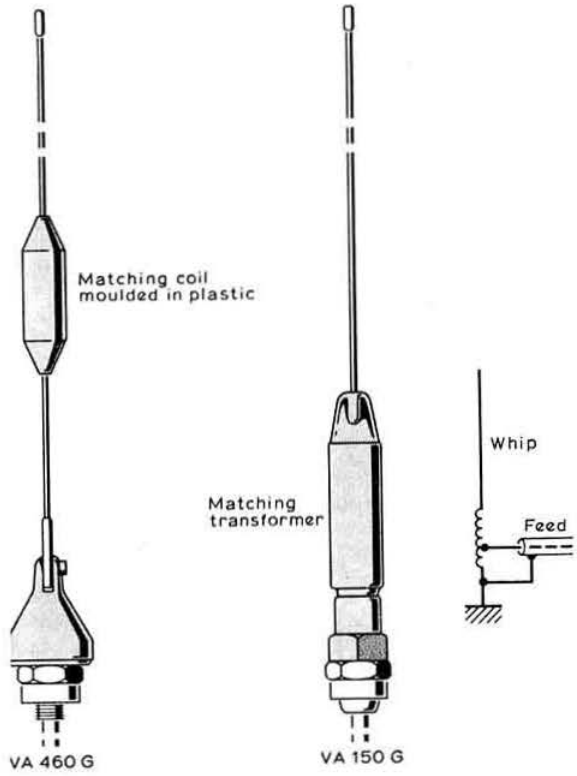
VHF aerials

At frequencies above 70MHz the roof-mounted vertical can be truthfully thought of as a ground-plane, since the metal area over which it is mounted will not be smaller than a quarter-wavelength in radius, and thus simulates a radial system, or perfect ground. This is well known to be an ideal structure, and shows up admirably in all respects listed in the opening paragraphs. There can in fact be little doubt that at any frequency a central roof position is probably the best obtainable since it has maximum height above ground combined with minimum screening by the vehicle itself. It is also as remote as possible from all sources of electrical interference both internal or external, and should be as nearly omnidirectional as can be achieved. However, the use of roof-racks, or of a " soft-top ", may not always permit this ideal arrangement, but experience has shown that the aerial can be offset without serious loss of efficiency; probably the best position being towards the front of the car roof, immediately above the windscreen. This position has the advantage of remaining broadly central above the metal mass of the car as a whole, and yet it permits a short run of feeder to the most usual position of the equipment near to the dashboard.

While it is not uncommon to drill the roof of a commercial vehicle to support a whip, this procedure is unlikely to appeal to the amateur who owns his own car! Among those who have effectively solved this problem may be mentioned G8CK/M, who makes use of one-half of the well-known " Ski-rack " which consists of a single bar fitted with the usual clamps to secure it across the car roof in any position. This can be fitted well forward of any obstructions, and the aerial mounting clamped to it; the method being suitable for any frequency and in no way confined to vhf. In practice it is not always preferable to earth the outer braid of the aerial feeder to this rack, and improved results have been noted in certain installations when the braid is left floating and earthed only at the equipment end. It is strongly recommended that both forms of connection be tried, without regard to the type of aerial or frequency-band in use, since there have been instances where a signal increase of up to 12dB has been reported by distant stations when the remote end of the feeder is lifted from the car body. This effect is not universal, however, since the car body is a very individual structure, and in many instances earthing in the more usual manner is essential.

A second approach to the mounting problem places the aerial upon a small matching unit or terminating box, which in turn is secured to a square of material such as copper sheet or plywood. The latter is then attached to the car roof by a suitable harness similar to that used for roof-racks, or even by a strong adhesive tape. The feeder is not taken through the roof in what may be regarded as the ideal manner, but at right-angles from the aerial mounting and over the roof to enter by a convenient side-window. It should, of course, be an insulated cable throughout, and the off-set or forward roof position may be preferable at lower frequencies if it makes possible a shorter feeder.



Two Pye aerials in which attention has been paid to ease of fitting to any vehicle. The mountings supplied are weather-proof and maintain a low resistance bond to the vehicle metalwork.

The type VA 460G uhf ⅝λ aerial is intended for operation in the band 450-470MHz. Inherent gain combines with height to give a high performance aerial. The radiating element consists of stainless steel rod with a sealed phasing coil placed in it ⅛λ from the base. The complete assembly is carried by a hinged clamp on an insulated base.

The type VA 150G vhf ½λ aerial is for operation in the band 146-175MHz. The greater height of this aerial is an advantage where a partially-screened mounting point must be used. The aerial consists of a tapered stainless steel rod mounted on a sealed matching transformer. A 12ft length of coaxial cable is provided with the aerial and this can be supplied full length or cut for a specified frequency; a cutting chart is supplied

Optimizing the feed arrangements for whips

It can be stressed at this point that it is a widely held view that a short and direct feeder run to the mobile aerial is of very real assistance, as it is rarely possible to arrive at and to maintain perfect impedance matching under mobile conditions and in consequence feeder losses cannot be neglected. Moreover, it is very advisable to keep the feeder as remote as possible from the electrical wiring and equipment of the car, and the effective bandwidth over which the aerial can be used without alteration tends to be wider if the feeder is short. The author has ventured to express the opinion that in practice it is more beneficial to select a feeder cable of low loss construction and having the lowest self-capacitance per foot, and to keep this to the absolute minimum length, than to select a cable which is a correct nominal impedance match to the aerial system. In the extreme case of a low-frequency transmitter which can be coupled to the aerial by a feeder of virtually zero length and capacitance, it is possible by means

of a conventional pi-network to feed at useful efficiency over a considerable bandwidth; whereas in the case of the conventional mobile installation employing a relatively long feeder-run this width is very restricted, seldom exceeding 25kHz on Top Band.

It is usual to feed the quarter-wave ground-plane directly by a short 50Ω feeder, which will not be a very good match into the estimated aerial impedance in the region of 20Ω. Two feeders in parallel have been used, but there seems no evidence that any worthwhile improvement in matching can be claimed. However, it has been pointed out in an admirable article by G4LU and G3BA that improved matching can be obtained if the aerial is lengthened to about one-third of a wavelength, which can exhibit a resistive component of 75Ω, while the added inductive reactance introduced by the increased length is tuned out by a series capacitor incorporated in a matching unit at the base of the lengthened whip. These amateurs have used an offset mounting at the side of the car roof with success, and it is a further advantage of the lengthened radiator that its impedance is less dependent upon strictly ground-plane conditions, and that the use of a suitable matching unit at the base enables the effects of differing aerial position to be compensated. They have further expressed the view that a correctly matched vertical system is not materially inferior to others when working home-stations using horizontal polarization, while being better for communication from car to car.

Stacked aerials

At the higher vhf bands it becomes practicable to stack vertical radiators, and this construction will prove very helpful at 432MHz. W2ALR has described an aerial where the usual quarter-wave vertical rod is continued into a " quarter-wave stub ", which on 144MHz can take the form of a half-wave section bent into circular form, and above this the whip continues vertically for a further half-wavelength section. Such a colinear stack would be some 10ft in overall height for the 2m band, and although this might be regarded as excessive for safety when roof-mounted, it would be quite suitable for a rear bumper position, when the upper half-wave would be in the clear. On 432MHz the structure would be more nearly 40in in length, and thus safe at roof level, while an additional half-wave stacked element could be added without exceeding a reasonable height. These possibilities make the band potentially attractive for mobile experiment. A construction which appeals to the author for open-car use is based upon the rear bumper mounting of a short insulating section of wood or bakelite tubing, perhaps 4ft in length, above which can be carried a centre-fed vertical dipole for 2m, or a stacked array for higher frequencies. The " J " match construction described in most handbooks also lends itself well to mobile mounting, being fed from the bottom at low impedance. A rear-mounted aerial of this form would be 10ft in overall height for the 4m band, and therefore has much to recommend it as a departure from the simpler varieties.

Horizontal polarization on vhf

For the amateur who feels that horizontal polarization at vhf must be retained, there are several well-known designs which aim to overcome the too-directional pattern of the horizontal dipole. Of these the halo aerial, which consists essentially of a dipole centre-fed with the aid of a gamma matching section to overcome the altered impedance, and having the two ends bent round, without contact, into a circular form, is very well established. The construction is not entirely effective in overcoming directional pattern, and has maximum radiation in the direction of the feed-point; there is some doubt if it is as effective in this respect as the vertical whip. The halo is mounted above the car, preferably not less than a half-wavelength above roof level, as at lower heights there will be a tendency for the roof or body of the car to reflect radiation upwards. It has the advantage of small size and weight. The " minihalo " has recently appeared, in which the diameter can be halved by joining a capacitive sleeve between the two previously open ends, resulting in a still greater reduction in these factors. It is, however, axiomatic that the field radiated by an aerial is a function of size, and any reduction will normally have some detrimental effect upon efficiency. An interesting possibility becomes evident at this stage. Although the author has not yet seen this development in use, it should clearly be possible to so dimension the minihalo that with the capacity-sleeve in place it resonates in the 70MHz band, while with this removed or replaced by an insulator it will resonate in the 144MHz band, thus providing a useful two-band assembly.

The search for still higher effectiveness from horizontal polarization has led to the development of the cloverleaf aerial, described in current handbooks, which is equivalent to three half-wave halos fed in phase. The aerial has more uniform directional characteristics, and an appreciable power gain over a dipole or halo; but at the expense of a rather conspicuous appearance and relatively high wind resistance. While of undoubted excellence, it may be regarded by many amateurs as better suited to portable or " static-mobile " working.

Aerials of this nature are unlikely to be chosen for frequencies lower than 144MHz owing to their size and weight, and for the under-used 70MHz band, vertical structures, or the halo, would appear to be a wiser choice. The 10m band has the distinction that a full-sized ¼λ vertical aerial approximately 8ft in length without inductive loading can be carried on the average car. It is possible to roof-mount such an aerial in the " ground-plane " position, giving perhaps the highest radiating efficiency obtainable on any of the amateur bands; but more often considerations of overall height and of accessibility for band changing lead to the choice of a lower mounting position. At this frequency, where the car body approximates in dimensions the " other-half " of a dipole, it is easy to see that much of it may be expected to be " hot " at rf, and it is not always fully appreciated that this is the normal state of affairs on all bands with the possible exception of the higher vhf bands, as at lower frequencies the vehicle body is far too small to represent an earthed mass, or to simulate a true ground-plane.

HF aerials

Positioning the loading coil

On bands lower in frequency than 28MHz, a vertical aerial structure is the only type widely used, as it conforms

relatively well to the requirements listed in our opening paragraphs, As loading is introduced, however, technique divides into two well-defined streams, namely " base-loading " in which the necessary added inductance to provide resonance is added at the base of the vertical whip where it enters the vehicle, and " centre-loading " in which the loading coil appears at some point higher up the radiator, generally at from 4 to 5ft below the highest point. These two streams can be further sub-divided according to whether the loading coil is interchanged for each band used, or whether some form of continuously variable tuning is incorporated into the design.

Structurally these two systems differ considerably, in that base-loading places the coil conveniently for access, reduces the weight and wind-resistance of the whip, and tends towards neatness and mechanical strength; whereas a higher position for the coil adds to these problems. It can be shown, however, that in the case of large aerial structures in which base, centre or even top loading really have significance, there is a marked increase in efficiency from placing the loading coil at the maximum height above ground. This provides a long section of aerial below the coil in which rf current is a maximum, and which contributes greatly to the radiated field. The mobile aerial, however, becomes very small in terms of wavelength at the lower amateur frequencies and is more heavily loaded with inductance than are most home-station verticals. The distance between the coil and car body is seldom more than two or three feet, so that the change in current distribution as between the two systems cannot be very profound. It is pointed out by advocates of base loading that as a result of the greater top-capacitance of the longer whip, the coil inductance can be materially lower than is necessary for centre loading, thereby reducing rf resistance. But this factor will in addition tend to reduce the rf potential across the coil, and it is suggested later that it can be of much greater importance to maintain a large potential.

The argument is strongest on Top Band, where the mobile aerial system is perhaps less than two per cent of a wavelength overall, and experiences on this widely used band may be expected to apply in a decreasing degree to the dx bands as frequency is increased. The author once carried out a series of tests on Top Band in conjunction with a remote field-strength meter, in which the coil position was progressively moved up a mobile aerial while keeping the feed current and all other factors as constant as could be devised. These tests showed quite conclusively that the radiated field at some 40 yards from the car was most nearly proportional to the height of the midpoint of the loading coil above ground, and *not* to that above either the feed-point, or the point of attachment to the car body. In these tests, of course, the ground level means nothing electrically, as the true " ground " may be some distance below the surface of a dry road. It must be taken as equivalent to the lowest point of the car body, namely that where the wheels meet the road.

From tests such as these, even if the agreement is only approximate, it becomes clear that the whole vehicle is effectively part of the aerial system, and that there is no fundamental distinction between base and centre loading, for the one merges continuously into the other from a performance point of view. If this were not so, and the car body played no part in radiation, it would be hard to understand the effectiveness of such popular mobile aerials as the G3FIF, which is normally used with the coil immediately above the mounting point, and thus has no bottom section at all to carry maximum rf current. It is clear that the important factor is loading-coil height, and the mobile installation should be designed to improve this as much as practical considerations allow. It is interesting to note that some users, for example G3KNB/M, have, after installing the popular aerial mentioned with good results, raised it a few feet further by the introduction of a bottom section; and have then experienced a further marked increase in signal-strength reports. This improvement may in part be due to raising the coil into an unscreened position clear of the car body, and some light may be cast here by experiences the author has had when transferring a particular installation from a saloon to a " soft-top " convertable. Although in the latter case the coil height above a rear-bumper mounting was less than previously, and the measured current at the base of the whip also some 20 per cent lower, due no doubt to less capacitance to ground, signal reports averaged an increase of two S points. It is difficult to find any explanation of this advance other than the removal of the loading coil to greater distances from the metal body of the car. Other amateurs have confirmed corresponding results, and there seems evidence that it would be necessary to move the aerial to a position well above a saloon-car roof in order to gain equivalent performance.

A golden rule therefore emerges, and this is to place the coil high and clear for outstanding results. This step will tend to help in other directions also, as it will keep the coil clear of radiation from the car itself, from passing vehicles, and from other surrounding disturbances. The reaction of these experiences upon the general belief that most radiation comes from the lower portion of the mobile system where current is greatest, and that both the coil and top section of the whip do not contribute a great deal, has long worried the author, as conflicting facts constantly seem to crop up. G5IC has pointed out that resonant-circuit theory demands that the current into the base of any loading coil and that out of the top must be equal. This current will taper off along the top section as it is dispersed through the capacitance of this section to ground, or more properly to the car body, but radiation must be important from at least the lower part of it. This component of radiation will tend to be a constant factor, but it is understandable that its contribution will increase with height above ground. Light is also thrown upon the claim often seen in American publications that a capacity hat at the *top* of an aerial, which will tend to increase rf current throughout the whole top section, is a desirable factor; whereas the experience, often reported in this country, that a hat located immediately above the loading coil does not seem a good proposition is also logical, since at this point it will tend to remove most of the current from the whip above it. It is thus unfortunate that a hat near to the top of a mobile system is so unsatisfactory from the view-point of wind-resistance and mechanical stability, as electrically it is a favourable design feature at the lower frequencies.

When operating " fixed-mobile " or portable with the mobile equipment, and with sufficient time to make such modifications, both the author and many others have found it most effective to add bottom sections to the aerial so as to raise the loading coil to a considerable height. When this is done, there will be an increase in the resonant frequency, resulting from the lowered capacitance to earth, and this can

be corrected by the addition of a light capacity-hat at the extreme top of the system. When lengthened in this way the mobile aerial becomes flimsy, and light nylon guys may be added. These should be attached at a point immediately below the coil, where the rf potential is relatively low, and losses will not be introduced. When operating on the hf bands the problem becomes different, for the added length becomes significant in terms of wavelength, and may predominate to the extent that coil inductance will require reduction. The required tuning effect can be achieved by reducing the length of the top section, although this is far from convenient!

Under portable conditions there are two interesting additional modes in which the mobile aerial can usefully be employed. In the first place, a quarter-wave aerial will resonate as a half-wave vertical adjacent to the next higher-frequency band, and can be used in this way if a high-impedance atu is available at the base. Thus a 1·9MHz loaded whip will resonate in the region of 3·8MHz, and will require a small amount of base loading to trim it into the 80m band. The author has used this arrangement effectively, adding a small rotary coil at the base of the system, and coupling into the equipment from a link winding slipped over this coil, thus retaining a low impedance feed out of the transmitter. The arrangement is convenient as an 80m receiving aerial, when another aerial is used for transmission, and can be coupled into most receivers having a medium-impedance input by means of a small capacitor from the top of the rotary coil. If the base-loading coil is earthed, the whole system can be resonated as a three-quarter wave system, and a 75Ω feeder at the bottom may be retained. This technique is applicable in the case of the 7 and 21MHz bands, having a frequency ratio of three to one, because an aerial adjusted for current feed in the usual mobile manner for the former will also function on the latter.

The second mode which is useful both under mobile and field conditions arises from an appreciation that the lower section of such a system up to the base of the coil can be current-fed as a quarter-wave vertical radiator without changing the feeder connection, the coil acting as an isolating choke. Thus if the lower section be made 8 or 12ft in length when portable, it can be loaded for the 10 or 15m bands. A more interesting possibility when mobile would be a bottom section of some 40in which will permit operation on 4m from a Top-Band or 80m whip without alteration. No doubt the coil design will play a part in getting the best from such an unorthodox arrangement, and should have minimum losses and self-capacitance; but these requirements are essential for a good loading coil in any case.

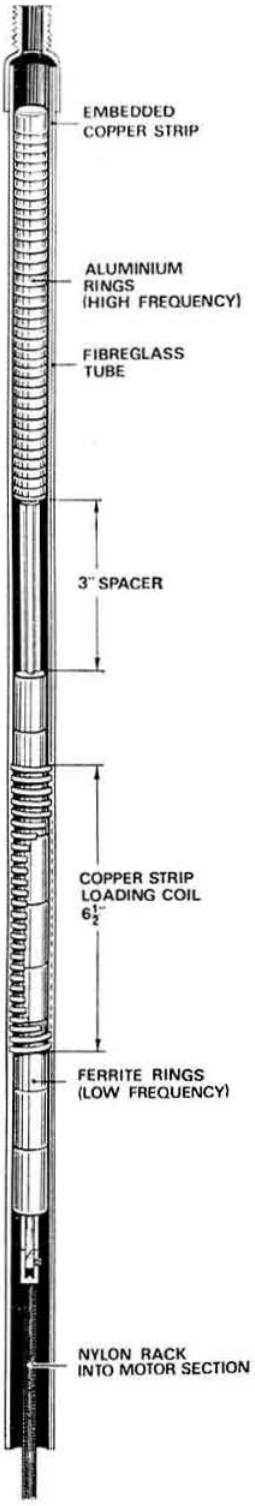
Design criteria for loading coils

The design of loading coils for the lower frequency bands has been a cause of concern to the author for many years, since in no part of the mobile system is so much variety seen, and some of the most successful designs appear to run contrary to published theoretical treatments which invariably stress the need for high Q as the principal requirement. In fact, the general view seems to be that if the coil is of the correct inductance, and has maximum Q, there is little more which can be done. That the coil should be of low-loss construction and minimum hf resistance is undoubtedly true, as pointed out under heading (c) initially, and this is implied in a high Q factor. It is also well established that the coil should have the minimum possible self-capacitance, and can with advantage be of sectionalised design, as rf current flowing through the self-capacitance plays no part in producing radiation but tends to promote power wastage.

When consideration is given to coil dimensions, however, an anomaly appears. Most experienced mobile operators agree that a high rf potential across the ends of the coil is one criterion of good performance, and proudly demonstrates the distance away from the whip at which a neon lamp can be struck by the electrostatic field. They also agree that comparatively long coils, having a ratio of length to diameter of perhaps six to one, are much the best, particularly on the lowest frequency bands; winners of many past rallies and competitions are emphatic on this point. But it is common knowledge from any textbook that to arrive at the maximum Q a coil must have a good " form-factor", namely a ratio of length to diameter in the region of 0·4, because this short, wide shape results in the shortest length of wire and the lowest rf resistance for a given inductance. But those who have tried coils of this form agree that the results are far from impressive, so it would appear that some of the factors which go to provide a high Q are desirable, but not all.

The author is prepared to hazard the view that Q is, in fact, not the most appropriate factor by which to assess a mobile loading coil, and would support this by pointing out that all the leading commercial aerials from the G3FIF to the Webster Band-spanner have comparatively long thin coils, which cannot have the best Q obtainable, and which in some cases do not appear to have particularly low-loss construction. Most of the leading American products for the hf bands do appear to pay full attention to this aspect. Accepting therefore that low rf losses are of the usual recognised importance, it is perhaps important to remember that the coil forms one part only of an aerial system having several other sources of resistance, the most important of which at the lower frequencies is certainly the series-earth loss. If it be accepted that the mobile system is completed by the capacitance of the vehicle to true ground, in which the electrical image of the aerial can be thought of as existing in high-resistance earth below the car, this will be a very " lossy " capacitance representing a series resistance much higher than that of the coil. This view is borne out by the well established fact that the hf mobile performs at its best when over wet or highly conductive ground, as for example when near to the sea-shore. As part of such a high-loss system the difference in coil resistance due to the form-factor may well be negligible, and the optimum shape may be determined by other considerations.

After much discussion on this subject a valid explanation on fundamental grounds seems to have been arrived at from a reversion to first principles. From the original equations of Clerk-Maxwell it is well known that any radiated field in space has both an electrostatic and an electromagnetic component, and that these must be correctly related. It is common experience that neither field component alone will produce radiation. For example, the intense electrostatic field between the electrodes of an rf dielectric heater dissipating many kilowatts fortunately produces comparatively little radiation. Similarly, the electro-magnetic field of a tank coil carrying equally heavy rf current is not an effec-



The Labgear hf mobile aerial type LTA10 is a continuously tunable aerial designed to have a nominal frequency coverage of approximately 2-15MHz. However, the height above ground, the ground plane effect of the vehicle, the position of mounting etc all contribute to small changes in the end limits of frequency to which the aerial will tune with a given transmitter.

Allowing for these environmental factors, experience has shown that under typical working conditions the available tuning range should be regarded as 2·25MHz to 12·5MHz and every aerial is checked at these limits.

The motor section, not shown, is made to fit in the boot of a car, and the mounting bracket and suspension assembly consist of a number of castings and a pair of springs and hydraulic dampers. The control unit should be fitted as close to the equipment control panel as possible.

tive radiator—no one expects to transmit far on a loop aerial. In both instances the available power is mainly dissipated as heat. Both field components must be present in the correct proportion for radiation to occur.

In the typical mobile whip it is accepted that current flowing mainly in the lower section generates a magnetic field. This will not be radiated, however, unless an adequate electrostatic component is also present in the form of an rf potential difference between the ends of the conductor carrying this current, namely the base and tip of the whip. Since the aerial is a resonant circuit, these components will be in the required phase relationship. However, there is very little potential gradient along the open portions of the whip, which are small in terms of wavelength, and the major part of this essential pd will appear across the ends of the coil, as is normal in any parallel-tuned circuit. The electrostatic field strength set up will be proportional to the distance apart of these two high potential points, namely to the length of the coil, since 100 volts (for example) across one metre represents an electrostatic field of 100 volts-per-metre, while if it were across one centimetre, the same pd represents only one per cent of this field. The conclusion therefore seems inescapable that however strong an electro-magnetic field component there may be, it can only be fully transformed into radiation rather than heat if an adequate electrostatic field is present, and vice-versa. In practical terms, there must be a minimum length of coil before full radiation becomes possible, and in fact there will be an optimum length for any particular system above or below which efficiency falls. No doubt this could be shown mathematically to correspond to a maximum radiation resistance. For an average Top Band aerial this length appears to be in the region of from 12 to 18in, and is a much more important factor in a good overall design than high Q if the latter be obtained at the expense of this dimension. No claims of exceptional performance from considerably longer or shorter coils can be traced, although the latter may be recommended on grounds of convenience.

Design conclusions

It now seems possible to summarize the design requirements for a good hf mobile aerial. The loading coil must be relatively long, and of good low-loss construction, but can be of small diameter with an overall advantage if the resulting reduction in wind resistance and weight permit a higher mounting position. The top whip section is not of prime importance, but as an overall height of 12 to 13ft above the road is perhaps the maximum for safety, it is better to make this not more than 4ft of ¼in or ⅜in diameter tubing rather than long and thin, so that the coil can be proportionally higher. The use of a telescopic whip for tuning purposes is most unwise in the author's view, for after a very short life it will become noisy and unreliable through weathering. A large diameter whip will exhibit a greater capacitance to earth per unit length. Less length is thus needed to resonate any particular loading coil, permitting the coil to be mounted higher without excessive overall height; alternatively a coil of lower inductance having less rf resistance could be used. In either case efficiency is improved.

The lower section of the aerial should be of low resistance, 1in diameter tubing being a good compromise between

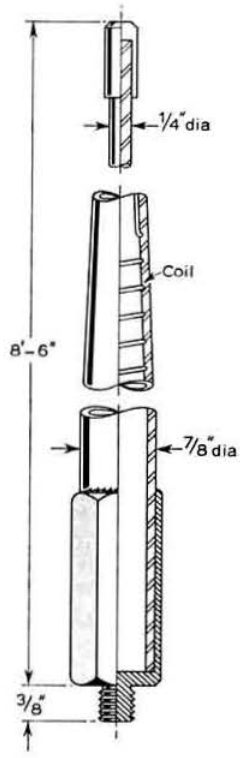
weight, strength and other considerations. The coil is sometimes stated to need no protection against rain, if it is well varnished and of waterproof construction. This may be reasonably true for Top Band systems, as the leakage path along the coil is considerable, but in the author's experience rain lying between the turns can greatly increase losses at higher frequencies, and the coils should be protected. A layer of pvc tape over a dry coil appears to be perfectly satisfactory. Many forms of coil cover can be devised, but unless the coils are sealed in a dry, inert gas, as are some of the best commercial products, the cover must not be sealed, for condensation will eventually occur. A good practice is to leave the cover open at the bottom.

Positioning an hf aerial

Position of the aerial on the vehicle is important, perhaps the overriding factor at hf being a clear position for the coil. The advantages of the central roof position have been stressed, particularly at vhf. In the USA, where convertibles are widely used, a rear bumper mounting is favoured. It can be excellent on suitable cars, but as applied to all-metal saloons there is a probability of the coil coming too close to bodywork. Furthermore, while the aerial is well clear of the car's own ignition and electrical system, it is liable to pick up maximum interference in traffic from following vehicles. In general, aerials in this country should be mounted on the off-side of the car, as this places them furthest away from overhanging trees and road-side interference. The conventional position on the off-front wing, favoured for broadcast aerials, has been shown to be quite effective, but work carried out in America by K5CFW has shown this position to be surprisingly directional. Of course there are few positions at which an aerial can be mounted on a saloon car and be free from quite pronounced directional effects. There is a tendency for signals to be concentrated forward with a wing-mounted aerial, and to the rear when rear bumper mounting is used. In all cases the radiation is lowest towards the sides of the vehicle, confirming the idea that the length of the chassis is frequently part of the resonant system, and nulls can in fact occur in the broadside directions. The directional pattern of an installation is not greatly dependent upon frequency in the hf bands, and maximum radiation is to be expected in the direction of travel, a little towards the near side *away* from that on which the whip is mounted. On the 10m, 15m and 20m bands the effect of turning the car was comparable to many beam aerials, variations of up to 20dB being common.

Construction—practical considerations

Ideas on aerial construction naturally vary widely, but tend to follow three main trends. A light, rigid construction is often possible at vhf or for roof-mounted aerials of limited height. In general, however, it is necessary in order to cater for high road speeds either to introduce flexibility into the system, or alternatively to mount a rigid system upon a flexible base. In this case the aerial may be expected to lean backwards at quite large angles during motorway cruising, and this has been criticised on grounds of detuning. American practice favours a stiff spring mounting for the rear bumper, where leaning is unlikely to be dangerous, but it has been advised that the usual spring should be covered with thick rubber tubing such as hosepipe, in order to damp out mechanical oscillations. The spring should be bypassed with copper braid in order to eliminate possible variations in inductance and hf resistance. W4QS is emphatic in condemning the use of springs of any type in any part of the mobile aerial system, although most popular commercial whips incorporate them. The author has used a spring mount for many years without detecting any adverse consequences, and mechanical failures have not occurred. However, the aerial feed is taken to a point *above* the spring mount, which is also insulated at the lower end, and thus the spring does not form part of the lower whip section. This would seem to get round any electrical objections.



The Bantex hf aerial type MI was developed in the USA for ssb transceivers and is made in the UK exclusively by Bantex Ltd. It is a helical aerial covering the range 3-15MHz. It is made in 15 different models covering this band and has found widespread acceptance in application where only a few frequencies are used, eliminating the necessity of an expensive aerial tuning unit.

Detuning as a result of the whip leaning does not appear serious at the lower frequencies, but may be expected to increase towards hf as lower portions of the aerial become relatively " hot". The dx operator should therefore be particularly alive to this risk, and it is always most unwise to employ a very flexible or " whippy " top section, as this will cause an unpleasant wobble in tuning and signal strength. A slightly flexible construction throughout such as is obtainable from the use of Fibreglass, has much to recommend it, and it is unfortunate that so little has been published regarding the effectiveness of helically-wound Fibreglass whips, although a design claimed to perform well on 7 and 21MHz has been published by G3FPK, and the American commercial " Heliwhip " for 10m, 15m and 20m has been well reviewed. It seems probable that this construction, which combines lightness, strength, low wind resistance and

a degree of flexibility, can be excellent for those bands on which limited inductive loading is needed. At lower frequencies, however, it is difficult to obtain sufficient inductance on such a small diameter without the use of fine wire having relatively high resistance, and losses tend to rise. A construction has been proposed in which the lower few feet of such a whip is wound with an open helix of heavy wire, followed by a close-wound section corresponding to the usual centre-loading coil, continuing with an open helix of fine wire to the tip. The G3FPK design employs a winding-pitch which is progressively reduced towards the tip, so that the greater part of the rf resistance will be in the upper part of the whip where current is lowest. This construction is also claimed to raise the feed-point impedance.

Tuning hf whips

Mobile whip aerials are normally regarded as equivalent to quarter-wave verticals, having maximum current and minimum impedance at the feed point. There is evidence, however, that many successful designs are in fact slightly longer than a quarter-wavelength electrically, thus raising the resistive component of the feed-point reactance towards 75Ω, and the current maximum is partway up the aerial where it will be more effective. This is almost certainly the case when bottom-loading or trimming is employed, or when the feeder is tapped up along a base loading coil or Z-match. The author has made no reference to this form of coupling, because in his experience, with which not all experimenters agree, no advantage has ever been noted from any kind of impedance-matching device in relation to an aerial which is correctly matched in its initial design. Such arrangements are convenient in maintaining loading when tuning over a band, but they cannot be without their own inherent rf losses, and the gain may be more apparent than real. It is worth bearing in mind, however, that whips can be designed for half-wave resonance, which will place maximum current well up in the clear, and fed from a high-impedance coupling unit. The helical construction, for example, can be wound with close-spacing at both ends, and a heavier-gauge open section in the centre: the construction is quite practicable for the higher frequencies and might be expected to give very interesting results.

It has been stressed by many authors that really low-loss construction is vital for the mobile loading coil, and while pointing out the importance of correct proportion, the author fully endorses this viewpoint. It is claimed with good reason that only individual, interchangeable coils for each band can provide this peak efficiency, and W4QS, for example, states that up to 3dB gain, representing double the effective radiated power, is obtainable over any form of tunable construction. However, there is little doubt that many mobiles feel the need for a multi-band system, particularly when dx operation is required, and will accept some penalty for this convenience. At vhf, as has been suggested, interchangeable whips are satisfactory or it is possible to introduce a telescopic feature if the greatest care is taken to keep all sliding joints clean and firmly clamped. On hf, however, it is not possible to change bands by length adjustment or capacitance-loading alone, and the coil inductance must be varied. The problem becomes the familiar one of doing this without the introduction of excessive rf losses. Tuning within the band can be carried out by (i) sliding a capacity-hat along the upper section, (ii) by hinged rods or (iii) by a small telescopic extension fitted at an angle to the whip just above the loading coil.

The best-known solution is undoubtedly that used in the " Webster Band-spanner " in which movement of the top section adjusts a sliding contact along the *inside* of a well-protected loading coil. This is not an easy form of construction for an amateur to attempt himself, and other approaches such as tapped coils or the variometer principle have been used with varied success. All such systems have the disadvantage, however, that the car must be stopped and the aerial manhandled, perhaps in pouring rain, in order to change bands or even to change frequency within the limits of one of the wider bands. It should not prove beyond the reach of amateur ingenuity to find a solution whereby band tuning or even band changing can be carried out from the driver's seat, and it seems that the modern ferrite materials should offer a promising approach.

G2BCX has described the use of a small piece of grade B2 Ferroxcube rod slid within the lower portion of a Top Band loading coil as a satisfactory means of tuning over the band, stressing the importance of avoiding saturation by the rf field, but has not referred to the remote actuation of this rod. The author has made considerable use of the latest ferrite materials in the construction of rf coils, including tank-coils handling the range of power levels in general mobile use, and while there are, of course, losses and the core material may become warm, he is of the opinion that these losses are not necessarily serious in relation to others which are always present. The experiment of moving a relatively large ferrite core longitudinally by means of a bowden-wire control has been tried, and it has proved feasible to tune a mobile aerial remotely from 3·8 to 1·8MHz by this method with tolerable performance. Losses are, of course, a minimum at the hf end, where the effect of the core upon inductance is small. This makes possible efficient working in the 80m band, and an instant change to Top Band without leaving the car. It is possible to visualize the movement of a combined copper-ferrite slug within a helically-wound hollow Fibreglass tube, having suitably graded windings whereby the effect of the ferrite will become greater as it is moved into regions having closely-spaced turns.

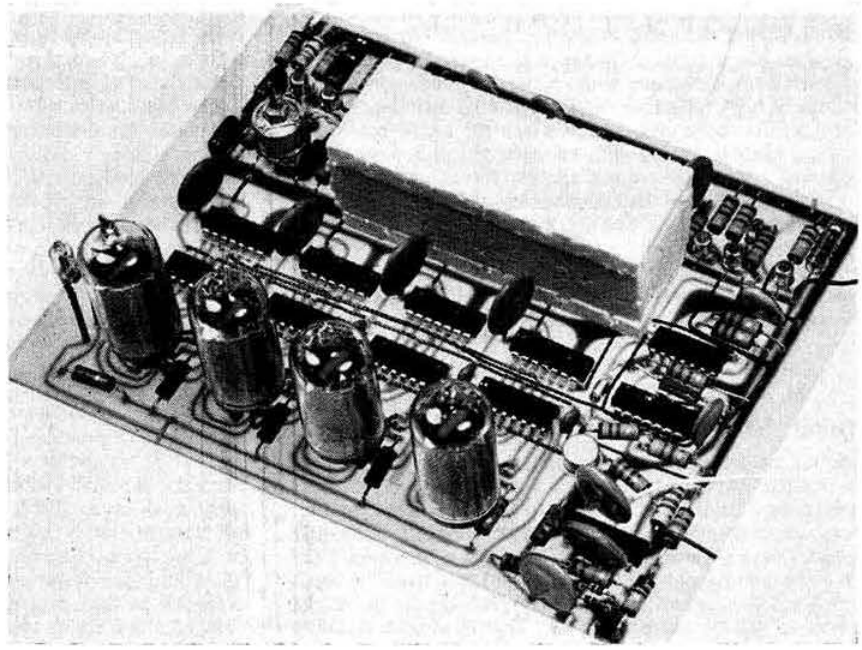
A still more flexible solution may lie in an application of the transductor principle, in which the inductance of a coil is varied by the saturating effect of dc passed through a control winding. If this could be developed at radio-frequencies through the skilful use of modern materials, without the introduction of too large losses as a result of core saturation, aerial tuning could be altered by the adjustment of a simple potentiometer on the dashboard. The varactor diode clearly offers another similar approach, but here there is a problem in that any form of parallel tuning capacitance has been shown to ruin the performance of mobile aerials. However, little or nothing appears to have been done with the idea of varying the tuning or current distribution by means of series capacitance, and there seems no reason, on basic grounds, why this method should not be feasible.

* * *

A more elegant approach to the design of multi-band or tunable mobile aerials is long overdue, and the author will be happy if any of his remarks contribute, however remotely, to the arrival at an ultimate perfect solution.

A 20MHz digital frequency meter using ttl integrated circuits

(Part 1)



by I. D. BROWN, BEng, AMIEE, G3TVU*, and S. L. NORMAN, BTech, AMIEE, G8BDO

A DIGITAL frequency meter was a logical extension to the integrated circuit calibrator used by G3TVU/M for the past two years, and after considering this instrument for some time the authors were finally spurred into action by the availability of numerical indicator tubes and low priced integrated circuit decoder/indicator tube drivers. It is believed that the instrument to be described may be built for less than £30.

Digital frequency meters

A digital frequency meter is basically a very simple device. If it is required to measure some frequency, say 1·935426MHz to the resolution shown, 1Hz, all that is required is to count cycles of the input frequency for precisely 1s and display the result. The above resolution would not be required by most amateurs, and does provide some problems in the generation of the accurate 1s period.

The authors decided that a 1kHz resolution would be adequate for the simple instrument in mind, and to provide this the input frequency is counted for 1ms. This period would give a display of 1,935kHz with the above input frequency. A block diagram of the instrument is shown in Fig 1.

Basic functions in a simple instrument

Referring to Fig 1, the frequency meter can be split up into the following blocks: input amplifier; signal gate; display counter; decoding and indicators; time standard oscillator; dividers, and control.

The input amplifier has to provide a link between the outside world and the internal logic of the frequency meter. This entails amplification for small signals or attenuation of large signals coupled with an interface to the standard internal logic levels used in the instrument.

The signal gate is the device which controls the flow of pulses from the input amplifier to the display counter. This

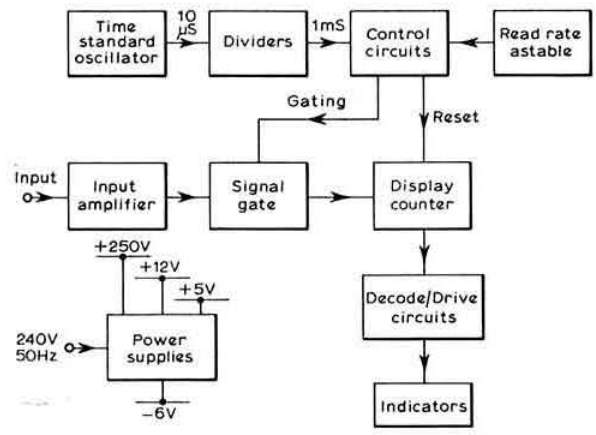


Fig 1. Block diagram

* 47 Peak View Drive, Ashbourne, Derbyshire.

gate has to be "opened" to allow pulses through for a precise period, 1ms in the instrument described.

The display counter accepts output pulses from the signal gate and totalizes them, providing outputs to drive decoding circuits for the display tubes.

Decoding is necessary to convert from the counting code used in the display counter to the 1 out of 10 high voltage drive required by numerical indicator tubes.

Precise time periods are required within the frequency meter. These are generated by utilizing a quartz crystal oscillator which should be checked against the broadcast standard frequency transmissions.

In general, the period generated by a frequency meter's standard oscillator is much too short to be used directly for control of the signal gate. To generate the required period, decade dividers are inserted between the standard oscillator and control circuits.

Internal organization of the frequency meter is governed by the control circuits. These accept input pulses from a read rate astable and synchronize them to the output of the divider chain. Two outputs are generated, firstly a pulse to reset the display counter to zero, and secondly the control period for the signal gate.

Logic family

The logic family used has a typical maximum counting rate of 18MHz. Thus, with a display in kilohertz, to utilize the full speed capability of the counting logic a display of 19,999 kHz is provided.

A 7400 series transistor-transistor logic (ttl) is used for all counting, dividing and gating functions within the instrument. Only two states are permissible in a binary logic system by definition; these will be called "high", (greater than 2V positive with respect to 0V rail) and "low"(less than 0·8V positive with respect to 0V rail).

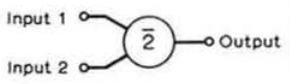
NAND gate

The basic element used is a two input "NAND" gate (NOT-AND) type 7400, four of which are contained in one dual-in-line package. This gate performs the function shown in the truth table in Fig 2, ie only when input 1 and 2 are high is the output NOT high (low). This is state D.

Set/reset bistable

Two nand gates can be combined to produce an edge-triggered set-reset bistable element, (Fig 3). The reset state A is stable. Gate 1 has one input held high by a resistor, and its second input is controlled by output 2 which is high. From Fig 2 truth table, this corresponds to state D making gate 1 output low. Gate 2 inputs can similarly be considered, one being high due to its resistor, and one low from output 1. Thus gate 2 output is high (Fig 2 state B or C).

To trigger this bistable, the negative-going edge of an input is capacitively coupled into one input of gate 1, making it become low. Gate 1 has now one input low and one high.

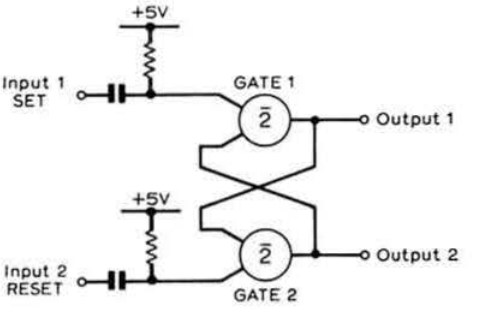


TRUTH TABLE

State	ip1	ip2	op
A	L	L	H
B	L	H	H
C	H	L	H
D	H	H	L

H...High L...Low

Fig 2. Basic 2 ip nand gate



TRUTH TABLE

State	Input 1	Input 2	Output 1	Output 2
A	R	R	L	H
B	T	R	H	L
C	R	R	H	L
D	R	T	L	H

H...High L...Low T...Trigger R...Rest

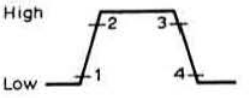
Fig 3. Set-reset edge triggered bistable

Thus from Fig 2 state B, gate 1 output becomes high. Gate 2 now has two high inputs presented to it and from Fig 2, state D, its output becomes low. We have now moved to stage B Fig 3. Upon completion of the input pulse state C ensues; but as output two is low there is no change in the output state of gate 1. This is the second stable condition of the bistable.

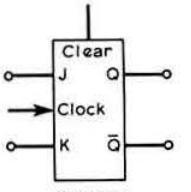
The bistable may be reset by application of a negative-going edge to reset input 2, which by similar reasoning to the above produces state D and then state A once more.

JK bistable

The second logic element to be utilized in the instrument is the "Master-Slave JK bistable". Two of these elements are contained in one type 7473 package. The term "Master-Slave" refers to the mode of construction of the device. It consists of



CLOCK WAVEFORM



SYMBOL

TRUTH TABLE

State	Before clock				After clock	
	J	K	Q	Q̄	Q	Q̄
A	L	L	H	L	H	L
B	L	L	L	H	L	H
C	H	L	L	H	H	L
D	H	L	H	L	H	L
E	L	H	H	L	L	H
F	L	H	L	H	L	H
G	H	H	L	H	H	L
H	H	H	H	L	L	H

H...High L...Low

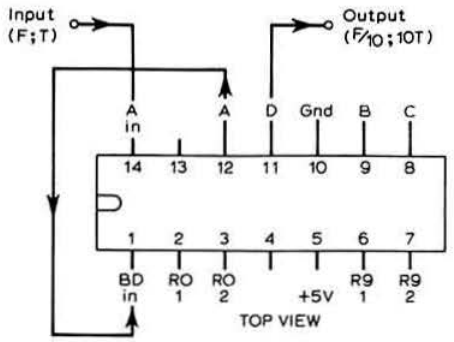
Fig 4. Master-slave JK bistable (7473)

a master set-reset bistable driving a slave set-reset bistable and a controlling gate system. The action of the device may be described with reference to Fig 4.

Each bistable in the package has two outputs Q and $\overline{Q}$ (NOT Q), $\overline{Q}$ is the inverse of Q. It also has a clock input and two further inputs J and K which control the bistable's action. A direct clear input is also available which overrides all other inputs, and operates when low to make Q = low and $\overline{Q}$ = high.

With the clock waveform low, the master and slave sections are connected and the inputs inhibited. On the positive-going edge of the clock the master and slave are isolated (1) and the input data at the J and K terminals is transferred to the master (2).

With the clock high, the master and slave sections are still isolated. On the negative going edge, the input gates are inhibited (3). Transfer of data from master to slave occurs at (4). The data is then exhibited on the output terminals of the slave.



TRUTH TABLE

BCD count sequence output A connected to BD in				
Count	Output			
	D	C	B	A
0	L	L	L	L
1	L	L	L	H
2	L	L	H	L
3	L	L	H	H
4	L	H	L	L
5	L	H	L	H
6	L	H	H	L
7	L	H	H	H
8	H	L	L	L
9	H	L	L	H

H....High L....Low

RESET/COUNT

Reset inputs				Output
RO(1)	RO(2)	R9(1)	R9(2)	DCBA
H	H	L	X	LLLL
H	H	X	L	LLLL
X	X	H	H	HLLH
X	L	X	L	count
L	X	L	X	count
L	X	X	L	count
X	L	L	X	count

X denotes H or L can be present

Fig 5. Decade counter/divider (7490)

Decade counter/divider

The third logic element utilized is a decade counter/divider type 7490. As the name suggests, this element can provide a divide by 10 function. Fig 5 illustrates the action of the device and its truth table when input pulses are routed into the "A in" pin, with A connected to "BD in". With these connections the 7490 counts input pulses, exhibiting the actual pulse count in binary coded decimal form (bcd) on its output pins. These have the following decimal weightings for high outputs: A = 1, B = 2, C = 4, D = 8.

Four additional control inputs are available, reset 9 (R9) and reset 0, (R0). For normal counting these four inputs are held low, but taking both reset 0 pins high holds all the counter outputs low, a count of zero.

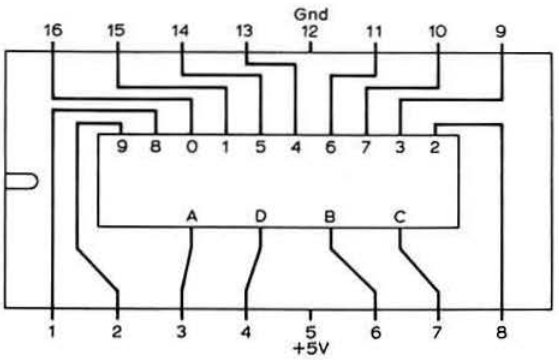
Decoder

The final logic element is type 7441, this provides decoding from 4-line binary-coded decimal to 10-line decimal. Its output devices are high voltage transistors designed to drive the majority of common cold cathode numerical indicator tubes, Fig 6 shows this device with its truth table.

Input amplifier—logic interface

One further integrated circuit is used, this is a type 710 comparator. This device performs all the input amplifier/logic interface functions required in the instrument.

The comparator has two inputs, the non-inverting and inverting inputs, marked + and − respectively. In action, if the + input is more than 5mV more positive than the −



TRUTH TABLE

Input				Output
D	C	B	A	on
L	L	L	L	0
L	L	L	H	1
L	L	H	L	2
L	L	H	H	3
L	H	L	L	4
L	H	L	H	5
L	H	H	L	6
L	H	H	H	7
H	L	L	L	8
H	L	L	H	9

H....High L....Low

Fig 6. BCD to decimal decoder/driver (7441)

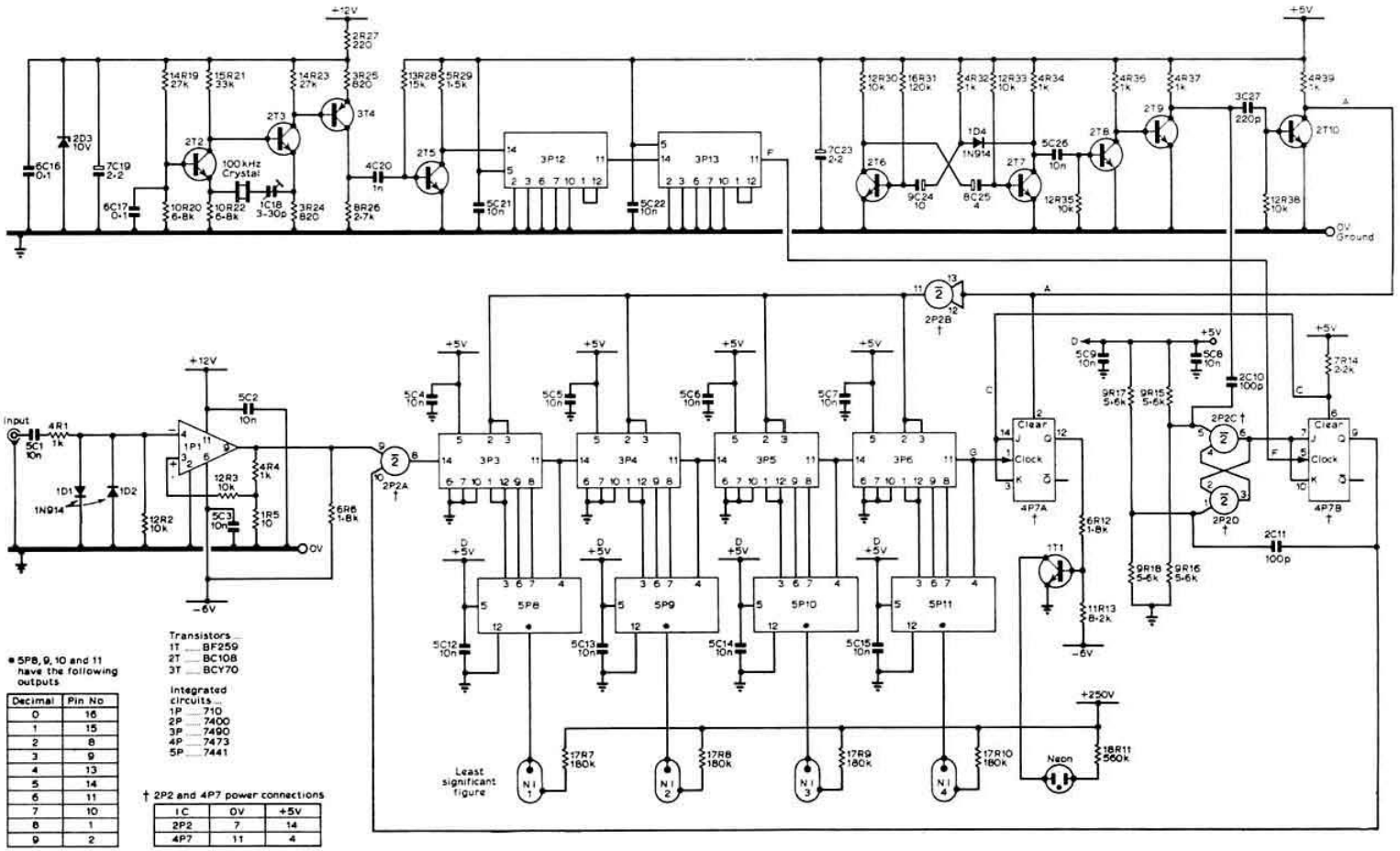


Fig 7. Circuit diagram

input, the output goes to logic high. Conversely, if the − input is more than 5mV more positive than the + input, the output becomes logic low.

Circuit description (Fig 7)

Input amplifier

As the 710 when used open loop has about 10mV hysteresis, it would be very prone to input noise signals. To overcome this, positive feedback is applied via R4, R5 and R3 to the + input causing the device to act as a Schmitt trigger. Feedback increases the hysteresis to the order of 60mV and output current sinking capability is increased by the addition of R6.

Input protection for the comparator is provided by a pair of silicon diodes (D1, D2) which limit its differential input voltage excursions to the order of ±0·7V. When the frequency meter input is less than this value the diodes do not conduct and the input impedance is of the order of 10kΩ. For large input signals, D1 and D2 conduct giving an input impedance of about 1kΩ.

The maximum input voltage to the instrument is limited by the dissipation of R1 and the maximum forward current rating of D1 and D2. In general the former will be the limit. A continuous forward current rating of 70mA is quoted for the 1N914 diodes used; with this current flowing through R1 it would dissipate 4·9W.

Signal gate

A 2 ip, nand gate P2A forms the signal gate. It accepts the logic level outputs from the input amplifier and controls their flow to the display counter under direction of control circuits.

Display counter

Four decade counters are cascaded to form the display counter. P3, being the least significant digit, accepts the signal gate output as its input, and counts at the maximum units rate in the display counter. On the tenth input pulse to P3, its D line changes from high to low (see Fig 5 truth table) causing P4 to count 1. P4 in turn drives P5, which drives P6. Thus P6 counts at one thousandth of the rate of P3, and if the unit count of P3 is in kilohertz the unit count of P6 will be in megahertz.

The output of P6 will change from high to low on the ten thousandth input pulse and this is used to drive P7A clock input. Considering Fig 4 truth table, it can be seen that this causes P7A Q output to change from low to high indicating a count of 10,000 or 10MHz in the time scale considered.

All the reset 0 (R0) lines of P3, 4, 5 and 6 are connected to a clear line driven by P2B output. This line rests low, going high for a short period under command of the control circuits. P2B is connected as an inverter, thus its output is low if its input is high and vice versa. As can be seen under "JK bistable", P7A is cleared by a low signal, and this is driven from P2B input.

Decoding and indicators

The bcd outputs of P3, P4, P5 and P6 are decoded by P8, P9, P10 and P11 respectively to give a "1 out of 10" output. These outputs drive cold cathode numerical indicator tubes as the display devices of the instrument, showing digits 0 through 9 as required.

One property of numerical indicator tubes is that when one cathode glow is established, the other cathodes will only rise to approximately +60V with respect to the ignited cathode. This means that transistors having a collector breakdown voltage of 70V, say, may be used as driving devices. However, if one transistor breaks down at 50V, this will be noticed as a background glow in the indicator tube.

P7A Q output changes from low to high for a count of 10,000 in the display counter. This makes T1 base positive with respect to its emitter, switching the transistor on illuminating the 1in half-digit neon. It should be noted that when a count of 20,000 is accumulated by the display counter, P7A Q output will change back from high to low, switching off T1. Although the half digit neon will only be switched on for approximately half a millisecond, the de-ionization time of the discharge is such that this is readily observed as a blip of light.

T1 is specified as a 300V breakdown transistor, as it drives a single discharge tube. When this transistor is off, its collector rises to full high tension potential of 250V.

The anode load resistors R7, R8, R9 and R10 of the numerical indicator tubes are selected to suit the manufacturer's current ratings, but will usually limit the tube current to between 1·5 and 2·5mA. R11 is the current limiting resistor for the half digit neon passing 0·5 to 1mA. It will be apparent if the tube current is too low, as the characters only partially illuminate, while at too high a current the digits become very bright and blurred.

Time standard oscillator

Transistors T2 and T3 form a Butler quartz crystal oscillator, their supply is zener stabilized at 10V by D3, R27 and decoupled by C16 and C19. The circuit is standard, using no inductors, but does utilize a pnp buffer stage T4. C18 enables the oscillator frequency to be adjusted to an external standard. As the oscillator utilizes a 10V supply, its output has to be interfaced to ttl levels. T5 performs this function and also provides a fast rise time waveform to drive the divider chain.

Dividers

The output waveform from the time standard oscillator has a period of 10μs (100kHz). This waveform drives P12 whose output period is 100μs (10kHz), which in turn drives P13 to generate a final period of 1ms (1kHz). The 1ms waveform is used as a time standard for the control circuits.

Control

Transistors T6 and T7 form the read rate astable multivibrator having a period of the order of 1s. This is quite standard except for the addition of R32 and D1. The action of these two components is to disconnect R34 and T7 collector from the timing circuit C24, R32 as T7 switches off. Thus the waveform at T7 collector has a fast rise time.

The positive-going edge of the waveform at T7 collector switches T8 on via C26, and T9 off. Due to the time constants associated with T8 base, T9 switches on once more some 40μs later. A positive-going pulse is generated on the base of T10 as T9 switches off, generating a 2μs negative going pulse at T10 collector. This is signal A, Fig 7, which causes P2B output to go high for 2μs. Thus as T10 collector goes low, P7A and P3, P4, P5 and P6 are all cleared.

When T9 switches back on after the 40μs period, the waveform negative-going edge passes via C10 to set P2C, P2D bistable with P2C output high. This signal controls the J and K inputs of P7B. Line F carries the 1ms standard time period signal which acts as the clock input to P7B.

When the next negative transition of the clock line occurs, P7B Q output changes from low to high, opening the signal gate P2A.

P2C output, and thus P7B J and K inputs, are still high when the next negative going clock line transition occurs. This second transition causes P7B Q output to change back from high to low, closing the signal gate P2A. The negative-going edge of P7B output is routed via C11 into the set-reset bistable to reset it with P2C output low. Thus P7B J and K inputs become low, preventing the clock line from affecting P7B.

From the foregoing it can be seen that a single time standard period is generated at P7B output under the control of the read rate astable and this is used to control the signal gate.

(To be concluded)

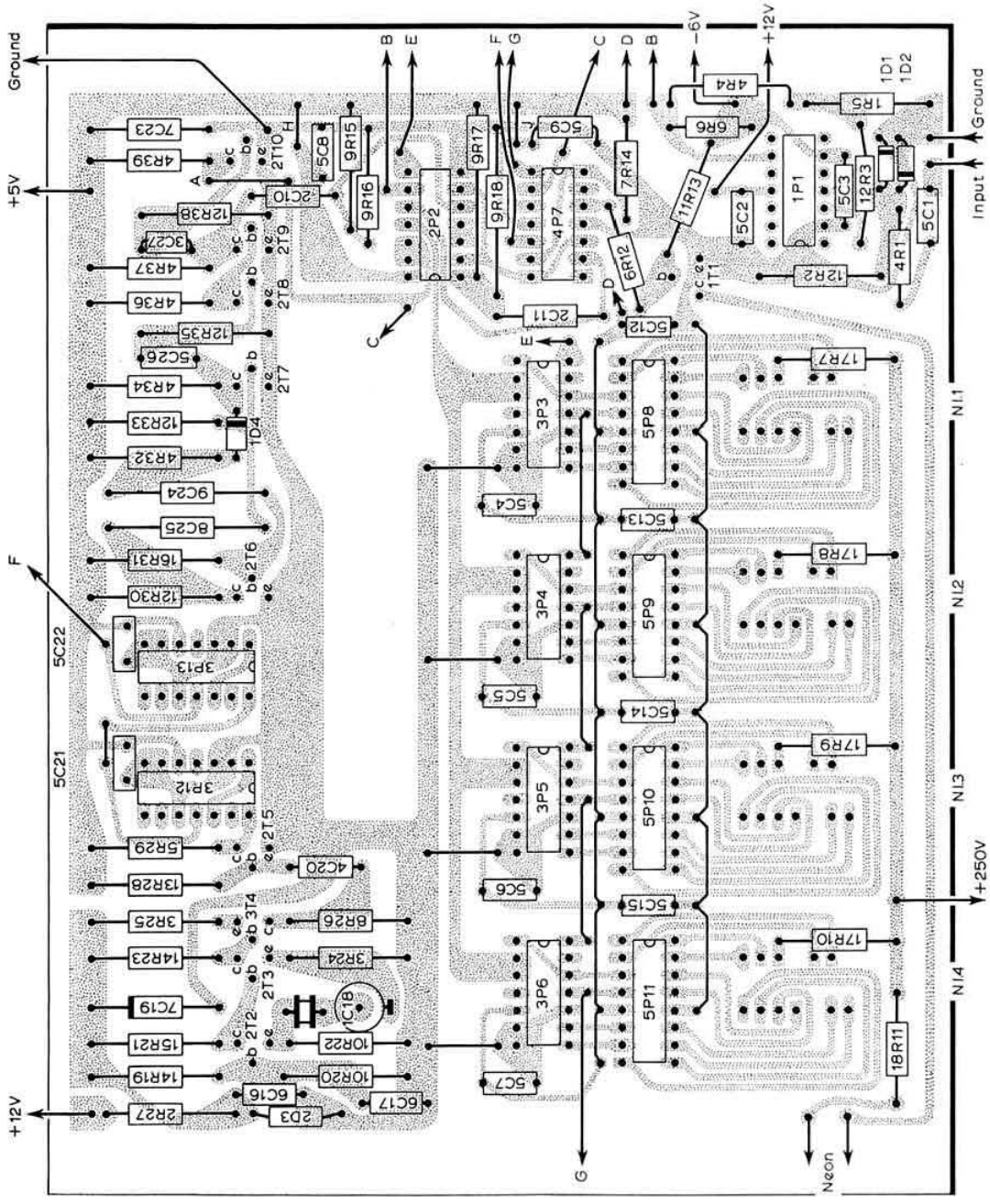


Fig 8. Component layout

A tester for field effect transistors

by A. G. THORBURN, G3WBT*

THE winter constructional programme at G3WBT included, for the first time, quite a few projects using field effect transistors, but because of a lack of knowledge and a lack of data on these devices, this fet tester was designed, constructed, and found satisfactory in operation. This design is not the last word in fet testers, as simplicity and availablility of parts in the stock (junk) box were important influences.

The design of such a tester should enable fet transfer characteristics to be ascertained so as to allow correct bias points to be determined and load lines drawn. From these, some understanding of FETs would be obtained and circuits using them could be laid out for efficient and effective use. Further criteria of the design were ability to check "N" and "P" channel junction FETs, MOSFETS or IGFETS; depletion or enhancement modes, and the ability to attach the fet easily to the tester and accommodate the multiplicity of different orders of drain source and gate connections.

The circuit

Fig 1 shows the circuit diagram, and Fig 2 shows the front panel layout. The latter has three crocodile clips, not shown in the circuit diagram, to which the fet leads are attached; the correct connections for drain source and gate being arrived at by insertion of the three miniature wander plugs in the appropriate sockets.

Switch positions in the circuit diagram are shown for "N" channel junction FETs where the drain has positive polarity and the gate is negatively biased from 0V to —6V by means of RV1 with the 6V zener in circuit, or to 9V with S5 open. S5 must be open when the tester is not in use otherwise the 9V PP3 will take current through the zener and R1 despite S2 being in the off position.

RV1 can be of very high resistance, as the gate, being reversed biased, takes no measureable current. S5 closed also allows RV1 to be calibrated in volts, 0 to 6, so no meter is required to read gate volts. When S5 is open the full 9V is available if required. With enhancement mode MOSFETS or IGFETS there may be no drain current until application of gate volts bias.

* 27 Banklands, Workington.

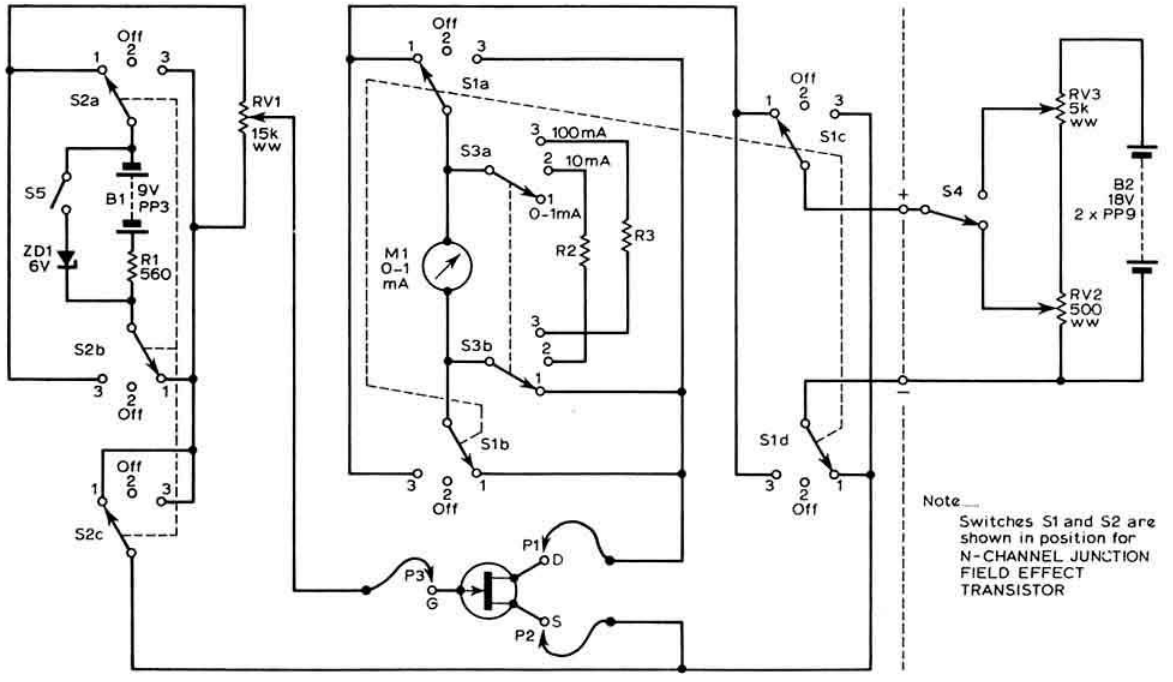


Fig 1. Tester circuit diagram. Switches S1 and S2 shown in position for "N" channel junction fet

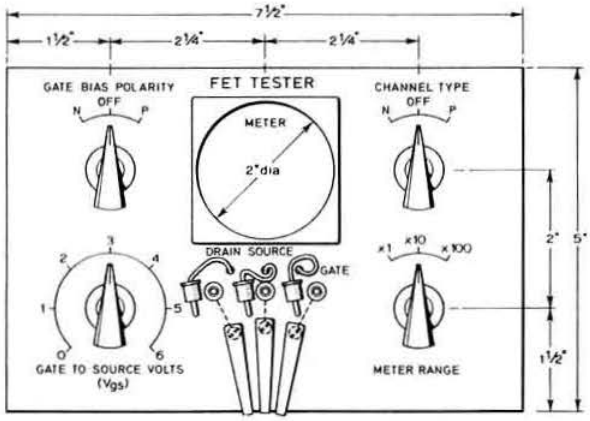


Fig 2. Front panel layout

For "N" channel MOSFETS with drain positive the gate will be positive, the drain current increasing with increased positive bias. "P" channel MOSFETS require negative bias for current flow.

Depletion mode MOSFETS have current flow with zero bias, the "N" channel type decreasing drain current with negative bias and increasing drain current with positive bias. In this way depletion mode MOSFETS can operate from zero bias on application of either positive or negative bias, ie from zero bias a change either way changes drain current. The B1 switching takes care of all these possibilities in conjunction with RV1.

In the model shown, B1 is external to the tester, as is the separate ac psu. Fig 1 shows B2 as 18V from two PP9 or RR6 batteries in series. B2 and components to the right of the chain line in Fig 1 can be built as a separate item as an alternative to the ac psu.

Operation

To operate, all switches should be off and the wander plug positions checked that they are correct for the fet to be tested. S4 should be switched to the 500Ω RV2 position, which should give 1·8V maximum with an 18V battery, and with a 30V psu 3V maximum. For a junction fet, RV1 can be set half way and S3 meter switch to 100mA. For IGFETS a finger should be held across the gate and source crocodile clips to prevent any build-up of static until the bias is switched on. Switch on S2 before S1 so that bias is applied before drain-source volts. Increasing bias on junction FETS decreases drain current. The meter switch should of course be moved to ensure that some drain current is showing. Manipulation of RV1, RV2 and RV3 in conjunction with S4, using the station multimeter to read drain to source voltage and tabulating drain current against drain to source volts at known gate to source bias volts, allows the fet's transfer characteristics to be plotted and curves filled in.

Fig 3 shows results obtained on an "N" channel general purpose fet.

While 18V should be all that is necessary for B2, as components were available in the junk box a variable psu, 0-30V, Fig 4, was made up. The transformer was an ex-radio speaker output transformer for 15Ω output. The 500μF capacitor is mainly to allow peak voltage to build up. Fig 5 shows the voltage drop against current taken for this psu, and is included as a matter of interest for those contemplating a similar type of psu.

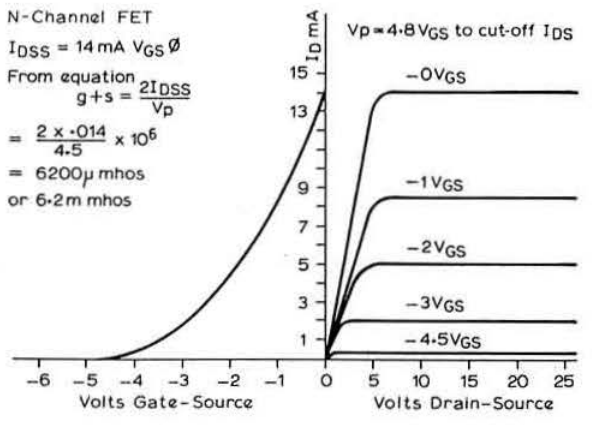


Fig 3. Transfer characteristics of "N" channel general purpose fet

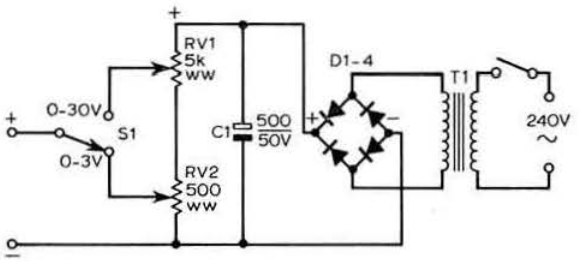
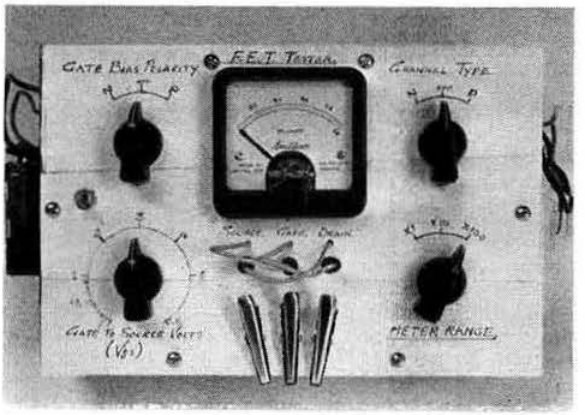


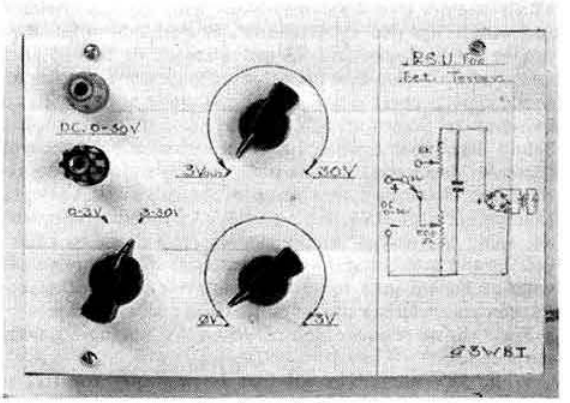
Fig 4. 0-30V psu circuit diagram

Construction

The tester shown is constructed in a ½in wall wooden box with an ¼in thick Paxoline panel. After marking out and drilling, a sheet of substantial plain white paper is placed over the finished drilled panel and all holes rubbed in.



Front panel of tester



Front panel of psu

Hole centres are easily found to allow the paper to be marked up, using a suitable pair of compasses and pen for all necessary inscriptions. The panel is then lightly gummed and the paper placed in position. After allowing a period for drying out, the author used 2in wide Sellotape to cover the papered panel and wrap a little around the edges. The large holes can be cut radially before folding inwards and the small holes pierced with pen or pencil.

Assembly of the switches, variable resistors etc, can then take place, the Sellotape protecting the panel while wiring and soldering takes place. RV1 is a linear wire-wound potentiometer and the panel can be pre-marked 0 to 6V as the input resistance is constant. It is advisable to subdivide the 0 or 1 division into either 10 or 5 further divisions.

It is not possible to divide out the sweep of RV2 and RV3 as the load here is not constant, as can be seen by Fig 5, which, in a way, simulates the varying load presented by the fet drain current. The station multimeter across B2 input to the tester when in use shows this up as widely varying voltages at identical positions of RV3.

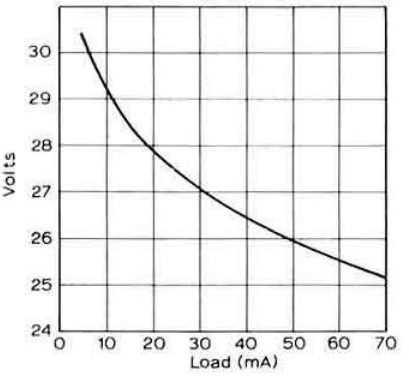


Fig 5. Psu voltage drop against load in milliamps

Tester components list

ZD1	6V zener diode. Mullard BZY88-C6V2, AEI-LR62 or similar
R1	560Ω carbon
R2	Meter shunt to suit 10mA fsd
R3	Meter shunt to suit 100mA fsd
RV1	15kΩ wirewound potentiometer (can be 20kΩ or 25kΩ)
RV2	500Ω wirewound potentiometer
RV3	5,000Ω wirewound potentiometer
P1, 2, 3	Radio Spares miniature plugs and sockets (wander type)
S1	4-pole 3-way wafer
S2	3-pole 3-way wafer
S3	2-pole 3-way wafer (or single-pole 3-way)
S4	Single-pole 2-way
S5	On/off
M	O-1mA fsd meter preferably 100 divisions scale
B1	PP3-9V
B2	2 off PP9-18V, or see simple psu circuit

PSU components list

C1	500μF
RV1	5kΩ wirewound potentiometer
RV2	500Ω wirewound potentiometer
S1	Single-pole, 2-way
D1-4	75V piv Si rectifier diodes
T1	20V miniature mains (Radio Spares)

Terminals or sockets—2 off

New equipment

TTU terminal unit

This is a solid-state fsk converter and keyer which provides all the circuitry necessary between a ssb, fm or a.m. transceiver and a teleprinter. The converter section of the equipment is of the fm demodulator type with pre-limiter and post-detector filters, and the demodulator discriminator response is optimized at 850 and 170Hz shifts but is adjustable from 1,000Hz down to shifts of very low values. The demodulator has an output for oscilloscope monitoring. A loop current supply is included and the auto receive circuit activates the teleprinter only when fsk signals are being received.

The keyer section generates standard afsk tones 2,125 and 2,975Hz or 2,125 and 2,295Hz, either normal or narrow shift. There is also a facility for on-off keying for use with the vfo of an hf transmitter. This can be either normal or reversed shift. Operation with a morse key provides an upward shift of 115Hz of the afsk mark frequency.

All the operating controls are located on the front panel of the attractively styled cabinet which measures 11in by 3½in by 11¼in deep. The weight of the TTU is 10lb and operation is from ac mains 110/220V, 50/60Hz. The price is £115 post paid in the UK.

The TTU is undoubtedly an equipment embodying the latest in solid state rtty techniques although at a price that may be discouraging to many. It brings to rtty operation a degree of sophistication that has not been seen in commonly available commercial equipment in the UK. Further information can be obtained from Spacemark Ltd, 14 Piccadilly, Manchester 1.

MICROWAVES–1,000MHz and up

by Dr D. S. EVANS, G3RPE*

Modulation systems on microwaves

In current practice, wide-band modulating systems use either pulse, or frequency modulation with speech or tone. The preferred bandwidth is about 1MHz. In the case of narrow-band (crystal-controlled) transmissions, there is a growing body of opinion that fm is preferable to conventional a.m., particularly because varactor devices are likely to be used in the multiplication chains. It may be noted here that this technique was recently used by G3BNL and G3EEZ in repeating their earlier British record contact on 9cm over the 54-mile path from Enville to Painswick.

An additional advantage of fm may be that if the deviation is increased from the 5kHz amateur standard up to a few hundred kilohertz, then this equipment becomes reasonably compatible with wide-band equipment already in use.

Any comments would be appreciated.

Bending klystrons

The art of bending klystrons is well-established. Thus the standard 3cm klystron of the 723 A/B type tunes up to 9,548 MHz only, but may be modified to operate in the lower part of the amateur band by carefully removing the spot welds locking adjusting nuts on a side arm, moving them up one to three turns and relocking. In spite of rumours to the contrary, most klystrons treated in this way continue to oscillate, generally up to 10,100 to 10,150MHz.

G8WDG and G8CUS (Bristol) recently successfully "bent" seven from a batch of 10. Of importance, however, is that the three which refused to oscillate after this treatment, did so when the resonator volts were increased from the normal 300V up to 350V. They presume that the increased velocity of electrons permits their correct bunching within the distorted cavities.

This appears to be worth trying on those unmodifiable klystrons which have no other obvious use.

Radiation hazards

I have been reminded that many newcomers may not be fully aware of the potential radiation hazards associated with their equipment. It is an unfortunate characteristic of the human race that they cannot resist peering up waveguide to see where the rf is coming from; and the eye is one of the more vulnerable organs.

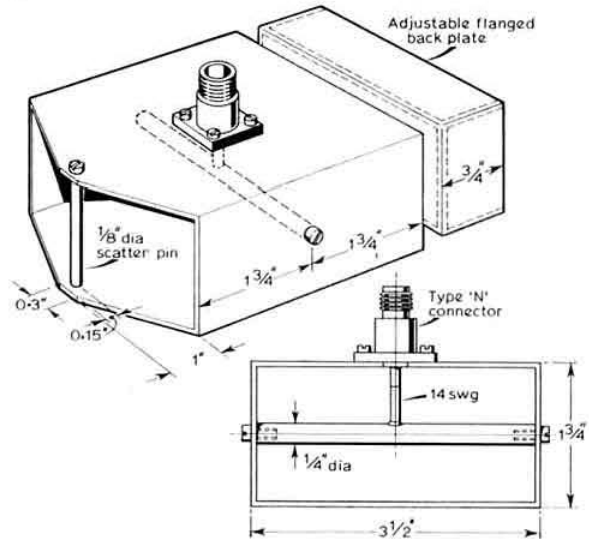
A generally accepted limit of power density to avoid damage to delicate tissues is 1mW/cm². Even the smallest equipment in current use exceeds this value within the waveguide by five to 10 times, although the radiation density of course quickly falls off at moderate distances.

The message is obvious. Never look up close to the end of a waveguide until you have made certain that there is no rf present.

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

A waveguide feed for 13cm

G3OBD (Poole) has supplied the accompanying sketch of the 13cm feed he exhibited at the last VHF/UHF Convention, the design of which appears to be due to G8AGM. The method of construction is obvious: suitable materials for the body could be brass, copper or even tinplate. Alternatively, a length of waveguide No 9 may be used if available. The back of the feed is closed with a flanged plate, which is adjusted for minimum vswr, and then clamped or soldered in position.



Details of other 13cm feeds are given in *Radio Communication* August and September 1969 (pages 558 and 634), and in the *VHF-UHF Manual* page 9.26.

BOOK REVIEW

Sun, Earth and Radio, by J. A. Ratcliffe. World University Library, London. Paperback 80p. Also hard-bound.

Any radio amateur who feels that he would like to relate his own practical knowledge of the vagaries of radio communication to the mysterious physical processes which regulate the perpetual motion of the ionosphere and magnetosphere will surely feel a sense of delight on delving into this book. In its 250 pages, well-stocked with diagrams yet involving no more complicated mathematics than does the RAE, Mr Ratcliffe has developed his theme so painlessly that the work reads more like a popular Christmas lecture than the useful text-book which it most assuredly is.

TECHNICAL TOPICS

A monthly feature by PAT HAWKER, G3VA

A COUPLE of years ago, in presenting a "check dozen" suggestions on the tvi problem (*TT* March 1969), we cautiously suggested that "with approaching single-standard uhf television, the worst is probably over". But even then we noted that certain trends in tv receiver design practices, including transistor tuner units, could jeopardize the relief from tvi which should theoretically result from: (a) the use of frequencies between 470 and 875MHz; and (b) the much higher field-strengths (more than 70dB above 1μV/m) to which the new tv networks were being planned. We also warned that there was one timetable for the building of the uhf network, possibly quite another for its use by the vast majority of viewers.

Today, with some 80 per cent of the entire population of the UK within range of three-channel uhf (but with almost certainly a good deal lower percentage of viewers actually using the new networks), it seems a good time to have another look at tvi to try to assess how many of the hopes have been fulfilled, or the reverse. In doing so, I am drawing on discussions with and/or correspondence from Barry Priestley, G3JGO, Ian Jackson, G3OHX, and F. A. Shaw, G3NXS, all of whom have given this matter a lot of thought and who are concerned about some of the problems which are arising. So this month, even though it means holding over some other material, we are devoting a good proportion of *TT* to matters relating to tvi. For this is still the single most important topic affecting modern amateur operation!

UHF and tvi

The first, and saddest, conclusion is that the degree of improvement in the tvi situation in the past two years is far less than we might reasonably have expected. Admittedly, Channels 20 to 68, in Bands IV and V, are much better than the notorious Channel 1 (45MHz) of Band I. But not only is the incidence of tvi to Bands I and III continuing at a depressingly high level, but there is a growing feeling that the official statistics are really only the tip of the iceberg. Many cases of tvi are dealt with by the amateur concerned (if only by his closing down during tv hours on one or more bands) or result in a running sore with his neighbours who often resort to tactics other than reporting the interference to the Post Office.

Recent surveys among Echelford and Greenford club members suggest that while Band I continues to account for about half of all interference problems, Bands IV and V (uhf) are rapidly approaching Band III in numbers of cases. The situation seems to be that for every two cases on Band I, there is likely to be one case on Band III and one on Bands IV and V. We also suspect, although we cannot produce any supporting figures, that the incidence of tvi cases among vhf operators has become more severe. All this suggests that the opening of uhf has not significantly lessened the tvi problem.

The reason is not far to seek. While Bands IV and V are less likely to be affected by harmonic radiation from hf transmitters, modern tv receivers have become increasingly susceptible to high rf fields, even on frequencies far removed from the tv signal itself. Front-ends are easily driven into non-linearity resulting in severe cross-modulation (some tv designs feed the aerial straight into a bipolar transistor without any preliminary tuned circuit), and signals leak far too readily into the i.f. stages or the af stages.

Colour and tvi

There is also a relatively new problem. Colour sets are significantly more susceptible to interference in the form of patterning produced by fairly high video beat frequencies. Recently we had an opportunity of watching the effect of injecting a simulated beat frequency into video signals going to two side-by-side monitors, one colour, the other monochrome, displaying still slides.

It was immediately apparent that beat frequencies and amplitude levels which resulted in barely noticeable patterning on the monochrome picture (one often had to look at uncluttered sky scenes to detect the interference) nevertheless produced spectacular effects on the colour monitor. While this may not have been entirely typical of actual interference, it did bring home very clearly that colour tv is a lot more critical to beats (particularly about 3 to 5MHz) than monochrome! The British colour sub-carrier on approximately 4·43MHz is not—unlike the American 3·58MHz—actually in an amateur band, but it is still very easy for 3·5MHz operators to find their signals getting into the colour circuits of a receiver with disastrous effect; a similar situation could also occur due to harmonic beats resulting from operation on almost any band. So we must accept that some levels of harmonic or spurious radiation which would be innocuous on monochrome are unlikely to be tolerated by viewers with colour sets.

The frequencies of uhf tv

It is always useful to know something about the tv signal and its frequencies when dealing with tvi. Bands IV and V consist of Channels 21 to 68 (Channels 35 to 38 are not used, as they form the gap between Band IV and Band V). Each channel is 8MHz wide (Channel 21 starts at 470MHz, 22 at 478MHz etc): in the British 625-line system (System I) the vision carrier is always +1·25MHz from the lower end of the channel, and the fm sound carrier+7·25MHz from the lower end. Fig 1 shows the frequency bands occupied by the various components. To find the lower frequency edge of any channel between 21 and 68, simply multiply the channel number by 8 and add 302. It must be noted, however, that within the main i.f. strip of a tv receiver these frequencies are transposed, with the vision carrier usually at 39·5MHz and the sound carrier (located on the

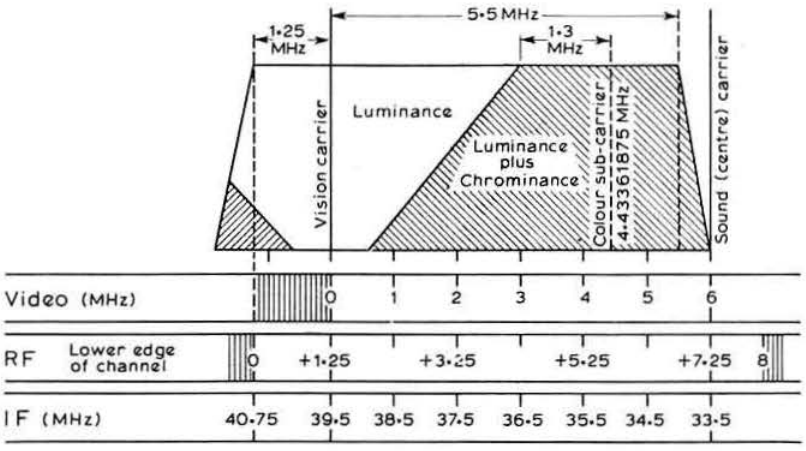


Fig 1. Frequency bands relating to the British 625-line (Specification I) television system. The rf frequencies must be added to the lower edge of the appropriate channel (eg 486MHz for Channel 23, 646MHz for Channel 43, 806MHz for Channel 63). Channel edge = Channel number × 8 + 302MHz

"intercarrier" shelf of the i.f. response) at 33·5MHz, with later sound i.f. stages at the 6MHz difference frequency. The corresponding frequencies for 405-line vhf reception are 34·65 vision carrier i.f. and 38·15MHz a.m. sound carrier i.f. These i.f. figures have been standardized for some years and most of the old non-standard sets have long gone into retirement.

With the latest single-standard uhf-only receivers no facilities are provided for vhf, so the lowest frequency which has any reason to reach the first stage is 470MHz; even a simple form of high-pass arrangement should, in fact, be sufficient to eliminate or greatly reduce the risk of blocking or breakthrough by hf, 70 and 144MHz signals. It is regrettable that no recognized performance characteristics in this respect appear to have been established by the set makers. "What is needed is some reasonable standard of design of tv sets," suggests G3OHX. This may not be altogether fair to a number of British firms (who are often well aware of the problem but plead the need for their sets to remain competitively priced), but the sentiments are likely to find a firm echo in many amateurs' minds.

G3OHX believes that much of the present trouble with uhf receivers is caused by signals leaking along the outer-braid of the coaxial cable, while open printed-board construction tends to reduce the inherent screening found in the older types of chassis. He feels strongly that the conventional isolating/aerial static discharge circuit, typically as in Fig 2 (a), is inappropriate for uhf-only receivers and should be replaced by a simple high-pass filter arrangement such as that of Fig 2 (b). At vhf, "braid-breaking" (ie making it more difficult for signals on the outer-core of the coaxial cable to reach the receiver circuits) could be achieved using a balun transformer type arrangement: Fig 2 (c). Simple filters of this type could be added externally (we mention later the possibility of using standard uhf/vhf "diplexer" units for this purpose), although G3OHX would like to see the set-makers adopt such circuits (he considers that they would actually cost the firms less than the conventional arrangements). It must always be stressed that amateurs should be extremely wary of altering other people's receivers in any way, other than perhaps just fitting an external filter.

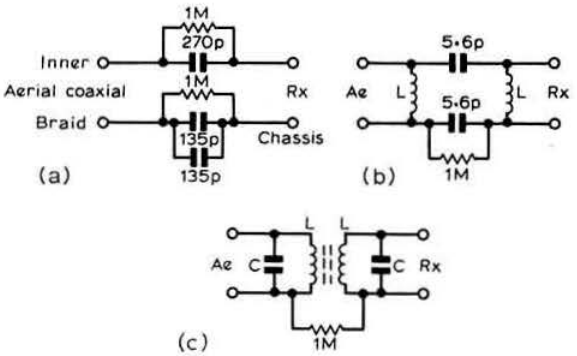


Fig 2. (a) Typical isolation/static discharge circuit used between aerial and receiver input of tv receivers; (b) G3OHX's suggestions for providing high-pass characteristics on uhf receiver, coils 4 turns ¼in id 24swg self-supporting or printed inductors; (c) transformer for vhf reception, L2 turns, capacitors to tune out leakage inductance about 4·7pF

Mains wiring and tvi

F. A. Shaw, G3NXS, stresses the role of mains wiring in the transfer of significant energy from a transmitter into a tv set. Sometimes as a path right into the receiver, but often as an "aerial" re-radiating energy to the viewer's aerial or the outer braid of his coaxial feeder. In the past he has cured a number of cases of tvi using the now obsolete FX1588 lossy toroids. This type of "lossy balun" as an aerial filter has gone a little out of official favour (partly because of the difficulty of obtaining sufficiently lossy ferrite toroids). G3NXS suggests, however, that the same technique can be used to form a very effective mains filter, stopping energy coming along the mains lead going directly into the tv set. His usual approach is to put a toroid filter in the mains lead close to the back of the affected tv set. About 10 to 15 turns in the usual bifiliar manner with an 0·01μF disc capacitor on the mains socket side between line (L) and neutral (N). He regards many of the usual types of mains filters which use the E of three-pin sockets as rather suspect since, in the circumstances, there is often an equally large amount of unwanted rf on the E lead.

But now, with recent colour receivers, he is encountering a new problem: rf re-radiating from the mains lead directly into the af module which forms the main af amplification. He comments that some forms of module are difficult

to bypass effectively for rf, particularly some which use vhf planar silicon transistors for af amplification; these are all too effective at rf. For his own receiver he has now replaced the original af module with older type germanium transistors of the OC71 category and this has solved the problem—but one just cannot do this with other people's sets, and he finds the firms tend to shrug off the problem as affecting only a tiny minority of viewers. Needless to say, G3NXS regrets the tendency of firms to use these planar transistors in this application, although it must appear that any attempt to halt this trend will prove a Canute-like failure.

Influencing the set makers

This raises the general problem of how much can the amateurs do to persuade set-makers to produce sets with better immunity characteristics. It would be helpful, for example, if some acceptable performance figures could be written into the current BSI draft specification on "The reception of sound and tv broadcasting" (revision of CP327.201 of 1960), or if we could bring our views to the technical committee of the British Radio Equipment Manufacturers' Association. One gathers that many American tv manufacturers are prepared to supply high-pass filters free of charge to help overcome tvi. This has been known to happen here but usually on a rather limited scale. In essence, of course, these are "political" rather than "technical" topics but there can be little doubt that they form an important aspect of modern tvi!

It is good to note that a recent issue of the *BRC Bulletin* (servicing notes for dealers issued by the British Radio Corporation, part of the large Thorn Group) contained an article "Investigating TV Interference" which gave a useful outline of some of the problems and cures in the field of interference to tv from vhf mobile services and from amateur stations. This set out the position quite fairly and included a number of useful ideas such as the use of single-stub coaxial-line filters; it also pointed out that for uhf-only reception it was often possible to cure or improve matters by fitting a standard uhf/vhf diplexer in the receiver input socket—this reduces the amount of hf and vhf energy fed into a receiver. The article, by K. R. Harris, stresses that interfering signals can enter the receiver via the aerial, the mains or by direct radiation. It is certainly a hopeful sign to see an article of this type being put out by our largest manufacturing group.

Where viewers are still using the vhf side of dual-standard sets, it is not possible to fit a high-pass filter in order to cure 144MHz tvi. Possibilities here include a stub filter, a bridged-T notch filter, or even a simple series-tuned trap of the type shown in Fig 3. This particular filter comes from *Radio-REF* (No 5, 1971) in connection with a description of an "anti-tvi" 70W hybrid 144MHz transmitter by A. Cocheteux. It is claimed to attenuate incoming 144MHz signals by 40 to 65dB.

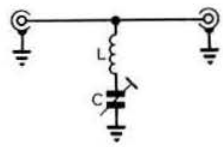


Fig 3. Simple series trap in tv feeder to reduce 144MHz input to receiver. Typically for 145MHz L is 7 turns, 12mm diameter, winding length 15mm, C is 0·6/7pF

Receiver immunity—awakening interest?

Happily there are some signs that this important question of receiver immunity to high rf fields is at last attracting serious attention. An abstract of a paper presented at the recent Montreux international television symposium by T. Dvorak (ETH-Zurich) includes the following passages:

"Little information is available concerning the behaviour of receivers in strong unwanted electromagnetic fields . . . it is felt that after relatively severe regulations have been introduced by most countries to control interference at the source, *the next logical step to be taken would be to investigate the possibilities of improving receiver performance and to lay down appropriate limits of its susceptibility* . . . by making use of good engineering practice in the design and manufacture of television receivers, the desirable screening efficiency of 35dB may be achieved even at the highest frequencies, where this parameter tends to deteriorate," (my italics).

Paradoxically, the amateur service may benefit from the growth of the mobile radio services; whereas the chances that the television industry would ever consider improving immunity of receivers solely on account of amateur radio must be considered slim, it is becoming increasingly urgent for sets to be able to operate in close proximity to the base stations of private and public two-way mobile systems. After all, it could be argued that the purchaser of a set has a common law right that it should be suitable for the purpose for which it is sold—*viz* receiving television pictures. The question of radiation from the local oscillators of radio and tv sets is also becoming of more concern and this may result in better screening and isolation.

Easily adjusted low-pass filter

Of course, not all tvi is the fault of the receivers. There is still an obligation on the part of the amateur to keep harmonic and spurious radiation down . . . and that usually calls for low-pass filters. While the traditional types, as given in all the handbooks, are usually quite effective when correctly set up, they are not always easy to align and check without test equipment. A design which did not perhaps receive sufficient attention at the time it was published ("An effective low-pass filter", by Glenn R. Welsh, WB6HRM, *QST* January 1966) is the one shown in Fig 4. The author claimed that this type of filter, based on the insertion-loss concept rather than the more usual image parameter type, offered several advantages: (1) it uses two less coils for equivalent stop-band attenuation; (2) it provides relative freedom in the selection of frequencies of maximum attenuation; and (3) it is easy to tune using only a grid-dip meter. His suggested filter had a 30MHz cut-off, with tuned circuits at 78·1, 40·5 and 47·3MHz resulting in the attenuation curve shown in Fig 5. Maximum vswr introduced by the filter was given as 1·3:1 at 29·7MHz.

To achieve this performance, the usual filter construction precautions must be taken. Coils were made from No 14 enam copper wire formed on a ¼in diameter mandrill: L1 8 turns; L2, L3 6 turns. When the coils have been formed, the capacitors C2, C4 and C6 are soldered across them and initially tuned to resonance by adjusting the turns spacing until a gdo indicates resonance at the appropriate frequencies. The coil/capacitor assemblies are mounted in the chassis (individually) and again checked for resonance. Finally, the shunt capacitors (C1, C3, C5, C7) are soldered into the filter. The WB6HRM unit was housed in a 5in by

3in by 2in aluminium Minibox, with aluminium shields providing isolation between the three filter sections. Attention was drawn to the need to secure each shield at eight points to assure good isolation, and he also used angle brackets to reduce leakage from the enclosure, with paint removed from the edges of the cover to insure good metallic contact between overlapping flanges when the unit is assembled. WB6HRM pointed out that these precautions are important in preventing harmonic currents from reaching the outside surface of the housing and so by-passing the filter.

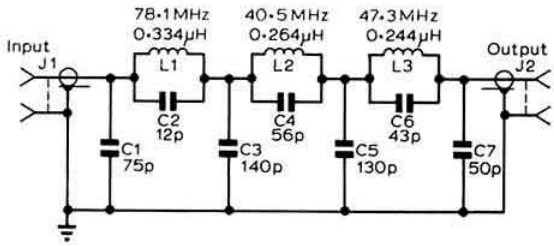


Fig 4. The WB6HRM low-pass filter providing attenuation exceeding 50dB above 40MHz with easy adjustment

Double-stub filter

The standard coaxial stub filter as described in the *BRC Bulletin* is well-known (Fig 6 is taken from that reference). But in *TT* (December 1970) details were given of a two-stub filter capable of providing either an appreciably deeper notch or alternatively the possibility of staggered bandpass characteristics. One reader who made good use of this idea, but with $\frac{3}{4}\lambda$ rather than the originally suggested $\frac{1}{4}\lambda$ stubs, is Alan Williams, G3KSU.

His particular requirement was to find some way of keeping extremely strong local Band II vhf/fm broadcast signals out of his 70MHz converter, where the intermodulation products between Radio 2, 3 and 4 (using frequencies separated by 2·2MHz) were producing spurii on 2·2 and 4·4MHz on his tunable i.f. He makes a number of useful comments:

"Various versions of coaxial filters were tried, using a Polyscop to check the performance, and the usual vswr bridge to measure the resulting mismatch that the filters introduced into the line. This last point is most important, since there is little point in clearing the spurious interference

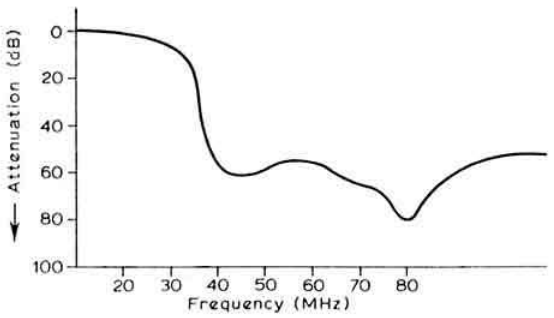


Fig 5. Attenuation of the WB6HRM filter; points of maximum attenuation depend on resonant frequencies of the tuned circuits

if the filter also introduces such a high vswr that the wanted signals also depart! Such a mismatch can be cancelled by using yet another stub, but in such cases the whole thing tends to get a bit messy. . . .

"However, the filter I ended up with not only does its job well, but does not introduce a mismatch on 70MHz at 75Ω (this is *not* the case on 144MHz where the vswr becomes greater than 10:1). The filter (see Fig 7) can be inserted at *any* point on the 70MHz line, and I have mine in the attic, half-way between the 70MHz aerial and the transmitter/receiver. At 91MHz, using coaxial cable having a velocity factor of 0·66, $\frac{1}{4}\lambda$ is 21in, and $\frac{3}{4}\lambda$ is 63in (the stubs can be coiled up to keep them out of the way)."

G3KSU mentions that at least three of these filters are now in use on the Isle of Wight and all the owners seem happy; confirmation that the double-stub filter can be a potent device!

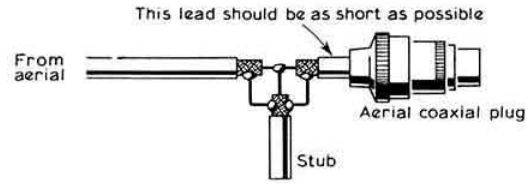


Fig 6. Open circuit single quarter-wave stub as described by K. R. Harris. Physical length about 2000/f (MHz) inches (but make stub slightly long and then trim for maximum rejection point)

State-of-the-art 144MHz preamplifier

After several years in which the trend of solid-state 144MHz front-end amplifiers has been towards fet devices (experimental fet devices have now been developed by GEC for use up to 1GHz), we could yet see a swing back to bipolar transistors. In *QST*—(April 1971), J. R. Hattaway, K4PKV, and Donald Belcher, WA4JVE, describe a preamplifier (Fig 8) with such exceptional performance that Ed Tiltman, W1HDQ, *QST*'s vhf editor, feels constrained to add a note emphasizing that "this is no April Fool thing: the amplifier does all that is claimed for it by the authors".

The amplifier, which works equally well on 432MHz, provides high gain (around 23dB) and has a noise figure of 1·5dB at 144MHz (and under 2dB at 500MHz), plus good intermodulation characteristics—and achieves all this without the traditional problem of neutralization!

There is, at present, one quite formidable snag: the amplifier is designed around a new generation of microstrip-packaged transistors (the Texas Instruments' MS175 series) and these do not come cheaply. *QST* puts the cost in the USA of the transistor as $16, or about $25 to build the complete amplifier; some may find this a rather expensive way of (as G3GGK and G3EDD put it recently) "dredging around in the noise for exotic dx". Nevertheless it seems well worth drawing attention to this new generation of vhf/uhf transistors which are already being put to various uses in professional equipment.

The *QST* article lists a number of precautions to take when using these devices. For example, the silver alloy leads are quite fragile and should be formed only once; the input and output circuits have to be kept physically separate; a 330Ω resistor should be inserted in series with the amplifier the first time it is powered (if all is well about

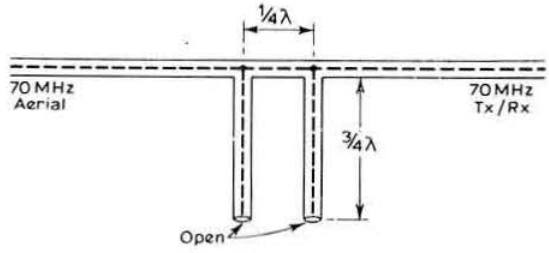


Fig 7. 91MHz double-stub filter used by G3KSU to keep Band II vhf/fm broadcast signals out of 70MHz converter

half the supply voltage will be dropped across the resistor). And, for maximum benefit, such an amplifier should preferably be mounted at the mast-head to avoid the effects of signal losses in the coaxial feeder. For anyone seriously contemplating building one of these high-performance amplifiers, we would suggest that the *QST* article be consulted.

24MHz bandpass amplifier

In the May *TT*, we reprinted the circuit diagram of a mixer-type mini-vfo by I1HF intended for use on 144MHz, providing output at 24MHz. In the accompanying notes, however, we indicated some concern that the output of the unit as shown was bound to contain a number of unwanted mixer products that might pass through a broadly-tuned transmitter and emerge as spurious radiation.

Ian Lever, G8CPJ, has been experimenting with mixer-VFOs and fully confirmed our view that some extra precautions will usually be needed. He was able to measure unwanted mixer products at quite alarming amplitudes. As a result he knocked up a 24MHz bandpass amplifier (Fig 9) using a couple of dual-gate FETs and imposed this between the output of his mixer-vfo and the main transmitter chain. This proved extremely effective; reducing all unwanted output without in any way affecting the ability to tune the vfo across the band. Using the two dual-gate mosfet stages he found the −3dB bandwidth to be 1MHz, with −70B points at 22 and 26MHz. Many amateurs might be prepared to settle for less than this—in which case a single mosfet stage would probably suffice.

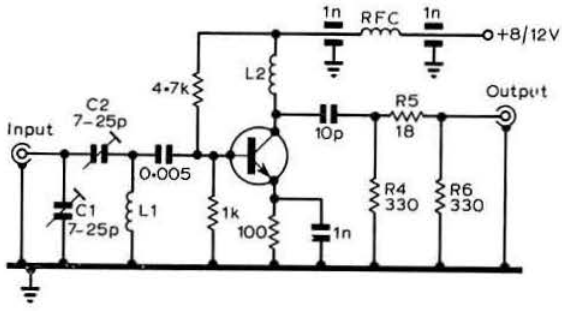


Fig 8. "State-of-the-art" 144MHz pre-amplifier using Texas Instruments MS-175 series transistor. L1 8 turns No 22 on 1kΩ ¼W resistor. L2 5½ turns on 10kΩ ¼W resistor. RFC 10 turns No 33 enamel, toroid on ferrite bead. A similar arrangement can also be used at 70cm. Development MS-175 devices were designated MS-0150A (*QST* April 1971)

It will be noticed that the output is low (1mW into 50Ω); this is in line with G8CPJ's policy of keeping power levels extremely low right up to 144MHz and then providing virtually all the power amplification at that frequency. Certainly we would recommend that anyone building the I1HF mini-vfo seriously considers using a one or two stage bandpass amplifier of this type.

Zinc-air batteries

A new form of compact, high-performance dry battery has been announced recently by Crompton Parkinson Ltd. This is a zinc-air cell for use in applications calling for continuous heavy discharge at appreciable current. The first type to go into pilot production, the 2AS, takes up the same space as two AA penlight cells, yet can provide a continuous current drain of 250mA at over 2V for about 10 hours. In such severe conditions, Leclanché cells of this size would drop to well under 2V in a matter of minutes: see Fig 10. While some caution is needed in interpreting these curves, since the conditions are clearly chosen to show the new cells in the most favourable light (nobody in his right mind would use conventional penlight cells under these conditions), there would seem every indication that this new type of battery may in future become a valuable form of power source for amateur radio applications or for tape recorders etc. Unfortunately, in spite of persistent questioning, the firm is not at present prepared to give any indication as to the likely cost of these batteries when they go into full production (they say only that they expect them to be "competitive" in cost per watt-hour with other high performance power sources).

The 2AS is rated at a nominal 2·8V in use, and has a capacity of at least 2·5 ampere-hours. It comprises two rectangular cells in series assembled with their air-breathing cathode faces mounted inwards on either side of an air channel; normally they are kept in air-tight packs until put into use. It is stated that where the cells are to be used intermittently, it is preferable to incorporate a device to prevent air entering the battery compartment when current is not being taken. The special cathode structure, consisting of several layers held in an external plastic frame, has been developed in collaboration with Leesona-Moos Laboratories in the USA.

Digital techniques at rf

A further letter on the subject of digital phase-shift (*TT* February, May and June) has come from John Boyce, VK3AXF, commenting on the original notes of GI3DVB. He points out, as did GD3XNU, that this type of technique was investigated by Dr W. Saraga at AEI and that a discrete version of logic phase-shifting was demonstrated by the company several years ago at the Physical Society Exhibition. He seems to recall that they were able to show better than 60dB suppression and that even then AEI had in mind the possibility that an easily reproducible form of ssb reception would be needed if mf broadcasting ever changes to ssb (incidentally, regular low-power experimental ssb broadcasts are now being made daily from several West German stations). AEI was endeavouring to develop both af and rf phase-shifting integrated-circuits avoiding the use of coils. Although VK3AXF mentions that he has heard no more of these techniques since that exhibition, in fact—as we stated last month—ssb modulators and demodulators stemming

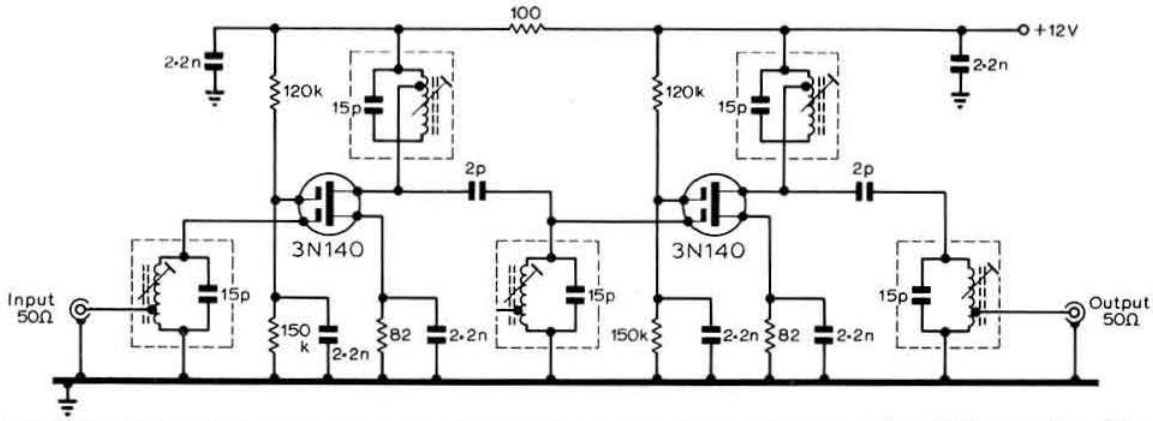


Fig 9. G8CPJ's 24MHz bandpass amplifier used to reduce spurious outputs from mixer-type vfo for 144MHz operation. All coils 22 turns tapped at 5 turns, 34swg enam copper wire in Neosid coil assembly type A6. Provides 1mW into 50Ω

from this work were demonstrated at the IEE signal processing conference last year, and a survey paper appears in the Conference Book.

VK3AXF believes there are many applications in communications for logic; not just as morse encoders and decoders but right down into the rf circuits. He suggests we should treat the rf generating side much as any other logic system where so many pulses are required per second (MECL III will go at over 400MHz if used carefully).

He advises, "Logic your modulator and generator system. An ordinary NAND will, if pull-up resistors are used, give 15mA of drive from 7400 ttl. Allowing an h_{FE} of 20 minimum and a 12V rail for the power amplifier, this represents about 1·8W out. Line drivers can be expected to provide drive into the amplifiers. These ICS are not expensive and their prices fall almost daily. Normal ttl runs happily up to 10MHz, while newer chips of the 7400H family will work up to 30MHz. For receiver use there are the line receiver chips, and core-sensing chips should not be overlooked. These have been developed to detect the very small noisy signals from the ferrite beads used in core memory stores. Incidentally a ¼SN7400 quad NAND will, if held in the threshold going from logic-1 to logic-0 be found to oscillate as a voltage-variable vfo over the range 25-45MHz. The stability and waveform leave quite a lot to be desired, however, and as the manufacturers will not admit this mode, it is no use complaining—nor will they guarantee the frequency range."

I suspect that VK3AXF's remarks will go over the heads of quite a few of us who are a bit shaky on "logic", but it does seem worth drawing attention to many of the new digital communications techniques that are opening up. For example, it is no secret that the ITA is at present working on digital synchronous demodulators for high-performance vsb re-broadcast receivers. There is also increasing interest in what are called time-domain commutating or switching filters, in which digital techniques are used for af and i.f. bandpass filters without the use of any inductors. To produce a low-frequency, high-Q bandpass filter it is becoming possible to build one by commutating simple low-pass filters (for introductory articles see ZL2AVF (*QST* April 1971) or *Electronic Design* October 25, 1970). Commutating filters based on existing ic devices already seem to offer interesting possibilities at frequencies up to around 10MHz. By changing the "clock" frequency, the resonant frequency of such filters can be varied from a few hertz up to several megahertz, while bandwidth is adjusted by changing the number of sections commutated (bandwidth is inversely proportional to the number of sections being switched).

But this subject must be left for another time.

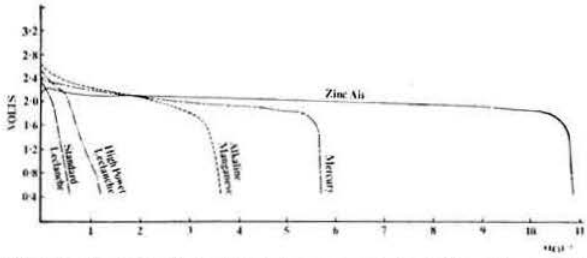
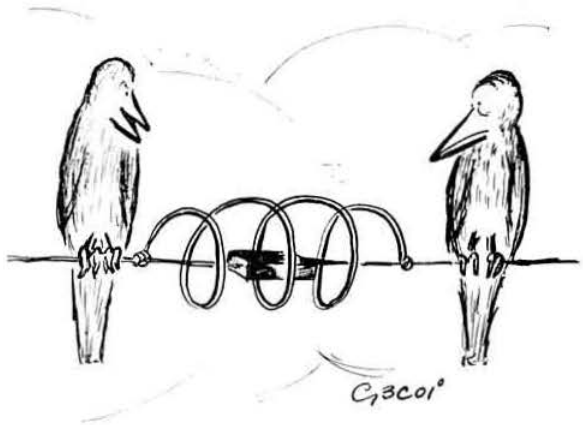


Fig 10. Comparative discharge curves of various types of primary cells based on continuous constant current discharge of two "AA" (penlight) cells at 250mA



"Be careful, its a trap"

FOUR METRES AND DOWN

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

"Spor" strikes again

True to the "law of universal cussedness", the big news about the 24 May Sporadic-E opening broke too late to catch last month's *Radio Communication*. What appears to have happened is that an intense ionized layer formed at the critical point over northern Europe to permit propagation to occur at precisely those angles of incidence and reflection that produce super-dx on the metre wavelengths.

As with past experiences of this anomalous and exciting mode of communication, different parts of the UK were not all sprayed by the same rf coming from the far south-east. Yugoslavs were favoured in some regions, Italians in others —and a few operators got both, plus a bonus or two. And again as during previous manifestations, "Spor" struck suddenly and unexpectedly, and, after allowing a few hours of glorious dx working, went out like the proverbial light. It was all very much like that famous Sporadic-E of July 1965 which obliged by opening 2m to 600-mile dx an hour or so before an RSGB contest was due to start, and disappeared an hour or two after it *had* started.

Avoiding so far as is possible the temptation simply to chronicle who worked what, for lots worked much while the opening lasted, one incident demonstrated emphatically that at least where vhf is concerned "ham spirit" is still very much with us. It happened to Harry Rance, G8AGZ, who lives on the Somerset coast. At 5.50pm on 24 May he received a telephone call from a BRS man, Frank Rowe of Wellington, to be told that a YU station was calling CQ on 144·5-MHz. Within minutes G8AGZ had notched his first ever Yugoslavian, YU2RBN, at RS59 both ways. In asking *FMD* to convey his gratitude to the listener, G8AGZ says: "There was absolutely no reason why Mr Rowe should have telephoned me, for I have never met him, or even heard of him until he phoned. Obviously, he must have heard me on 2m from time to time, and realizing the importance of such a dx station saw fit to ring up. Prompt thinking and action."

* * *

The localized effect of E-bounced signals occurs as the result of different angles of incidence being initiated at the transmitting end. At Plymouth G5ZT worked three YUs and an OE; and G3TWG arrived on the band in time to hear one of them (John Patrick knows much about Sporadic-E on "Four" from his sojourn at Gibraltar: on "Two" he was hearing it for the first time). Farther north, GD2HDZ worked I6ZAU (Ancona, 1,700km and believed first GD-to-I on "Two"), then I1BBK (Padua) and I4PVU (Rimini) but no YUs; and on the same latitude G8DKZ in Durham, alarmed at what seemed to be "traumatic breakthrough" on his converter, discovered that he was indeed listening to Italians on 2m. No contacts: the kitbag "Snowflake" transmitter was not quite man enough to compete with the QRM. And way out west EI4AL contacted one of the Italians but no YU. Most people report the opening to have lasted from about 1700 to 1930gmt; later in the north than the south, all signals S9 with deep fading.

A comment from GD2HDZ: "On the subject of VFOs I must add that I remained on 144·465MHz throughout, and that no Italian so far as I know (I heard about 15) called on my frequency, with the result that three QSOs were completed without trouble. On the other hand, I believe several Italians were in considerable difficulty due to numerous Gs calling simultaneously on *their* frequencies."

* * *

A repeat "E" on 28 May did not favour the UK so much, but nevertheless opened "Two" for communication between PA and EA.

* * *

Prompted by the startling results achieved on 24 May, I1RGA, who is an RSGB member living in Salerno, has been keeping a special watch on "Two" for UK stations. in company with his neighbour I1ZBU. Both have high power and gainy multi-stack aerials to help give maximum bounce from any Spor-E concentration that forms. Respectively on 144·62 and 144·72, they come up on the band each night at 2030gmt. During the July contest they intended to go portable on a 5,000ft mountain nearby, and with that sort of take-off, well, you never know. . .

* * *

Members who have followed Ron Ham's reports of intense solar activity this year will have expected Spor to ensue. His own observations now take in tv sync transmissions from the Continent on 49·75MHz that give early warning of quite frequent Sporadic-E occurrences.

Malta story

Since his return from holiday in Malta, Peter Lennard, G3VPS, has been keeping in hf-band touch with 9H1BL to take reports on his vhf observations. While there, 'VPS was able to see for himself some of the remarkable television reception which is possible in the island, pictures being resolvable from 11 stations in eight countries. The Rhodesian service, copied on 10 out of 15 days it was monitored, again demonstrated transequatorial possibilities (see "A Taste of TE", *FMD* May).

Most exciting of all was hearing UK stations on "Four", when the powerful QRM from Continental fm broadcasters allowed. Several G-men would have been identifiable if callsigns had not been gabbled or cw had been used. The big day was 26 May (Note: not the 24th, when the Spor-E

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bounces occurred in the UK). At 0905gmt telegraphy from the 8W transmitter and 3-element indoor Yagi at G2DN in Surrey pounded through at 579. Eight hours later GB3SX was 559 *off the back of the beacon's beam.* Both were taped.

This dx, exactly on cue so far as the time of year was concerned, reaffirms the capabilities of the 4m band for long haul working, as shown in earlier years by the historic ZB2 to UK contacts, only in this case the path distance is even greater at 1,200 miles. It is a great pity that Malta men cannot transmit on "Four"; but 9H1BL keeps constant watch on the band with a 6-element beam at 70ft, into a preamp, JXK converter and Trio JR599, and will report back on 14,150, 21,150 or 28,200kHz, calling "CQ G" if anything is heard.

Later.—As a postscript to the above came the big events of Sunday 13 June, when "Four" opened up in no uncertain terms to Malta. Several of us monitoring the band that morning noticed a high level of "E-return" from Continental broadcasters. Then at 1129 the fun began, and by 1350gmt 9H1BL had worked 14 Gs on 70·26 cw, replying on 10m, from G3PLX in Essex round to G8LY in Hampshire and northwards to G3COJ and G3TDH, all at big strength, plus another four heard, and the two beacons into the bargain. Thus "Four", the ever fascinating, chronicled another chapter in the history of anomalous propagation—a chapter which is by no means concluded.

Also on the dx front . . .

"Ephemeral and exciting" is a just description of Sporadic-E lifts. The same goes for aurora, except that Ar is about more often, especially in this year of active sun. Hardly a week goes by without a 2m observer somewhere or other noting auroral characteristics on familiar distant signals such as RSGB beacons or Meldrum tv, and cursing his luck that there is nobody about on the band at the awkward times at which these things seem to happen. Example: early on the evening of 17 May G3IPV on the north Norfolk coast logged SK6AB for 10min on 144·010 fully Ar. The opportunity was used to check best bandwidth for Ar reception: G3IPV goes for 1·3kHz.

Noting the same SK6AB as an auroral regular, G3LTF at Chelmsford has been maintaining an aurora watch on "Two" that keeps him at the receiver sometimes until 2am or 3am with rewarding results. His log reveals consistently that if some of the markers show Ar tendencies during the usual early evening period it is well to check the band around midnight for enhanced auroral manifestations. "Repeats" often occur.

For most of us contacts via Ar and Es represent just about the ultimate in dx at metre wavelengths. Beyond that, extensions of range have to come about by meteor-scatter or moon-bounce, and these call for specialist know-how allied to limitless dedication and patience—though not lots of cash, by the way, although it helps. And of course in an earth-moon-earth context, it is G3LTF most people have in mind. **So it should be placed on record that on 5 May Peter Blair resumed E-M-E contact with W2NFA on the 1,296MHz band,** and not only anticipates that such QSOs will be regular now that 'NFA equipment is installed on a more permanent basis, but is hoping for W9 on 23cm before long. From what we hear, more surprises in this specialized area of activity may come out of Chelmsford before long.

1,214 contestants

It takes a sensational Sporadic-E opening like that of 24 May, or the fine tropo break-through 10 days later (Scandinavians S9 on 70cm), to disclose to us in these islands something of the teeming metre-wave life that exists on the European mainland. Last year much of this activity was canalized into two major international contests organized by IARU Region 1, which embraces most of the nations of Europe and Africa.

Each year a different member society of IARU Region 1 organizes a series of international metre-wave contests. Finland did so last year, Norway is doing so this year, and RSGB will do so next year. The Finns have just published a smartly got-up booklet announcing last year's results of the vhf/uhf event of 5–6 September and the uhf/shf event of 3–4 October. It may come as a surprise to us in the UK to learn from the published tables that no fewer than 1,214 stations participated in the two events, made up of 1,081 in September, 104 in October, plus 29 listeners to both.

The British entry was low, largely Stroke P stations operating on the conjunct VHF NFD, just 25 of us. Indeed, in this IARU portable section alone the 397 entrants included 102 Germans, 62 Italians, 51 from YU and 39 from F. Yes, we know they are blessed with lots more mountain tops than we are from which to emit huge signals, but in our view there are two other reasons for the big Continental entry compared with ours: one is "European mindedness"; the other, better publicity (or maybe a greater inclination than we have to take notice of publicity when it is put out).

So far as this year's IARU contests are concerned, there can be no plea of lack of publicity to RSGB members. Virtually a whole page of *Radio Communication* last month was taken up by details of the IARU metre-wave events of 1971. Each runs concurrently with an RSGB event (or ours with it, whichever way round you like it!). Entry is easy: make a copy of the RSGB log and with a few minor mods tailor it for entry in the IARU events. The "how" is on page 412 last month. Read it in conjunction with the rules for VHF NFD, page 207, March. Then decide to have a massive "go" at the international events. It *could* be a UK station that brings back the "Region 1 VHF Trophy" or the "PZK Cup" in 1971.

Just to round off the 1970 results, it should be reported that the British entry, though modest, was effective, and collected the first 11 places in the 432MHz Portable Section of 5–6 September and the first eight in the 1,296MHz Portable Section. But elsewhere the competition was formidable: OE2OML, winner of the 144MHz Fixed Station Section, amassed 81,969 points, topping an entry of 514. Highest scorer of all was F6ADZ/P in the 2m portable bracket, who headed a field of 397 by piling up a total of 102,575 points.

We ought finally to record another feat of endurance, and that was the task of ploughing through 1,214 entries undertaken by the three members of the SRAL Contest Committee. Full marks to the Finns for presenting the results in such a readily digestible form.

A touch of the jumps

"Jump to it. Get off my land. You've no right to be here."

You would hardly think in this day and age that any group on portable operations would be foolhardy enough to encamp on non-public land without asking permission first, preferably well ahead of the event. Apparently one

large group failed to observe this essential courtesy, and participation in the May 2m contest was quickly cut short when their marching orders were received in the above peremptory terms.

The incident was the more inexplicable not simply for the lack of the aforesaid common courtesy but for the effort wasted in pulling down masts and equipment painstakingly erected.

* * *

Another variety of "contest jumps" has been annoying Arthur Breese, GD2HDZ, causing him to question whether the vfo technique is quite the desirable thing on vhf it is made out to be when employed as it was during the "May portable". He found 2m to be little short of chaotic "largely due to the indiscriminate use of these diabolical devices!"

By contrast, a fixed frequency station in a rare county which 'HDZ wished to work during the contest was watched until the time came to give him a quick call to collect him. If the wanted station had been jumping about all over the band he would have been lost. Arthur Breese goes on to say: "At the present rate of progress 2m will become like the dx bands. I shall then retire to 70cm where for the moment sanity still seems to prevail."

The mild word of warning is timely, for GD2HDZ is not alone in harbouring a sense of foreboding that vhf could degenerate from its present ordered state to a condition of racing rats.

Yet for most of the time it is not like that at all, the vfo still being used intelligently either as a co-channel device (two stations in contact thus occupying the space of one) or as a means of getting near to the other man's stated direction of tuning (a flock of switchable crystals will do that too).

Any technological development, from atomics to motor cars to variable frequency oscillators, provides the temptation for anti-social misuse. The antidote is to know well in advance that such misuse is possible.

* * *

As if to show how effective the vfo can be when properly used we have a note from Chris Towns, GM8BKE, of Glasgow, recalling the opening of 3 June (remember it, before The Great Rains came?); he reports 2m full of German and Netherlands stations, large numbers of which were worked during five hours that evening. "The use of a vfo in conjunction with the ssb was most invaluable for this type of work," he declares.

* * *

And apropos the first week of June opening, it should be reported that 70cm, too, was productive of long haul dx, a useful indicator of conditions being provided by a Dutch beacon, PA0VD, on 432·1MHz, plus or minus a few kilohertz.

PA looks at G beacons

Sustained observations on GB3GEC have been made during the course of this year by PA0VZL and PA0GDV, proving that the London 70cm beacon is there most of the time. Separated by 150 miles, the two PAs were on a long base line from which to take readings, 'VZL about 160 miles from GB3GEC, and 'GDV about 250. When one missed, the other frequently filled in.

The GB3SC beacon, much further away, is readable for 5 per cent of the time, but will roar up when aided by aircraft flutter.

Regarded by PA0GDV as a routine demonstration of what 70cm can do, is his schedule with G3LQR in Suffolk (". . . a relatively short distance", he says: but it is still 120 miles). This has been operating for the last four years, Sunday, Tuesday and Wednesday at 1830gmt, and never fails.

Perseids this month

Meteor scatter men will need no reminding that this is the month of the Perseids meteor shower, due to appear during the last week of July and giving possible radio returns for the following couple of weeks or more. The radio rate per hour is 50, second best only to the Geminids of December.

Not many amateur stations are equipped with the high-power transmitters and sharp, high-gain aerials essential for successful M-S work. Rather more, perhaps, have precise frequency counting facilities to permit setting up narrow bandwidth receivers on to the frequencies of distant ping-producing senders.

In this kind of specialized work there is a place for the vhf BRS member which he has not yet occupied as actively as he could. Maybe the requirement to be able to read fast morse is a bit off-putting, but it need not be when it is remembered that M-S transmissions, though rapid, are repetitive. Patience is another virtue characteristic of listening members accustomed to waiting and winkling on "Two" that stands them in good stead for the long watch necessary for real success in M-S observations. The forthcoming Perseids should give them further opportunities.

Come to that, there is—and always has been—scope for the BRS operator in many metre-wave activities other than M-S.

Which brings us to . . .

The case of Malcolm Roper

To regular users of "Four" the name of Malcolm Roper is well known. Seventy-megacyclists despairing of getting a reply from an apparently empty band have been heartened to receive an unexpected QSL from him telling them that at BRS32026 in Cowes, at least, they were loud and clear.

Just before he submitted himself to "the dreaded RAE" in May and a subsequent visit to Niton Radio for the morse test, BRS32026 had gathered in the last remaining cards to make possible a claim for the 70MHz Listener's Award. He is but the third receiving member to do so. "Surely I can't be the *only* one to send in reports on 'Four'," he says; which prompts the thought that for the BRS the 70MHz band, just as with M-S, offers a great deal of scope for systematic observations.

Malcolm Roper asks *FMD* to pass on his thanks to all the 70MHz operators who replied to his reports: the QSL return rate at no less than 84 per cent speeded his claim for the Listener's Award.

"Fixed time" on "Four"

A near 4m neighbour of Malcolm Roper's is G3KSU, along the coast at Ryde. He agrees with earlier observations that there are problems in knowing how long or—particularly on 70·26 where QRM to mobiles may be caused—how short a call should last. He puts forward this suggestion:

"The answer, I think, is to nominate pre-determined calling times, ie on the hour and half hour only. Thus the man calling would stand a fair chance of being listened to, and the man listening would stand an equal chance of hearing something! Mobile stations, being forewarned, could stand by at these times and hence avoid being QRMd."

Similar initiative taken a few years back on 2m and 70cm has certainly paid off in terms of promoting activity. Likewise an earlier suggestion to put out A1 "on the hour" on "Two" has been taken up by the telegraphy operators to the extent that now one contact sparks off another.

"On the hour and the half hour on 4m" then: reports on how the suggestion works out over the next month or two or three will be welcome.

* * *

A further thought on calling techniques on "Four". While to have 70·26MHz as the national calling frequency is universally regarded as a good thing, not so good is the practice of remaining on the frequency after a reply has been raised; by moving off it, fixed stations clear it for others, and particularly for mobiles.

Another thing: it is surprising to note how many 4m owners of adapted ex-commercial rigs set up the "receive" sections on 70·26MHz spot frequency only; which is all right when you are on the move and perhaps do not wish to change channel, but is inhibiting when operating at home by denying oneself contacts anywhere else in the band. Many a "fixed receive-frequency" operator has missed good contacts solely through his inability to search the whole of the available 675kHz.

Expeditionaries

Here are details of the Farnborough and District Radio Society's expedition to the Channel Islands (all dates inclusive):

Tuesday 6 July to Thursday 8 July, Alderney; Friday 9 July, Guernsey (free for all and no schedules); 10-12 July, Sark; 13-15 July, Herm; 16-18 July, Jethou (if a landing is possible); 1800–2300gmt nightly, first quarter-hour ssb, second quarter-hour A1, last half-hour A3. Operation on ssb and cw will be on 145·4MHz, searching bottom 150kHz for cw calls. On A3, operation will be on 145·0 and 145·5-MHz.

The club's callsigns, GC8DIZ/P (voice) and GC3XCH/P (key), will have "the full gallon" behind them on all modes, pumped by twin 10-element Yagis at 50ft.

By now, as the result of publicity over GB2RS, skeds will have been fixed via G8AXZ. For FMD Award purposes this well-organized expedition should give many operators back on the mainland the opportunity to collect a country (GC) plus three counties of Guernsey, Alderney and Sark (Herm and Jethou belong to Guernsey).

* * *

From 11 to 24 July there will be 2m activity from rare Scottish counties by GM3XOD/P. Send a quick sae for skeds and times to G3XOD, R. Horsman, 1 Hillside Avenue, Kingswood, Bristol BS15 2BP.

* * *

Rare also is the Isle of Lewis (it comes within the county of Ross and Cromarty). From there John Wardle will be operating as GM8DKZ/P or even GM4 something if the Class A ticket comes through in time. So check the low end of "Two" as well as 145·78 for him between 18 and 23 July.

* * *

"We certainly appreciate the expeditions to GM, EI and GC, but how about someone activating the rare *English* counties?" Several people have made this remark to us. Now the Hereford Amateur Radio Society is doing precisely this. Says hon sec Stuart Jesson, BRS30628, "Look for us under the callsign G3YDD/P on 16 July, 20 August, 17 September and 15 October. Otherwise third Friday in each month using 25W, a 6-element Yagi and 144·39".

Operating from Westhope Common, six miles morth of Hereford, the 'YDD-ers were so popular on their first outing that although PAs were coming through at the time, half of Britain had beams turned on Hereford.

* * *

And another to Scotland, with callsigns GM3YCT/P on cw from the hour to 15 minutes past, and GM8CXK/P on a.m. from 15 minutes past round to the hour, frequency 145·45, 8pm to midnight, on the following itinerary: 10 July, Ayrshire; 11–12, Bute; 13 July, Argyll mainland; 14–15 July, Isle of Gigha, Argyll; 16 to 18 July, Isle of Islay; 19 to 21 July, Jura; and 22 July, south Kintyre, all in Argyll; 23 July, a county in southern Scotland on the way home. No schedules are being taken, but with nearly 60 hours of operating planned from good sites they should be readily workable.

* * *

No round-up of vhf expeditions would be complete without recording the pleasure given by GM8AGU/P and GM3JFG/P to large numbers of 2m operators during their progress through 14 Scottish counties. For example, EI6AS worked them in all 14, on ssb up to 320 miles. This was the order of path distance achieved also by many South of England operators. There was praise all round for the way in which full power plus fine operating made this an expedition to remember.

* * *

Finally, three points made to us by several members in areas recently visited by expeditions: remember the indigenous population is still there when the expeditions have left, so look for them! Secondly, after a contact with an expedition look for the locals, for they too may be calling you. Thirdly, there is dx en route, its QRB may be only 150 miles instead of 300; it too may be attempting to raise *you* after your contact with the exotica.

Sked spot

"Am interested in skeds on 2m or 70cm lunchtimes between 12.45 and 1.30pm, preferably to the north and east." Write to G8BKR, J. Woodham, 17 Faringdon Road, Westbury on Trym, Bristol.

* * *

"Would welcome skeds for any time during the summer, preferably on 4m, but 2m gear almost ready. And the Glasgow University Club (which includes GM3OFT) will be

operational for most of the summer contests from Chippermore Fell in Wigtownshire." Write to GM3WOJ, Chris Tran, QTHR.

* * *

Around Nuneaton there is The Early Risers' Net, centred on G8BEO, G8CVD, G8ERM and G8ESH, 145·1MHz, 0630–0700 gmt. ("If we are not up with the lark we can at least say we are up with the TERN", remarks Ken Hadley, G8BEO).

* * *

Nightly on 145·943, at 2030gmt, G8ANQ in the County of Durham with G3ZPZ near Sheffield.

* * *

Keyboard pounder? Then check for rtty emissions from the Bristol area, especially Thursday evenings, 144·6 and 145·3MHz. Five Class B men plus G3XOD participate, using afsk.

* * *

Chris, ZC4MU, will be active from the top of Mt Troodos, Cyprus, from 23 to 30 July at 1800, 1830, 1900 and 1930, transmitting on 144·126MHz for 3min listening for 3min, and so on.

* * *

An all-rounder is Keith Marriott, BRS31245. He can offer reception schedules on 4m, 2m and 70cm, any modes, including rtty at two speeds, 45 and 50 bauds. High gain aerials well in the clear are used on all three bands at a 325ft asl site. Yes, there is tv too, 405 or 625 line, in the 70cm band. For skeds write to him at 12 Godber Road, Hucknall, Notts.

Tech Corner

From G8DLN (Geoffrey Baxendale, of Darwen, Lancs)
I recently constructed the fm discriminator using the TAA570 as described in *FMD* last January. Upon testing the unit with a signal generator, however, no results could be obtained. Having recovered from the shock of the failure of my first ic project, I consulted the manufacturer's published data on this device; the circuits shown there and in *FMD* had a remarkable similarity except that in the published data a low resistance connection was always provided between pins 8 and 9. Without this the first transistor appears to be without bias. When a 50Ω resistor was soldered between pins 8 and 9 and a signal fed to pin 8 via a 0·1μF capacitor, the circuit performed to specification. It has now been installed in the 2m receiver.

It should be pointed out that with 50Ω across 8 and 9 several volts are needed at the input to the trimmer to limit the ic. This order of output is probably available from the end of a valve i.f. strip, but with a transistor one it might be necessary to increase both the trimmer capacitor and the input resistor. I have used 33pF and 100Ω.

Here and there

We have just seen a cyclostyled booklet called *RTTY the Easy Way* by G2FUD—and it lives up to its title. Priced at 25p, plus 3p postage, it may be had from the secretary of BARTG, 184 Hale Road, Hale, Cheshire. Membership of BARTG is only 75p per annum.

Daventry's big signal on 70cm has a new callsign: G8BTN is now G4AFX ("This means a desertion of 2m and 70cm for a little while, but hope for a 4m transmitter soon," says 'AFX).

* * *

Nearby at Watford Gap, just off the M1, another famous 70cm signal now appears in a new context. Cyril Hayward has changed from G8BBY to G4AHH. And G8DFL, just back from Cyprus, is now G4AMH.

* * *

"The convention was very enjoyable. Particularly, congrats to the new management at the Winning Post. In such circumstances the RSGB will have a job to find anything better"—BRS15744 of Storrington (Ron Ham speaks for very many others who have made similar comments either to G3FZL, chairman of the VHF Committee, or to *FMD*).

* * *

Look out for GB2FON from 10 to 25 July, 24 hours a day at weekends, evenings during the week. This is a special event station to be operated on "Two" by the Nottingham Amateur Radio Club.

* * *

"The GM8BQX/P sortie was a real boon to Scottish county hunters. He sent all my QSLs direct the day after the contact! "—G8ANQ.

* * *

EI5CD has just acquired an American Clegg 22-ER transmitter for "Two" but no circuit diagram or manual. Can anyone oblige him with the loan of one for a few days? (A contact with EI5CD/P may be the reward!) Letters to Des Walsh, Ballylynch, Carrick on Suir, Co Tipperary.

* * *

"Have acquired the use of a further elevated site for 70cm and 2m portable sorties: XO36E, 600ft up, 4½ miles south-east of Belfast, and a clear take off to G and GM. Also hope to activate Co Donegal 10 to 24 July"—GI8AYZ (generally /P).

* * *

"Last station worked over the water in 1970 was UK5EAP in Moscow. His QSL gets the place of honour"—GM8BRM (Yes, this was on "Two"!) .

* * *

"A new frequency standard just completed gives me accuracy to 1kHz at 70cm. This is useful for MS observations and reads out the TF3EA frequency of 144·020 as 500Hz higher than that stated. Others following MS might like to note that during their Thursday sked TF3EA transmits for the first five minutes after 2100gmt, then G3CCH, and they continue to alternate"—G8ANQ.

25 YEARS BACK

"During magnetic storms and other disturbances it is possible for small areas of the E-layer to reach enormous ionic intensity, and on these occasions, which are often quite brief, signals on the band [this referred to 5m] may be reflected and received at great strength by distant stations . . . from transmitters 300 to 600 miles distant"—*RSGB Bulletin*, July 1946. ("The Month on Five" by G2WS).

YOUR OPINION

The Editor
Radio Communication
Sir—It is with great interest that I have been following the articles by G3PDM in the March and April issues of *Radio Communication*. However, I feel that there are one or two points which perhaps Mr Martin has not made quite clear.

Firstly, I must disagree with him about cross-modulation. This is not caused by third harmonic distortion, but by third order distortion. The difference is much greater than would appear at a first look, since harmonic distortion will manifest itself on a single signal, while cross-modulation is a multi-signal effect. Furthermore, should cross-modulation be caused by harmonic distortion, the introduction of traps tuned to three times the signal frequency would eliminate the problem, and, of course, this is not so.

Secondly, I feel that the use of an rf amplifier is to be recommended for several reasons. Beyond the obvious advantage of amplification, two signal performance at high levels can be improved since the rf gain can be throttled back, helping to reduce the levels of signal at the input to the mixer. Of course the rate at which gain control is applied to the various stages of a receiver is important, especially where no rf stage is employed, since if the rf or first i.f. gain is reduced at a different rate to the later i.f. stages, then signal to noise degradation can easily occur; in fact, many cheaper receivers do suffer from this disadvantage.

When a block filter is used to determine the selectivity of a receiver, narrowing the noise bandwidth of the i.f. strip by the use of tuned circuits offers some advantages over distributed filtering, since a block filter placed at the beginning of the i.f. strip prevents blocking of the early i.f. stages in the presence of a very strong adjacent channel signal. In any case, providing that the noise level is not such as to cause problems at the detector, rudimentary low-pass filtering in the audio stages is sufficient to dispose of any difficulties in this respect.

A minor point, but I make no excuse for raising it in the interests of accuracy. The original Lamb noise silencer came out in 1933, before the advent of B7G valves, and in fact used a 6L7.

I feel that for a really high performance receiver, phase-locked or digital frequency synthesis is by far the best answer, but to reduce the requirements of the phase-locked loop, some degree of ganging, if not particularly accurately, helps in making sure that loop will lock.

I must take issue with G3PDM on the subject of audio amplifier intermodulation. There are two forms of intermodulation to be considered in a receiver. Firstly, there is that caused by signals outside the passband of the receiver; eg a receiver tuned to 7MHz may produce an output from signals at 11MHz and 4MHz. This intermodulation occurs in the rf and/or mixer circuits, and is hopefully of the order +80dB μV to produce equivalent inputs at the tune frequency of +30dB μV.

The second form of intermodulation is in channel intermodulation and is very similar to that appearing in transmitters. Two signals, inside the passband of the receiver and producing audio output, will intermodulate anywhere in the receiver to produce intermodulation products at af. Now if the total intermodulation production in this case is of the order of —30dB, this is of the same order as those appearing in the output of an average transmitter, and so to attempt to get any better than, say, —40dB intermodulation products at this point is no less than a waste of time. Indeed, for marine ssb equipment, which is perhaps the nearest service commercially to the amateur service, transmitter IPs are —25dB rel p.e.p. maximum, and of course in service this will be approached. If the resultant distortion is considered satisfactory for public telephone calls, I do not see why it should not be more than ample for amateurs.

I hope that the points I have raised may clarify some doubts that readers may have, and, like many others, I am looking forward to further articles in this series.

Yours faithfully,
Peter E. Chadwick, G3RZP

The author replies:
Mr Chadwick has raised some interesting points, and I agree that cross-modulation is caused by third *order* rather than third *harmonic* distortion. However, this slip on my part does not affect the validity of the comparison between receiver mixers and hi-fi amplifiers since, in the latter case, third order distortion is the principal source of third harmonic distortion.

On his second point, one of the things I stressed throughout the series was that rf amplifiers have no real advantages below 30MHz. Controlling the gain of an rf stage does not aid the reception of weak signals in the presence of large ones, unless a local agc loop is used around the rf stage. This technique has another name: desensitization!

On the question of block i.f. filtering, I stand by my comments in Part 1 of the series (March p171). Block filtering may become necessary if high gain precedes the filter, due to using an rf stage or more than one mixer.

Many versions of Lamb's noise silencer have been published. I quoted a readily available reference and the version of the circuit therein.

I agree that ganging the vco in a frequency synthesizer makes phase-lock even easier to achieve, but it is quite feasible to use systems of the type described. Ganging to the preselector circuits has the disadvantage that lock may be lost when tuning the front-end, and ganging to the reference oscillator is made difficult by the dissimilar operating frequencies.

Mr Chadwick's discussion of channel intermodulation is valid in the case of ssb signals with *average* intermodulation levels of only —30dB. There are many instances where spurious sidebands from radio transmitters are lower: a good cw transmitter might be better than —120dB. As several cw signals may exist in a receiver i.f. passband, paying attention to intermodulation in the audio circuits is emphatically not a "waste of time". I would hesitate to draw comparisons between the amateur service and public telephone calls.

Peter G. Martin, G3PDM/W1

The Editor
Radio Communication
Sir—Your correspondent G3JNB has presented the case of the "appliance" operator with admirable clarity and no doubt it will be rebutted with the argument that if one hasn't the time to pursue the hobby with relentless industry then one should not partake at all. This, of course, is not a new theme and is one that is harped on in many fields of leisure. Surely, the more who take part can only create a healthy market for component manufacturers to the benefit of the rabid home constructors? I am sure the majority of appliance operators would dearly love to be able to produce nice gear of their own, but apart from any other considerations is not the ability to do this something of a gift and not altogether a skill that can be acquired even after a long time?

I speak as one who has made many items over more than 20 years but the latest effort still looks like a rat's nest—nevertheless I always have my commercial gear to support my operating and am very glad of it.

There is no doubt that operating self-built gear gives one not only a sense of achievement but also not a little smugness, and it is the latter which should be suppressed along with the tvi. Let us not forget another type of appliance operator—the old timer whose failing physical powers put home-brew beyond his reach—would one deny him the pleasure derived from contacts?

I am secretly rather proud of my home-built muck, but I shall henceforth view the G4 plus 3 in a new light when I hear him describing his new "Super Band Blaster".

Changing the subject, recently, once again, I tried to copy the RNARS 40w/m code proficiency run on 80m and once more although I could read it I could not write it down. Is it possible to write at this speed or does one have to learn how to type?

Yours faithfully,
J. John.

This correspondence is now closed.—Editor.

The Editor
Radio Communication
Sir—My father being the guest speaker at the AGM of the National Haemophilia Society, I was prompted to suggest to the committee at the AGM, that the hobby of amateur radio be encouraged among haemophilics, so that people who might otherwise not speak with people around the world, might do so.

I would like to suggest that affiliated clubs get into contact with local branches of the Haemophilia Society in order to encourage this.

Haemophilics are not cripples or disabled, so that RAIBC would not be suitable for their needs.

Yours faithfully,
R. Stern, G3ZLG

THE MONTH ON THE AIR

A monthly feature by John Allaway, G3FKM*

THOSE who share the writer's concern over the delays which seem to occur over the delivery of *Radio Communication* will draw some comfort from the fact that our friends across the Atlantic seem to be experiencing the same difficulties. ARRL has recently announced that in future copies of *QST* will be sent out by first-class airmail to those who pay an extra £5 per annum in addition to their annual membership fee.

Some very interesting points are made by Pat Hawker, G3VA, in the June *Wireless World* concerning the relatively poor privileges conferred on European as opposed to American amateurs in the matters of frequency allocations and power ratings. It is pointed out that while Europe has only 3·5 to 3·8MHz and 7·0 to 7·1MHz, Region 2 has 3·5 to 4MHz and 7·0 to 7·3MHz. With the likely spread of high-power USA phone stations into the areas of the hf bands hitherto excluded to them, your scribe feels that the time has come when the least that can be asked for is that the power limits in the amateur licence, which were set down many years ago, be updated.

Top Band news

G3RND has pointed out that the list of coastal stations given in the May *MOTA* is by no means complete as far as Europe is concerned. Those given were merely the ones located in the British Isles and therefore the most likely to be troubled by interference from UK amateurs. Other European stations listed by the Admiralty in 1967 are as follow:

1,800kHz, Patrai.
1,803kHz, Bod.
1,806kHz, Brest, Lyngley.
1,813kHz, Blavand.
1,818kHz, Gdynia.
1,820kHz, Bordeaux, Ostend etc.
1,824kHz, Rodos.
1,850kHz, Canabkale.
1,852kHz, Maarianhamina.
1,855kHz, Bari.
1,862kHz, Bordeaux etc.
1,876kHz, Brest (also GZU on cw).
1,879kHz, Athinai.
1,883kHz, Kiel.
1,888kHz, Civitavecchia.
1,890kHz, Scheveningen.
1,895kHz, Carriers.
1,904kHz, Anvers, Goteburg
1,906kHz, Marseilles.
1,918kHz, Kiel.
1,934kHz, Lisbon.
1,939kHz, Marseilles etc.
1,994kHz, Scheveningen.

The advice to carefully check *all* frequencies for other occupants on the 160m band cannot be emphasized too strongly.

Slow-scan tv

G5ZT, Plymouth, is very active on all bands 80 to 10m and has now worked seven countries. Contacts have been had with FG7XT, KL7DRZ, KP4GN and WA7HOV, as well as with many other Ws. On 21MHz Harold has contacted W4TB, W4UMF and FG7XT and wonders whether these are the first G QSOs on this band?

News from overseas

Mike Farmer, G3VAO (ex-VS9OC, 9V1OE and 9V0OE), is now on the air from Gan in the Maldive Is and has been given the callsign VS9MF. He expects to be there for the remainder of 1971, and asks for QSLs via G3VAO (see *QTH Corner*).

A letter from TA3W gives the news that his equipment (together with that belonging to TA3AY and TA3OZ) was seized by the Turkish authorities on 27 April. QSL cards were also impounded, and Chat says that in future, letters and QSLs should be sent to Cetin Kayaalp, 59 Sokak Nr 7, Buyukcigli/Izmir, Turkey. It would seem to be advisable not to mention amateur radio in the address.

The statement in May *MOTA* that QSLs for VP8LK should be sent via VP8LE has unfortunately proved to be incorrect. They should be sent via G3NOM. VP8LK says he is ready to operate on 14,090kHz rtty and will do so particularly after September when conditions improve; he is also to be found on 21MHz cw and ssb.

Eric Lomax, 5N2ABG, who is hon secretary of NARS, has kindly supplied an up to date list of Nigerian licence holders. The active ones are 5N2AAE, 5N2AAJ, 5N2AAK, 5N2AAN, 5N2AAV, 5N2ABG and 5N2ABH. 5N2s AAA and KPT are not active at present and 5N2AAU is a club

This excellent slow-scan television picture was received by G5ZT recently on 21MHz and is believed to be the first ever received from Guadeloupe in the UK on this frequency

* 10 Knightlow Road, Birmingham B17 8QB

station in an educational establishment (Zaria University). 5N2s ABB and ERL have now left and may be reached at the addresses given in *QTH Corner*.

G3YOB (ex-MP4BHA) is in Germany and will be on the air soon with his DA2XD call. VP8JR is now also in Germany and has the callsign DA2XW—he is also G4AGM and may be reached at the address in *QTH Corner*.

Colin McRae, G3WRN/9V1PM, will be in Malagassy with the callsign 5R8AB until about 14 July, with a possible return visit during January and February 1972. Due to mail difficulties, QSLs can only be handled via the bureau to G3WRN or to the address in *QTH Corner*. Bands 10, 15 and 20m.

The 1971 CHC/FHC/IARJS Convention

This will be held in the UK at St Albans over the period 29 to 31 July. K6BX together with a number of other overseas members will be present, and all CHC/FHC members and others will be most welcome. The final day will include a semi-formal lunch at Batchwood Hall, St Albans. Full details may be obtained from Chapter 8 President—Ft Lt R. Handley, G3GJQ, Officers' Mess, RAF Cosford, Wolverhampton, Staffs. G8TK has undertaken to assist with booking accommodation if required (A. L. Browning, 105 Langley Grove, Sandridge, Nr St Albans, Herts).

The 14th Jamboree-on-the-Air

This will take place during the weekend of 16-17 October, and for the first time will run from midnight to midnight local time. There are very few rules and it is emphasized that the event is *in no way* a contest but an opportunity for Scouts throughout the world to meet on the air. Intending participants are asked to advise their national organizer (in this country, Mr L. R. Mitchell, G3BHK, 28 Darwell Drive, Ascot, Berks). The importance of observing the terms of the transmitting licence most strictly during this event cannot be over stressed. Those taking part are asked to send in a report of their activities to their organizer after the event. In 1970 some 73 countries took part and it is hoped that the total may reach 100 in 1971.

Expeditions

SARL has announced that ZS3KC and ZS3XQ will be taking a trip to Cape Cross on 9 and 10 October. This is the spot where Diego Cao planted his cross in 1482 after his long sea journey to find the southernmost point in Africa. The callsign used will be ZS3CCE and the station will be on the air from 2200 on the 8th until 2200 on the 10th continuously. Both ssb and cw will be used and the likely frequencies are given as 7,020, 7,070, 14,050, 14,200, 21,050, 21,280, 28,050 and 28,600kHz (plus or minus 10kHz for QRM). Special QSL cards will be sent out via the bureaux and it is requested that contacts be limited to exchange of reports only so that as many as possible can be logged.

Region 1 of the Irish Radio Transmitters Society will be organizing a trip to Dalkey Is, a small island off the east coast of Eire, to take place over the weekend of 31 July–2 August. The callsign EI0DI has been allocated and operating times will be 1200 31 July–1200 2 August. Operating modes will be A1 and A3a on all bands 3·5 to 30MHz. The station will operate from petrol generators. A special QSL card will be used to confirm all contacts.

Colin E. Pollard, G3DPX/W6, of Costa Mesa, California, who has managed WAC, WAS, 114/56 countries and 35/26 zones in just two years

Awards

The WRC Beograd Award

This is issued by the Belgrade Radio Club for contacts with members of the club—five for European applicants, and three for others. Members are YU1s AAQ, AEG, AFQ, AK, APQ, ARQ, AU, BKL, CV, CW, EO, FM, KL, LU, MV, NBR, NBQ, NBT, NBU, NCD, NED, NEO, NHD, NHV, NID, NOC, NOP, NOR, NPW, NPZ, NRK, NSF, NSH, NSW, NUK, NUM, NUN, NRW, NYE, OAW, PKW, QAA, SJ, SW, YR, NVU, NZN, NYO, OAU. Log extracts and 10 IRCs should be sent to the Award Manager, PO Box 235, Belgrade, Yugoslavia.

The WGA Award

The Worked Gotland Award is for earning 21 points by contacting stations in Gotland (SM1) after 30 June 1970. Each QSO counts two points for Europeans but the points value differs from band to band for non-Europeans. A log extract, certified by two licensed amateurs, and accompanied by 10 IRCs, should be sent to the Awards Manager, GRK, PO Box 461, S-621 04 Visby 4, Sweden. Note that there is a special activity week between 1 and 7 July each year and that about half the island's 40 amateurs are usually active at this time.

The WDPNR Award

Issued by EDR (Bornholm Is section) for working amateurs in different Danish postal number areas—20, 40, 60, 80 and 100 for 5th, 4th, 3rd, 2nd and 1st class awards respectively. At least two Bornholm QSOs must be included (they may be in the same district). Contacts after 1/1/57 count and a certified QSO list and 10 IRCs should be sent to OZ4PM, 3751 Oestermarie, Bornholm Is, Denmark. A full list of postal numbers may be obtained from OZ4PM price 2 IRCs.

The CQ DX Award

Supplies of application forms for this certificate have still to reach G3FKM and a direct approach to WA6GLD, PO Box 1271, Covina, Calif, 91722, USA, is advised. Congratulations to G3RWQ who is listed in May *CQ* as first UK holder of the award.

The Diplom Interessen Gruppe

This organization was founded in W Germany in October 1969 and now has more than 400 members. It has its own

award programme which includes the EU-PX-A (for working 100 European prefixes since 1/1/1969), the Worked German Large Cities (for contacts with 20 or more large cities after 1/1/1962), and others. All licensed amateurs and listeners are invited to join DIG; the requirements are that the former must possess 10 awards and the latter five. Applicants should send details of their awards and 5 DM (or equivalent) to Eberhard Warnecke, DJ8OT, Sekretar, 562 Velbert, Postfach 1244, Germany. There is a DIG net which meets on 3,770kHz at 1800 every Thursday and more information may be obtained from members.

Contests

The 12th All Asian DX Contest

1000 28 August to 1600 29 August (cw only).

There are single-operator single- and multi-band, and multi-operator multi-band single transmitter sections, and the object is to contact Asian stations. Exchanges consist of RST plus age (in the case of lady operators this will be given as "OO"!). Each QSO counts one point and each Asian prefix worked on each band counts as a multiplier (*NB* Ogasawara Is (JD1) is in Asia, but Minami-Torishima Is (JD1) is in Oceania). Final score is the sum of the multipliers on each band multiplied by the sum of the QSO points on each band, and logs should indicate each new prefix as worked. Separate sheets should be used for each band and entries must be sent to reach the JARL Contest Committee, Central Post Office Box 377, Tokyo, Japan, not later than 30 November. In the 1970 event, UK scores were at follows:

G2DC	(Multiband)	5280	**G3LNS**	(21MHz)	9516
G3ESF	,,	4750	**GM3CFS**	,,	4743
G3KMA	,,	3268	G8KU	,,	209
G2AJB	,,	1998	**G3OCA**	(7MHz)	117

The International Short Wave Championship of Romania

1801 7 August to 1800 8 August.

All bands and modes 3·5 to 28MHz (but not cross mode). Single and multi-operator single and multi-band entries are accepted and as many YO and extra-European stations should be contacted as possible. Contacts with YO count 10 points and with all others two points. RS/T plus serial QSO number should be exchanged. Each YO "county" and each DXCC country is a multiplier on each band/mode. Logs should be accompanied by the usual signed declaration concerning rules and licensing conditions and must be posted before 1 September to: RARF, PO Box 1395, Bucharest 5, Romania. Leaflets giving fuller details are available from G3FKM.

Results of the **1970 VK/ZL/Oceania Contest** show that top European entrants were DL6TV in the phone section with 10,819 points, and OK2RZ in the cw section with 6,120 points. UK scores were as follows:

Phone		CW	
G3PHO	**1,980 points.**	**G5RP**	**2,424 points**
G6XN	1,456 ,,	**GM3CFS**	**1,512** ,,
		G6XL	1,332 ,,
		G2DC	828 ,,
		G3VW	396 ,,

The WAE Contest

0000 7 August to 2400 8 August (cw).

0000 11 September to 2400 12 September (phone).

This contest covers all bands 3·5 to 28MHz and there are single- and multi-operator sections. A compulsory 12 hours of rest must be taken in not more than three periods. Exchanges consist of RST plus serial QSO number, and contacts count one point except on 3·5MHz where they count two. Multipliers for European entrants consist of ARRL DXCC countries, plus JA, PY, VE, VO, VK, W/K, ZL and ZS call areas, UA9 and UA0. To promote lf activity, 3·5MHz multipliers should be multiplied by three and 7MHz by two before adding to the final multipler total. Additional points can be earned by receiving QTCs from non-European participants. These are details of European stations previously worked by the sender, each counts one point and consists of the time, callsign and QSO number given by the station worked. Up to 10 of these may be passed at a time. Full details of the QTC exchange procedure, contest rules and official DARC log forms should be available from G3FKM in exchange for an sae. Mailing deadlines for entries are 15 September (for cw) and 15 October (for phone). In the 1970 WAE Contest (phone) **G3KDB** was world top in the multi-operator category with 580,881 points. UK scores were as follow:

CW section		Phone section	
	points		points
G3FXB	170,820	**G3KDB**	580,881 (Multi-op)
G2DC	52,871	G3FVA/A	76,942 ,,
GM3CFS	51,216	**G3XKV**	4,176 (Single op)
G3ESF	49,980	G3YWI	3,198 ,,
G2AJB	3,311	G2AJB	1,560 ,,
G5AQO	1,628		

DX news

Strange prefixes continue to appear on the bands at an increasing rate and the habit now seems to have reached the USA. WZ6NSI is reported to be on St Nicholas Is (off California), WM8ICH was the callsign used by Catalph ARS during Michigan week, KD4ITU was used during the World Telecommunication Day celebrations by K4ZA, and WU3-USA celebrated Armed Forces Day on May 15. Special QSL cards will be sent out by the last mentioned and will be routed via W3ADO.

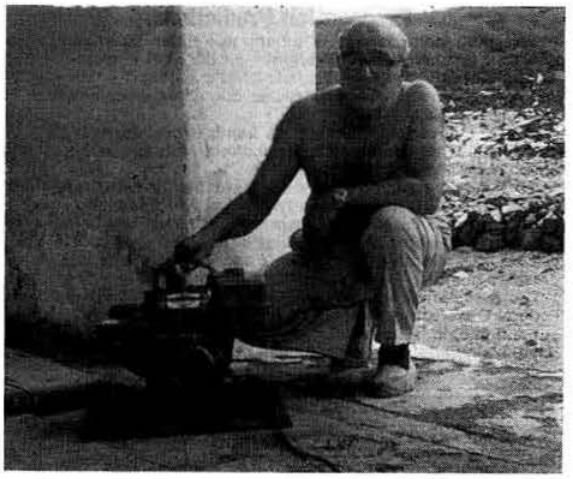
The 13th World Scout Jamboree will be held in Japan in August and an amateur station will be on the air from the site between 1 and 10 August. The callsign is likely to be JH2BSJ.

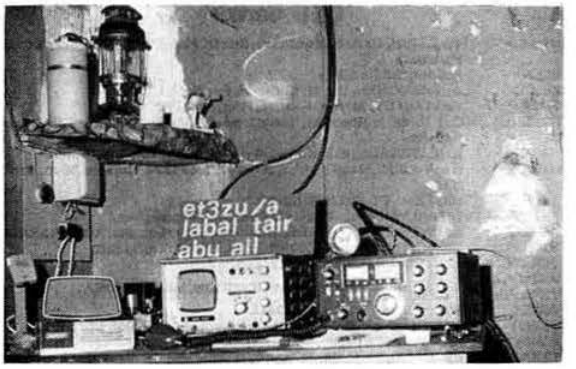
VP2EQ will remain in Anguilla until the end of July and is making a habit of looking for UK contacts daily between 1830 and 2200 on 21,275kHz. QSLs may be sent to the address in *QTH Corner* accompanied by an sae stamped with a 3p stamp.

9X5AA will be leaving Ruanda in mid-July and returning to the USA. 9X5WJ will continue to operate from the USA Embassy for a few more months. WA1ARF/KS4 (Swan Is) is also due to QRT this month, he is often to be found in the Int'l YL SSB Net on 14,332kHz in the evenings.

9V1QA (W6BPO) is currently in Saigon and is hoping to obtain operating permission and the callsign XV5QA. His favourite operating frequency seems to be 14,040kHz and time between 1600 and 1700.

The latest list of stations for whom W1YRC acts as QSL manager includes CT2BD, EP2TB, VK9KS, 6O1GB, 9M8FME, 9M8FMF and 9X5AA. W2GHK (of DOTM) has taken over QSLing for FM7WF and FM7WQ contacts as from 1 May, and a letter from K2DDK advises that he will be handling all cards for 8R1J contacts after 1 June.





Aldo, ET3ZU (left) recently used this equipment to make over 1,000 contacts from Jabal at Tair Is in the Red Sea. The island is uninhabited but has a lighthouse which is maintained by international agreement (see Dxpeditions)

WB8EUN will be QSL manager for HM1EX from 12 October (HM1EX is quite active on 7MHz cw).

5VZWT is rumoured to be visiting Dahomey (TY) this month. There seems to be some piracy of TJ1 calls taking place as both TJ1AZ and TJ1QQ are at present out of the country although their calls are being heard on the bands. TJ1BA's legality is being questioned in some quarters and the only currently active legal licensee seems to be TJ1AW.

Darlene, ex-VR5DK, is reported to be intending to visit Rodriguez Is and to operate with a 3B9 call this month. Jacky, VQ9SM, also anticipates being on the island in late August and September and will use the call 3B9CF.

Contacts with ZD9TDC will be confirmed with a special QSL card via GB2SM. Those not claimed with SAEs will be sent out via the bureaux.

The Bellevue ARC of Nebraska will be operating a special station from 26 June to 7 July to celebrate the founding of the city. Its callsign will be WA0ATA.

The station signing 3V8AL who is currently active is a pirate. The legal 3V8AL closed down on 7 March this year and moved to the Congo; he is also almost entirely a phone operator.

An up-to-date list of stations for whom WA5UHR acts as QSL manager includes HK4s BSW, BUC and BZQ, VP2AP, VP2AAP, VP2AZ, VP2LDD, PA0SNG, HP1XHG, 9X5CC, 7X0WW, 7X2BD, KR6EA, CR6IY, SP3DOI, F0BF/FM7WG and UA0YAE.

Several Panamanian stations were authorized to use the 3F1 prefix during World Telecommunication Day celebrations.

Stations in the Maldive Is which formerly used the 8QA prefix are now using 8Q6, and 4S7WA has recently been heard signing as 8Q6WA from Maldive.

G3LQP advises that he now acts as QSL manager for the following stations: HB0XTG/P, MP4MBB, VS9MT, 5X5NA, 9H1AZ, 9H1CB and 9V1PA. Many of these are to be found in the British Commonwealth Net which meets at 1430 on 21,354kHz daily.

Dxpeditions

Garth, 5H3LV, is awaiting the arrival of an HW-101 to replace the HW-100 which was damaged during his last trip to Zanzibar. He says that there are "growing problems" in Tanzania and that discussing possible trips to 5H1 over the air causes him embarrassment as his transmissions appear to be monitored excessively. If he does manage to operate from Zanzibar he will only give out signal reports and will not give any information as to his location.

EP2CC now has some equipment which has been provided by INDXA and he hopes to visit a number of Middle Eastern countries in the immediate future.

The *DX'ers Magazine* says that LU3DGX and LU5DL intend to visit the island of Martin Garcia in September. This is said to be about 500km from Argentina and an application to ARRL for DXCC recognition has been made. The island is administered by the Argentine Navy Department and their help is being sought. Other operators are being invited to join the party and other trips to Javatai Is and Isla los Arroyos are planned, possibly this month. Callsigns on Martin Garcia will be LR3DGX and LR5DL, and frequencies to be used 3,748, 7,098, 7,128, 14,198, 14,250, 21,300 and 28,550kHz. QSLs go to Casilla 23, Dolores, Buenos Aires, Argentina.

ON5TO will be in Andorra between 5 and 20 July. He will use the callsign C31DP and should be found near the following frequencies: 3,505, 3,750, 7,005, 7,075, 14,005, 14,250, 21,005 and 21,180kHz.

OH2BH and his fellow dxpeditioners were unable to operate from Albania after all and spent a frustrating week in that country without access to their radio equipment. Their return to Finland was followed by a decision to postpone their trip to Mali Is (exact location undisclosed but said to have been given DXCC "country" recognition) until the end of July or early August. This was originally planned as a 50-hour continuous operation and a request has been made for stations to make *one contact only* in order to give as many as possible a chance. The plans for Equatorial Guinea and Annobon Is are also said to have been put back by two to four months.

A repeat visit to the islands in the Red Sea recently activated by ET3ZU/A is envisaged. F2QQ, F5QQ, K3BSY and G3TXF hope to go to Jabal at Tair for a four-day stay about 25–30 August. Aldo, ET3ZU, will accompany them in order to carry out the routine lighthouse servicing. They will

QTH Corner

CR3ND	via CT1BH, Dr A. N. Rodrigues, Rua D. Pedro V 92, Vila Nova da Gaia, Portugal.
EI0DI	Box 462, Dublin 9, Eire.
EL2CB	now via W3HNK, Box 14, Norwood, Pa, 19074, USA.
FM7AA	via WA8TDY, 3528 Craig Drive, Flint, Mich, 48506, USA.
FR7ZL/E	Guy P. de la Rhodiere, Lottissement Tanapin, La Brule, St Denis, Reunion.
G4AGM	R. H. Williams, 103 E. Pafford Av, Watcombe, Torquay, Devon.
HM1EX	via WB8EUN, Daryl Kiebler, 517 Farmstead Lane, Lansing, Mich, 48917, USA.
JY9AL	via 9K2AL, PO Box 2320, Kuwait.
JY9WB	EP2WB, Wolfgang Bauer, PO Box 3241, Teheran, Iran.
KG4EQ	via W4PKS, 2nd Marine Div. Hqtrs Btn, Camp Lejeune, NC, 28542, USA.
MP4MBC	G3XEC, G. Grundy, 91 Colnels Road, Felixstowe, Suffolk.
TN8BK	(new) PO Box 123, Brazzaville, Congo Rep.
VK9NP/M **VK9NP/W**	via INDXA, 35 Allview Drive, Ellicott City, Md, 21043, USA.
VP2EQ	Police Unit, Anguilla, BFPO 643.
VS9MF	via G3VAO, c/o 75 Beechwood Rd, Fishponds, Bristol, BS16 3TW.
WS0ATA	K0BLT, Box 33, Ithaca, Neb, 68033, USA.
YB3AAU	PO Box 168, Surabaja, Java, Indonesia.
YB3AAY	Jess Marino, USA Embassy, Surabaja, APO San Francisco, Calif, 96356, USA.
YB8AAP	WB6IZF, Edward Gribi, Box 984, King City, Calif, 93930, USA.
ZD9TDC	via GB2SM, Science Museum, S Kensington, London SW7.
ZK2AU	via WA6LXN, West Valley ARC, 5650 Shoup, Woodland Hills, Calif, 91364, USA.
3C0AN **3C0EG**	via OH2NB, Armas Valste, Lansipellontie, 12 Helsinki 39, Finland.
5N2AAE	Nicholas Geogallis, IITA, P.M.B. 5320, Obadan, Nigeria.
ex-5N2ABB	Fokke Mulder, PA9LX, Bremstraat, 21, Alphenadryn, Holland.
ex-5N2ERL	E. Langford, 14 Bradelgh Rd, Newton-le-Willows, Lancs.
5R8AB	Colin R. McRae, 9 Portal Close, Barnham, Thetford, Norfolk.
5W1AU	Box 1069, Apia, W Samoa.
5X5NA	via G3LQP, 56 Combe Rd, Tilehurst, Reading, Berks. RG3 4NE.
7Q7AA	K4CDZ, Wayne Ashworth, RFD 2-Box 353, Lewisville, NC, 27023, USA.
8R1J	K2DDK, Box 248, Manhasset, NY, 11030, USA.
9L1ITU	via GW3AX, Belle Vue House, Higher W. Cross Lane, Swansea, Glam.
9N1JK	via DJ9KR, Schulweg 16, 7451 Rangendingen, Germany.
9Y4HR	PO Box 767, Port of Spain, Trinidad.

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

use the callsign F5QQ/A on ssb and F2QQ/A on cw and hope to operate on all bands using three sets of equipment and two beams. QSLs will be sent out via Box 810, Asmara, Ethiopia. G3TXF has kindly provided the information that only the two islands of Jabal at Tair and Abu Ail are likely to count as the new country. The British Government looks after the lighthouses on these two islands as the managing government of an international agreement signed in 1968. Any other islands in the area would merely count according to their ownership. The two islands named were Turkish until the first world war and their final ownership has never been settled. *Official Bulletin No 325* from ARRL has announced that Abu Ail and Jabal at Tair will count for one new country for DXCC purposes. DXCC credits may be submitted from 1 August.

Band reports

The excellent spring weather has taken its toll of reporters this month, but those who have found time to be on the air have found conditions on the hf bands to be very erratic. Very little activity is reported on 28MHz and it seems that Pacific dx on 21MHz had disappeared. Morning openings into the same area on 14MHz are now not very good, the late evening period seems to be a more rewarding time to be on this band. Deliberate interference on 3,799·99kHz is still in evidence, as is the increasing determination of those troubled by it to locate and punish the culprits.

Many thanks to all correspondents and specially to the following for supplying the information from which this section was produced: G2HKU, G3HB, G3YHB, G3YOB, G3YWX, G3ZBA, G5JL, G6GH, BRS2098, BRS17567, BRS19682, BRS25172, BRS27880, BRS30231, BRS30694, A6148, A6966, A7056, A7437 and A7555. Callsigns listed below in italics were heard on cw, the others on ssb.

3·5MHz. 0100 ZS1MH, ZS3PT. **0300** ZL4JF/A. **0500** *ZL3FZ*, ZL4JF/A. **0600** *ZB2AV*. **2000** ZS5XA, 5H3MM, 7X0WW. **2100** CR7IK, MP4MBC, ZB2A, ZD8AY, 9Q5ITU. **2200** EP2BQ, JY9WB, 5H3LV, 9G1DY. **2300** KV4FZ, PYs, 3B8CR. **2400** MP4BJE, VEs, VOs.

7MHz. 0000 PJ2CW. **0500** *CO2BB*, ZL2BIB. **0600** *HR2HH*, PYs, VKs, *XE1CE*. **0800** *8P6DR*. **2000** CR6YS, ZS1MH. **2100** CT2AK.

14MHz. 0500 ZL4OL/A. **0600** KC4USX, KS6DT, VR6TC, 5N2ABG. **0700** WA8FPN/KS6, *VK8HA*, ZK1CD,

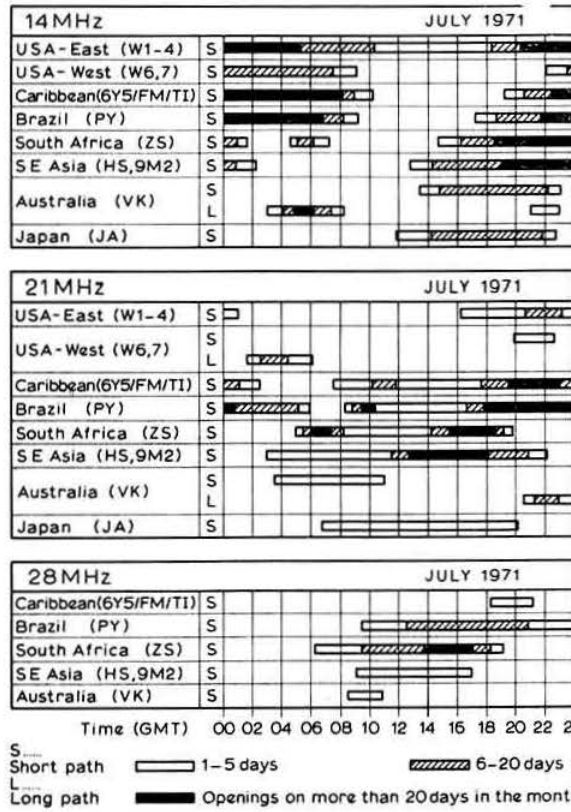
Propagation Predictions

Propagation conditions this month will differ little from those given for last month. DX conditions on the high frequency bands are still not favourable, particularly **28MHz.** A small compensation will be the more frequent short-skip conditions over distances of about 500—2,000km.

14MHz will remain the main dx band, especially at night. The possibility of dx contacts via the indirect path is again indicated for both **21MHz** and **14MHz.**

As it is now winter in the southern hemisphere, traffic with South Africa (ZS) will cease early. Central African stations such as those in Tanzania and Rhodesia will be heard longer than ZS. The same goes for corresponding conditions on **21MHz.** There will be no noticeable change on **7** and **3·5MHz** compared to the previous month.

The provisional sunspot number for May 1971 from the Swiss Federal Observatory is 53·8 with activity evenly distributed throughout the month. The predicted smoothed sunspot numbers for September, October and November are 58, 56 and 54 respectively.



1971 Countries Table

	1·8MHz	3·5MHz	7MHz	14MHz	21MHz	28MHz	Total
G3YHB	—	6	23	85	89	19	232
G8VG	1	16	29	25	44	20	135
G3YWX	—	12	17	52	17	—	98
BRS27263	—	77	58	171	115	87	508
BRS27880	1	32	33	68	71	34	239
BRS30694	5	9	17	69	60	35	195

5W1AU, *9G1DL*. **0800** CR3ND, KH6s, KS6DW, ZK2AF. **1100** C21AA, **1400** *JX4RI*. **1500** *FB8XX*, *HV3SJ*. **1700** *FL8RC*. **1800** *VP2AZ* (QSL to W0CA). **1900** A2CAQ, TT8AC, *ZD9BR*. **2000** AP2KS, KD4ITU, M1KVC (on a.m.), VP8KF. **2100** (DX6GI on Guimaras Is), JY1, KL7-AWR, PY0AD, ST2SA, SU1MA, VS9MB. **2200** JY2, WA1ARF/KS4, W7TNA/MM (Trimaran *Chamaru*).

21MHz. 0600 *5R8AP* (Box 3242 Tananarive). **0800** *FR7ZX*. **0900** VK9FH. **1000** HM4EW, VS6DA. **1100** ZD8TS. **1200** AP2KS, TT8AD, 3B8CZ, *4S7AF*. **1300** *HC0HM*, KX6IP, 9L9ITU. **1400** CR3ND, YA1IOS, YB1AK, ZC4RAF, ZD9TDC. **1500** *HV3SJ*, *K3JSV/KG6*, *TY1ABE*, *XW8BP*, YS1JL, ZF1WF. **1600** FR7AE, HC8FN, *MP4TDT*, *PY0AD*, VS9s MF, MT, VU2IRA, *4U3ITU*. **1700** TJ1AR (on a.m.), VP2EZ, VQ9RK, 7P8AR, WA4OVP/8R1. **1800** EA9EJ, KC4USP, VP2VAG. **1900** VP8s LO, MF, ZD8RC, 5X5NA, 9K2AM. **2100** TR8MR, VP2GBL. **2200** FM7WW (QSL via INDXA), ZD8AB.

28MHz. 1100 MP4MBC. **1300** *JW5NM*. **1400** *CE8AA*. **1500** ST2SA, *TU2CX*. **1700** VS9MT, XT2AA, 5H3LV.

Very many thanks to all correspondents and specially to the following for items obtained from their publications: **NARS Newsletter** (*5N2ABG*), **Long Skip** (*Nick Sawchuk*), 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*) and the **DX'ers Magazine** (*W4BPD*).

Please send all items for **August** issue **to reach G3FKM** not later than **9 July**, for **September** issue by **4 August**, and for **October** issue by **8 September.**

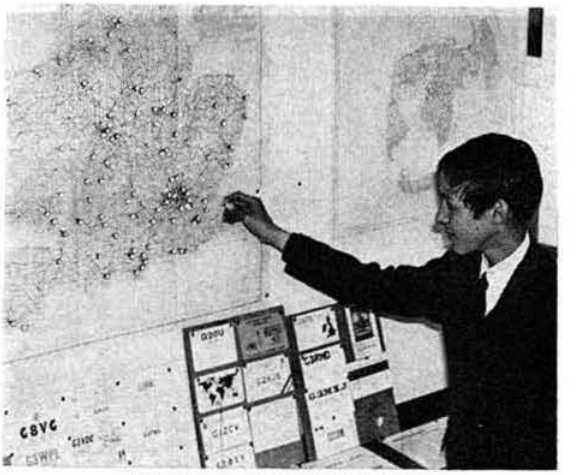
World Telecommunication Day 1971

THE UK contribution to World Telecommunication Day 1971 was the operation of a special activity station with the callsign GB2ITU. Last year GB2ITU was on the air for two days only; this year it was active for a week. In 1970 activity was on 3·5MHz only; this year the hf bands were also utilized. Contacts on 80m ranged over the whole of the British Isles. Indifferent conditions for dx working prevailed on the higher frequencies, with short skip providing many European QSOs; however, WAC was achieved. On two days, brief openings on 14MHz enabled a number of rapid contest-style contacts to be made with the USA.

GB2ITU was again located at Tonbridge School, Kent. Equipment in use included two KW Atlantas with remote VFOs, KW Ee-zee Match, KW swr bridge and low-pass filter. Gratitude must be expressed to K. W. Electronics Ltd for assistance with the equipment, which performed magnificently throughout long hours of operating. Aerials included an 80m dipole at 40ft, and a TH3 beam at 45ft. The latter was specially installed for the occasion by the school's works department; this was a great achievement, for it was a task that they had never before attempted.

Members of Tonbridge School Radio Club (an affiliated society) ran the station; acting as log-keepers, completing QSL cards, keeping two map-boards up to date, and answering questions from the many visitors. They were very pleased to welcome G2AJS, Norman Maddock. The special QSL cards, which have been despatched to every station which was worked, were printed by the Tonbridge School Press; photographs are by A. L. R. Fincham of the Photographic Society. The club has Tim Hughes, G3GVV, as its master in charge. He is director of technology at Tonbridge School, and Executive Vice-President of the RSGB.

G3GVV, background, operating the station assisted by two members of the Tonbridge School Radio Club



Plotting contacts with GB2ITU

Northern Radio Societies Association's Convention

General view of the convention

THE annual convention of the NRSA took place at the Belle Vue Zoological Gardens, Manchester, on Sunday 9 May 1971. It followed its accustomed pattern, with the focus on club stands organized by member societies, with the object of presenting amateur radio to the general public. Those taking part this year were: Bury & Rossendale Radio Society; East Lancashire Radio Society; Eccles Radio Society; Liverpool & District Radio Society; Manchester & District Radio Society; South Manchester Radio Club; Stockport Radio Society; Wirral Radio Society, and The Metre Wave Club.

Stands were also organized by the RAEN and the Scouts; and the RSGB bookstall, organized by Mr P. E. Jeffs, was well patronized throughout the day.

For the members of the participating clubs the day started early, with most of them arriving at Belle Vue between 0700 and 0800 to erect stands and set out displays, while other teams set up the operating stations and erected aerials. By just after 0900 the first QSO had been entered in the log and the doors of the exhibition hall were opened to the general public.

Mr Basil O'Brien, G2AMV, RSGB Region 1 representative, addressing the convention. Seated (left) Mr John Heywood, G8BHQ, vice-chairman of NRSA, and (right) Mr Sam Potter, G3YKJ, chairman of NRSA

At noon the convention was officially declared open by the President of the RSGB, Mr Fred Ward, G2CVV, who later also undertook the onerous task of judging the club stands and presented the G8AYD Trophy to the winning club. South Manchester Radio Club, which won the trophy last year and was joint winner with Manchester & District Radio Society in 1969, was again successful with a stand displaying "Club activities—technical, social and communal".

Mr Ward referred to the very high standard of home-brew equipment on display on the stands and to the reservoir of constructional talent which lay behind it. He was very favourably impressed with the basic conception of a convention built around a nucleus of amateur club stands and felt it would be a good thing for amateur radio in general if this type of event were taken up by clubs in other parts of the country. This very favourable overall impression did not prevent him from offering some constructive criticism which he hoped would help clubs to improve their presentation techniques.

Stations were active throughout the day using the special callsign GB2BVC, and talk-in stations were operated by South Manchester Radio Club—VHF Group (2m), RAEN (4m) and GPO-Dial House Radio Club (Top Band). The main convention station working the hf bands was operated by the South Manchester Radio Club using Sommerkamp equipment feeding a TA 33 Junior beam which along with the vhf beams was mounted on a 65ft tower provided and erected for the day by courtesy of Strumech Ltd. QSOs were made with many countries during the day, including 9J2 and KP4, and QSL cards will be sent to all stations contacted.

Another interesting activity was the amateur tv station operated by members of the BATC, who provided both cctv in the exhibition hall and reception of live "off-air" pictures from local stations and a station operating portable from Winter Hill (some 17 miles from Belle Vue) which transmitted pictures of one of the 2m talk-in stations.

During the afternoon the following communication films were shown in an adjoining suite by courtesy of Cable & Wireless Ltd; *East West Island*; *Ring Around the Earth*; *Call the World*; *Voices under the Sea*; *Apollo in Ascension*, and *The New Caribbean*. Over the years this has become a very popular feature with visitors to the convention as it provides

a pleasant and interesting interlude and also gives them an opportunity to rest tired feet.

Backing up the central theme of club stands were the trade stands of The Amateur Radio Shop; J. Birkett; Dynatec; Garex Electronics Ltd; Heath (Gloucester) Ltd; M & B Components; Microwave Modules Ltd; Stephens James Ltd and J. Tweedy.

During the day over 1,000 callsign cards were issued to visiting licensed amateurs and it is estimated that there was a total attendance of some 3,500 people. DX visitors included K6TWT and his xyl, WA6IEB, both of whom are currently pursuing post-graduate courses at Liverpool University. The organizers were also very pleased to welcome members of the RAIBC who, like everyone else, appeared to have a most enjoyable day.

Looking forward to next year's convention, which has been provisionally fixed for Sunday 7 May, the committee would like to see an extension of club participation and would particularly invite a challenge from clubs on the "White Rose" side of the Pennines, although, of course, all northern clubs are more than welcome. Any interested club secretary should contact G3YKJ, QTHR, for information.

Mr Fred Ward, right, presents the G8AYD Trophy to the chairman of the South Manchester Radio Club, Mr Roland Parkinson, G3FNM

MOBILE RALLY NEWS

Wessex AR Group Mobile Rally, 25 July
There has been a change of site for this rally and the new venue is Braemore House, nr Fordingbridge, Hants, off the A338. Start at 1100bst with talk-in on 160 and 2m; attractions include a df hunt and a stately home.

White Rose Mobile Rally, 25 July
Organized by the White Rose Radio Society, the rally will take place at Allerton Girls High School, King Lane, Leeds 17. Talk-in on 2 and 160m, trade stands, raffle, refreshments, bring and buy, ample car-parking space. Further info from G3YEE, QTHR, or G3WIX, QTHR.

Radio Foxhunt, 1 August
This event is being held by Ovingham & District ARC and three starting locations will be used—the Morpeth Approach Road, map ref 201854; the Market Square, Hexham, 936642, and the Claremont Road Carpark, Newcastle, 246654. Competitors may either hand in to the marshal a QSL card or a postcard with name and address on. Transmissions begin at 2pm and will be keyed on with the call G8BGU, followed by a 30 per cent audio tone, pulsed at 6s intervals of 100 per cent tone. At the end of the 5min period the callsign will be given again. The close of transmission will be marked by a 1s audio pulse. These transmissions will continue until 3.45pm when the site location will be given to enable lost souls to find the chosen site for a cup of tea. Good site for picnics and safe for children but there will be no toilet facilities. Transmission will be on 145·1MHz. Prizes are being offered and further details are available from the secretary, Ovingham & District ARC, 27 Dene Garth, Ovingham, Prudhoe, Northumberland (sae pse).

Derby Mobile Rally, 15 August
To be held at Rykneld School, Bedford Street, Derby (between Uttoxeter Road and Burton Road on the Derby Ring Road). Attractions include G3ERD/A on 160m, refreshments and children's events. Admission and parking free, further details from T. Darn G3FGY, QTHR. Tel Ripley 2972.

Torbay ARS Mobile Rally, 15 August
The venue for this event is Newton Abbot Rugby Club Ground on the Newton Abbot to Exeter Road, opposite the racecourse. Top Band station G3NJA will operate from 0930gmt, and there will also be a 2m station and a special rally station, GB3TMR. There will be various competitions, a radio draw, exhibition of old time equipment, and refreshments and a bar will be available.

Bromsgrove ARC Mobile Picnic, 22 August
At Avoncroft Museum of Buildings, Stoke Prior, Bromsgrove. Talk-in on 2 and 160m, G3VGG/P and G3CLN/A respectively. Further details from J. Dufrane, 44 Hazelton Road, Marlbrook, Bromsgrove.

G3VPR, G4OO and G2CVV at the Spalding Tulip Time Rally on 2 May

Among those present at the Northern Mobile Rally on 16 May: (l to r) G2VO, G3UDW, G2CVV, G4JW and G3WVD

SOCIETY AFFAIRS

A brief report of the Council meeting held at Society HQ on 3 May 1971

Present: *Mr F. C. Ward (President, in the Chair), Dr E. J. Allaway, Messrs J. Bazley, R. J. Hughes, G. R. Jessop, W. F. McGonigle, A. C. Morris, L. E. Newnham, C. H. Parsons, J. R. Petty, W. A. Scarr, R. F. Stevens, G. M. C. Stone, 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 B. D. A. Armstrong, J. O. Brown, E. G. Ingram and A. W. Smith.

VHF/UHF Convention
A report was presented on the VHF/UHF Convention held at Whitton on 17 April which was considered to have been very successful.

Function in place of Exhibition
Considerable discussion took place as to the type of function and the area in which it should be held. It was reported that it had been impracticable to obtain a suitable booking for 1971 and so it was agreed that the Exhibition Committee should be requested to consider the matter and to put forward recommendations to Council for a function in 1972.

Correspondence
The President read a letter dated 15 April 1971 from Mr Barnard, editor of *Wireless World*, thanking the Society for its good wishes on the occasion of *Wireless World*'s 60th birthday.

A letter dated 26 March 1971 from Mr Arthur E. Blick, President, Canadian Amateur Radio Federation (CARF), was read. Council agreed that the Society would support CARF in a protest to the USA Licensing Authority (FCC) against the terms of FCC Docket 19162—"Proposed rule-making, USA phone sub-bands". It was noted that CARF would shortly be established in corporate form and it was agreed that the Society would establish ties with CARF in order that mutual problems could be discussed and a service established for the benefit of amateurs of both countries.

Accounts
The cash situation was considered and it was agreed that a payment should be made to the Lambda Investment Co Ltd so that the company's overdraft could be reduced.

Membership and affiliation
It was resolved:

(i) to elect 48 corporate members and 17 associates;
(ii) to waive the subscriptions of 12 members on the grounds of blindness or other disability;
(iii) to accept a reduced subscription from one member;
(iv) to grant affiliation to the Doncaster College of Technology.

70cm band
Council considered the current situation relating to the amateur allocation in the 420MHz band. Mr Newnham had attended a meeting of the Frequency Advisory Committee on 16 April 1971 at which a reduction of the present frequency allocation to 432-440MHz had been proposed.

Space conference
A report was presented by Mr Stevens on the preparatory work that was being undertaken for the space conference in Geneva in June/July. From the information received it seemed that the delegations from France and Switzerland were unlikely to support amateur proposals.

It was understood that there would be approximately 160 exhibitors at the Telecom 71 Exhibition being held in Geneva during part of the time of the space conference and that IARU Region 1 were being allotted a stand space free of charge.

BBC feature programmes
Mr Stone reported that he had recorded an interview for the BBC "New World" programme to be broadcast on Radio 4, and that he had also received an invitation to visit Radio London.

Advertising
The chairman of the Membership & Representation Committee, Mr Petty, reported that his committee had approved in principle that a poster be produced in quantity and be issued for Society publicity purposes at rallies, meetings and exhibitions, and to schools, colleges and clubs, etc.

Minutes of committee meetings
Council approved the minutes of the VHF Contest Committee (3.3.71), Mobile Committee (9.3.71), VHF Committee (17.3.71), Diamond Jubilee Committee (5.4.71), VHF Contests Committee (6.4.71), MPT Liaison Committee (2.4.71).

Among other matters discussed were the computerization of subscription records, reprint of the *Radio Communication Handbook* and production of the *Radio Amateurs' Examination Manual*.

OBITUARIES

Mr W. H. Baker, G3JW
Bill Baker, who died on 29 May, aged 65, was a former chairman of the Torbay ARS. During the second world war he organized meetings which many overseas radio amateurs attended.

Mr F. Christie, GM3FAX
Frank Christie died suddenly on 1 June. He was a well-known amateur throughout GM and was always ready to help and advise. His widow, May, is GM3IMR.

Mr C. Crocker, G2NN
Fred Crocker of Twickenham died on 27 May. First licensed in 1913, Fred was a member of RAOTA and founder president in 1933 of the Thames Valley Amateur Radio Transmitters Society. He was active on 1·8-28MHz up to his death.

Mr J. Godden, G3DXA
Jack Godden, past president and founder member of the Echelford ARS, died on 1 May.

Mr B. Marston, G3GEG/ON8GM
Brian Marston died on 10 October 1970 in Munich, aged 33. He had just moved to Germany from Brussels. He was active on 7 and 14MHz, always cw.

Mr C. A. Penniston, G3GVK
Cyril Penniston died at Lincoln on 23 April. Licensed in 1950, he joined and became chairman of the Leicester ARS. He later became a member of the Lincoln Short Wave Club and served on the club committee.

Mobile Rallies Calendar

11 July	Worcester, Upton on Severn.
17 July	Winchester, Family Outing.
18 July	Scarborough ARS.
25 July	White Rose, Leeds
25 July	Wessex AR Group
1 August	Ovingham Foxhunt
8 August	Woburn Abbey.
15 August	Derby.
15 August	Torbay, Newton Abbot Rugby Ground.
22 August	Bromsgrove.
22 August	Swindon, Wroughton Aerodrome.
25 August	Mobile gathering, Hogs Back
29 August	Preston.
29 August	Stratford-on-Avon.

RADIO AMATEURS' EMERGENCY NETWORK

by S. W. LAW, G3PAZ*

The proposal to organize a Raynet section at the RSGB Rally at Woburn Abbey on 8 August has now become a reality thanks to the co-operation of the Mobile Committee. Although members of the Raynet Committee are now busy making arrangements, it is not possible at this juncture to give full details.

It is probable that Raynet will be handling the 4m talk-in channel and will be tuning the band in addition to the known Raynet frequencies. A separate tent will act as a Raynet office and it is hoped that as many members as possible will attend. Any groups which have mobile signal office caravans will be particularly welcome as we would like to make a good show.

Arrangements are to be made to park all Raynet cars together, so members should ensure that a RAEN sticker is on their windscreen in order that the stewards may direct them to the right area on arrival.

Fuller particulars will be given in the July issue of the *Raynet Newsletter* to all controllers and in the August issue of *Radio Communication*. We trust the latter will enable the isolated members to make last-minute arrangements.

SE activity

Those among the large attendance at the Maidstone Rally on 30 May will have noted the mid-Kent Raynet exhibit doing well at the 'Y' Centre. Earlier in the month we noted that our badge was also in evidence at the Medway Radio Rally held in conjunction with the Steam Fair at Gillingham on 15-16 May. The remarks about 'steam radio' were naturally ignored!

A listen around the 4m section in the London area shows that the SE groups are all well organized, even to the weekly snappy net reports which are a feature in this part of the country apart from the usual run of exercises. May we point out to all groups that such short reports at a scheduled time are a boon to controllers who have then an up-to-date picture of the state of the art at any time and are thus saved both worry as to possible call-out set-up and the cost and delay of postal information about changes in member/equipment availability.

Surrey controller G3MFB has now moved to a new QTH at 'Applecross', Medstead, Alton, Hants, (tel. 04206 2551). Assistant controller of N Surrey area, G3VK, has also changed QTH to 22 Keswick Close, Benhill Wood Road, Sutton, Surrey. For W Surrey, G3XUU is still assistant controller and QTHR, while G3HVE (also QTHR) still acts as training officer and assistant group controller.

The position in Kent is G3GGH, group controller, with G3YCN as assistant controller for the Maidstone area. The one-time SE GLC group, although now merged with the Bromley/Orpington area, still retains G3FZL as controller; G3GJW dealing with the Orpington section. Incidentally, the latter has so impressed the local BRCS that the group has been donated a duplicator; real liaison work here!

Norfolk

Controller G3HRK points out that the coverage is Norfolk and NE Suffolk, with G3YDZ in charge of the Suffolk section. We understand that Mid-Anglia comes under G3GXE at the moment. Yet another 'rail disaster' exercise on 16 May was conjoined with the St John Ambulance Brigade to the great mutual satisfaction of both. Good liaison again. As is their wont Norfolk held another of their social functions at Barford on 20 June, which made a pleasant break before their participation in the Royal Suffolk Show on 30 June and 1 July.

Group frequencies

A list of frequencies used by the Raynet groups (at 7 May 1971) and for other purposes is given here, but regarding our reference to 70·125MHz last month this frequency has no significance in the context of Raynet and we apologize for any misconception this reference aroused.

Frequency (MHz)	Raynet group
428·400	Mid-Severn Valley (projected 1)—G3NUE
427·500	Mid-Severn Valley (projected 2)—G3NUE
145·900	W Sussex (secondary)—G3LQI
145·800	**National Common Frequency**
	Liverpool & SW Lancashire—G3DCA
	Glasgow (*calling*)—GM3VQJ
	Mid-Thames—G3FSN
	Manchester & Salford—G3MBQ
	E Sussex—G3JFM
	Sutton Coldfield police area—G3CNV
	W Sussex (primary)—G3LQI
	Yorkshire—G3VAP
145·600	Glasgow—GM3VQJ
145·486	Mid-Severn Valley (projected; relay)—G3NUE
145·300	**Northern & International RTTY Frequency**
	S Anglia—G3WXZ
145·250	Norfolk (secondary)—G3HRK
	NE Suffolk (primary)—G3HRK
145·240	Mid-Thames—G3FSN
145·200	Kent—G3GGH
145·150	Surrey—G3MFB
145·108	W Sussex—G3LQI
145·050	Norfolk (primary)—G3HRK
	NE Suffolk (secondary)—G3HRK
145·000	**National Mobile Frequency**
	Liverpool & SW Lancashire—G3DCA
144·940	Sussex—(secondary)
144·860	E. Sussex—G3JFM
144·750	Essex—G3GNQ
144·700	Liverpool & SW Lancashire—G3DCA
144·600	**Southern England RTTY Frequency**
	Glamorganshire (a.m. & fm)—GW3FKO
144·486	Mid-Severn Valley (primary)—G3NUE
144·480	Glamorganshire (a.m. & fm)—GW3FKO
144·350	Glamorganshire (a.m. & fm)—GW3FKO
70·620	Ayrshire—GM3LTW
70·560	**National RTTY Frequency**
70·520	Liverpool & SW Lancashire—G3DCA
70·500	Essex—G3WCO
70·445	Surrey—G3MFB
70·400	Surrey (*calling*)—G3MFB
70·380	Liverpool & SW Lancashire—G3DCA
	SE London (primary)—G3FZL
70·375	**National Common Frequency**
	N Sussex—G3FRV
	Glasgow—GM3VQJ
	Mid-Antrim (*calling*)—GI3AOB
	Essex—G3GNQ
	Kent—G3GGH
	Mid-Thames—G3FSN
	Manchester & Salford—G3MBQ
	W Sussex (primary)—G3LQI
	Surrey—G3MFB
	Ayrshire—GM3LTW
	Yorkshire (main)—G3VAP
70·365	Surrey—G3MFB
70·362	Manchester & Salford—G3MBQ
70·355	Kent—G3GGH
	SE London (secondary)—G3FZL
	Mid-Thames—G3FSN
70·300	N Sussex (provisional)—G3FRV
	W Sussex (secondary)—G3LQI
70·260	**National Mobile Frequency**
	Cumbria North—G3XEN
	Glasgow (*calling*)—GM3VQJ
	Surrey (mobile control)—G3MFB
	Mid-Thames—G3FSN
	Yorkshire (secondary)—G3VAP
70·225	Mid-Severn Valley (secondary 1)—G3NUE
70·200	Mid-Antrim—GI3AOB
70·075	Mid-Severn Valley (secondary 2)—G3NUE
28·889	Hertfordshire—G3NRB
3·600	Cumbria—G3XEN
1·980	Cumbria—G3XEN
	E Sussex—G3JFM
1·970	Norfolk (nominal)—G3HRK
1·915	Sutton Coldfield police area (nominal)—G3CNV
1·875	Mid-Severn Valley (nominal; secondary)—G3NUE
1·850	Mid-Antrim (nominal)—GI3AOB

Special Raynet callsigns

Essex:	G3PHQ, Police, Springfield, Chelmsford.
	G3NYP, BRCS, Chelmsford.
Kent:	G3ZRX, BRCS, Bromley.
Surrey:	G3RCC, County Control, Woking.
Sussex:	G3ZSJ, BRCS, Hove (70·375MHz)
	G8ERC, BRCS, Hove (145·108 & 145·800MHz).
SE London:	G3NAT, (G3IIR), Forest Hill, SE23.
Hertfordshire:	G3VVN, Hertfordshire Group callsign.

PLEASE SEND ANY NEW FREQUENCIES OR CORRECTIONS TO G3GJW—QTHR

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

CONTEST NEWS

DF Qualifying Round—Derby

Date: 18 July 1971.
Map: OS Sheet 112 (Nottingham).
Assembly: 1300bst for start at 1320bst.
Location: 300yds from the junction of the B6020 (at the edge of Nomanshill Wood) NGR 542557. Frequencies and callsigns will be announced at the start.

This event is being organized by the Derby Radio Club, and intending competitors are asked to notify Mr A. Hitchcock, 38 West Road, Spondon, Derby, of the numbers in their parties requiring tea. Please advise him as soon as possible.

Second World RTTY Championship results

There were 203 entrants for the championship during the period March 1970 to February 1971. Five contests: the BARTG Spring, DARC WAE, RTTY DX Sweepstakes, A. Volta RTTY and Giant Flash, were taken into account, and the final placing was given by the best four scores out of the five possible.

Giovanni Guidetti, I1KG, was the overall winner with a total of 120 points, followed by VK2FZ with 80 points and I1CGE with 73 points. It is not possible to publish all the final placings here, but the British entrants were placed as follows: GB2SM, 30th with 22 points; G3MWI, 38th with 18 points; G6JF, 45th with 15 points; GI3VDB, 71st with i5 points; and G3IGG, G3LDI, G3OWN and G3VQT, 123rd to 126th respectively, each with 1 point.

In the Short Wave Listener Section, Alexander Morton of Scotland came 2nd with 45 points to Giordano Venuti (47 points), and Dick Coates of England came 8th with 22 points. There were 13 placings in this section.

1296MHz Fixed Station Contest Results

The effects of the postal strike on the delivery of *Radio Communication* prevented this new contest from receiving adequate prior publicity, and the attempt to promote and assess activity from home stations was not as successful as might otherwise have been the case. Only 19 contacts were recorded, none of which managed to connect the isolated pockets of activity.

Peter Blair, G3LTF, using his moonbounce equipment for 'terrestrial' purposes, made 294 points from six scoring contacts and proved the easy winner. He points out that although pa efficiencies are low on 1,296MHz, the licensing conditions for ssb deal with power output rather than input; the advantages of ssb for weak-signal telephony are well-known. G3LTF also claims the first two-way ssb contact in Britain on 23cm, made during this contest with G3LQR.

The only other extended comments received were from G2WS, who believes that activity on this band is as yet inadequate to permit of any restriction on operating sites; yet the writer wonders if portability and low power may not prove the greater restrictions in the long term?

Thanks go to the entrants for taking the trouble to submit logs, however brief, since all are passed on to G3RPE for his records of microwave activity.

Posn	Callsign	Score	QSOs	County	Best dx (km)	Power	Aerial
1	G3LTF	294	8	EX	86	300*	2½ft
2	G8AKE	165	4	LR	60	100	2¾ft
	G8ARM	165	7	LD	66	12	34Y
4	G3TDM	164	6	LD	39	10	3ft
5	G8BAV	43	1	DY	43	37	5½ft
6	G2WS	37	1	ST	37	15	11/11Y

Y = yagi * SSB power output

May 1971 2m Portable Contest results

At 1800 on 1 May the 2m air was well and truly rent by the beginning of what must have been, VHF NFD excepted, one of the most hectic 24-hour periods of its history. Several hundred stations were on the band to fight out this contest, and the uproar was increased by the above-average conditions. Add to this the growing, and by some people regretted, tendency towards the use of vfo netting techniques, and it is easy to see why many contestants complained about QRM and some found activity too high for many contacts to be made at all!

Unfortunately, the general standard of operating was not high. Numerous complaints were heard about over-modulated signals and poor use of procedure. In particular there seems to be confusion in many minds about the use of "QRZ?" and other 'Q' codes, though why they are used at all on 'phone is not clear. For a poor operator the answer to "QRZ?", ie "Who is calling me?" is all too often "Nobody!".

Your adjudicator, having heard dreadful rumours about several stations making over 300 contacts, was preparing to leave the country at one point, but fortunately only one entrant in fact topped the 300 mark, (GW3NUE/P . . . who else?) and only 97 entries were in fact received.

In a contest of this magnitude held under good conditions, it seems essential to be in the far north, south or west, and the results this time seem to bear out the theory, with GW3NUE/P and G3OBD/P in Wiltshire the respective winners of the two sections, both by substantial margins.

The experiment of holding long and short sections was very well received, with several suggestions for an extension of this format to other contests. All in all, with good conditions, high activity in the UK and on the Continent and, for once, good weather, a good time was had by all . . . except GW3OXD/P, whose generator broke down! Still, they cannot win them all.

LONG SECTION

Posn	Callsign	County	Points	QSOs	Best QSO	km	Power	Aerial
1	GW3NUE/P	BR	2,210	331	—	—	30	10
2	G3ZXR/P	HE	1,892	247	DJ5BV	575	60	8/8
3	GW3UCB/P	DB	1,608	263	PA0JNH/P	550	60	10/10
4	G8AJC/P	KT	1,510	190	DC1QY/P	474	25	9/9
5	G8BQX/P	SX	1,494	211	F2QU/P	525	20*	8/8
6	G3XUS/P	SX	1,347	214	DL0AN/P	437	30	8/8
7	G8AWN/P	YS	1,337	199	G3KHU/P	420	20	8/8
8	GW6OI/P	DB	1,297	208	PA0JNH/P	540	25	10
9	GW4ABR/P	MG	1,274	198	F8EL/P	485	50	14
10	G8BCL/P	YS	1,268	171			40	
11	GW3GBU/P	MG	1,263	200	ON5LT	570	50	14
12	GW3NWR/P	DB	1,216	208			25	14
13	G3ILO/P	GR	1,206	247			30	6
14	G6UQ/P	SD	1,156	230			25	7
15	G8AUN/P	NK	1,130	145	DK1BM	420	70	10/10
16	G8BHH/P	SE	1,126	221	PA0JNH/P	505	75	14
17	GW3ITZ/P	DB	1,108	197			28	
18	G8CFZ/P	SX	1,104	182	PA0MOT/P	400	28	8/8
19	GW8AZU/P	MR	1,087	171	F9ZG/P	525	4	10
20	G3VNQ/P	LE	1,007	143	G3XUS/P	428	50	8
21	G8AWM/P	BD	932	179	F1AMN/A	360	25	10/10
22	G3PIA/P	BE	931	182	PA0DMT	470	25	10/10
	G3UES/P	HE	931	196	F8EL/P		25	8/8
24	GW3VKL/P	BR	890	166	F9DM/P	435	20	8/8
25	G8AVH/P	WK	889	211	PA0CML	390	25	10
26	G8DJT/P	DY	881	181			25	
27	G8DFJ/P	LN	838	133			35	
28	G3WOR/P	SX	813	159	F1BBC/A	535	25	6/6
	GW3PUV/P	CA	813	128	G3DAH	330	4	14
30	G3WKF/P	CL	793	106	G3AMW/P	475	140**	8/8
31	G3HOX/P	SD	786	126			15	10
32	G3BRS/P	LE	783	150	F1AOY/P	420	35	14
33	G3XEP/P	YS	777	111	ON5QW/A	550	40	14
34	GW3OXD/P	RN	760	128	PA0FHV		20	10
35	G3KHU/P	DN	753	118	G8AWN/P	412	6	8
36	G3ZIS/P	YS	746	119	G8CFZ/P	355	40	8
37	G3ZPT/P	HE	726	150	G3VNQ/P	380	8	14
38	G8DDW/P	KT	723	154	G8EEM/P	340	20	6
39	G8BZG/P	BS	721	159	PA0JNH/P	392	24	18
40	G3AMW/P	YS	676	102	G3WKF/P	450	20	8
41	G8DUQ/P	WE	659	125	G8DKU	375	15	14
42	G8AIE/P	HF	607	128	G3WKF/P	347	25	10
43	G3BXF/P	WK	601	140	G3WKF/P	320	30	8
44	G3SDC/P	LR	578	113	F1AOY/P	430	12	10
45	G8ALM/P	EX	572	117	G8DKU/P	450	80	10/10
46	G8DKU/P	DH	570	87			20	
47	G8DXS/P	YS	555	103			50	
48	G3SJX/P	YS	508	76			1*	
49	G3MQV/P	LR	454	111	F1KCG	280	10	8
50	G8CDL/P	BD	450	101	PA0CML	320	25	10
51	G3CMH/P	ST	410	97	F6AYC/P	365	15	8/8
52	G3WOS/P	ND	408	71			40	8/8
53	G3KUE/P	LE	384	94	G3WKF/P	380	15	8
54	G3TBK/P	YS	376	60			20	
55	G8EEM/P	YS	356	70	G8DDW/P	362	33	10
56	G8CXS/P	YS	340	68	PA0JNH/P	400+	80	10
57	G8DOQ/P	DH	316	67	G8BZG/P	340	18	8/8
58	G3THC/P	NR	261	76	PA0FHV	310	30	8

SHORT SECTION

Posn	Callsign	County	Points	QSOs	Best QSO	km	Power	Aerial
1	G3OBD/P	WE	642	111	G8CID/P	387	25	
2	G3GJY/P	YS	499	71	PA0FHV	440	22	14
3	G8CUB/P	KT	458	79	F6KBM	323	25	8
4	G3DOV/P	NK	452	70	G8EAM/P	315	40	10
5	G8BPN/P	OX	431	83	PA0FHV	320	25	10
6	G3CGQ/P	DT	419	67	F1AKE/P	355	15	6
7	G8BXI/P	WR	418	112	GM8CVN/P	407	25	8
8	G3JQA/P	LE	408	88			30	
9	G3PXP/P	LR	396	101			25	5/5
10	G8DDC/P	BD	387	82	G3WKF/P	315	15*	14
11	G3JEQ/P	SY	379	89	G3VNQ/P	380	10	6/6
12	G3IGV/P	CL	373	50	F1AKE/P	407	25	6/6
13	G3VPF/P	DT	372	73	F6AYG/P	350	25	7/8
14	G3SLH/P	BE	362	75			10	
15	G3NYY/P	HF	345	62	GD2HDZ	362	25	8
16	GI8AYZ/P	AM	327	41	GW4ABR/P	316	12	6
17	G3ZVC/P	WE	297	74			10*	
18	G3ATZ/P	DY	294	72	G8BQX/P	296	22	14
19	G3UHF/P	DY	280	82	G3WKF/P	342	25	8
20	G5HZ/P	HE	276	74	G3WNQ/P	280	12	6/6
	GM8CVN/P	BW	276	54	G8BXI/P	405	30	10
22	G8ELO/P	NR	273	73	G3WKF/P	270	26	10
23	G5PI/P	SF	244	50	ON5QW/A	310	25	8/8
24	G3OUR/P	OX	237	74			30	8
25	GW3AHD/P	FT	233	71	GM8CVN/P	288	8*	8/8
26	G2CUZ/P	LE	224	61	GI8AYZ/P		15	6/6
27	G8ENZ/P	SX	217	77	F9ZG/P	315	25	8
28	G8CDP/P	YS	208	50	G8GP	328	40	8
29	G5UM/P	RT	167	53	GD2HDZ	190	9	5
30	G3LCV/P	DY	164	60	G3SLH/P	176	10	5
31	G3WXI/P	YS	160	39			25	4
	GI8CEA/P	TE	160	24	GW3VKL/P	400	25	6
33	G3TSZ/P	CH	120	52	GW3VKL/P	172	10	6
34	G3WDH/P	LE	113	43			6	8
35	GW3ZSS/P	DB	110	35	G8AWN/P	202	0·8	4
36	G2WS/P	ST	88	32	GW8ZU/P	170	10	4
37	G3JFY/P	HE	57	25	GW3VKL/P	165	10	4
38	G3XOL/P	DY	52	22	G3KJX/P	116	12	8
39	G3ZNW/P	KT	49	29	FIAOY/P	120	2	10

Check logs acknowledged from G3RSD, G8BKR, G8CRN, G8BNE/A.
* Output power. ** Linear amplifier.

January 1971 144MHz SSB Contest results

The contest this year attracted nearly double last year's entry. G8BBB retains his position at the top with 389 points from 61 contacts. His best dx was a contact with EI6AS at a distance of 435km. This year, second and third positions are taken by portable stations. Runner-up is GM8AGU/P operating from a location in Kincardineshire. He made a total of 16 contacts, only one less than 50km, and his best being with OZ5NM at a very creditable 840km. Conditions seemed to be about average during the contest and activity was quite high.

Comments received included: "By the time I had lashed up the transmitter there was only one minute left!"—G8CJV.

"Heavy QRM from power cables to the east"—G8BBB.

Posn	Callsign	Points	QSOs	County	Best QSO (km)	Power	Aerial
1	G8BBB	389	61	CE	435	400	10-el Yagi
2	GM8AGU/P	361	16	KN	840	150	—
3	GW3USB/P	313	48	DB	356	200	10-el Yagi
4	G3BA	295	54	WK	516	350	—
5	G3JQA/P	278	46	LE	—	70	7-el Yagi
6	G3OXD/A	268	55	WR	250	150	10-el Yagi
7	G3DY	263	44	CE	—	200	—
8	G3FZL	246	50	—	280	200	14-el Parabeam
	G3RND/P	246	33	—	—	140	4-elYagi
10	G3MCS	242	53	—	—	—	10-el Yagi
11	G3POI	231	43	LD	365	500	8-el Yagi
12	G3HCW	174	33	YS	276	75	2/2 Slot
13	G8DDC/A	168	42	BD	—	120	—
14	G6RH	160	35	KT	260	200	9-el Yagi
15	G3REH	156	28	LN	295	2	10-el Yagi
16	G3PWJ	154	36	SD	275	120	10-el Yagi
17	G3XFA	149	38	—	—	100	10-el Yagi
18	G8AJC	147	20	KT	420	150	8-el Yagi
19	G8ABH	142	32	SY	305	200	14-el Parabeam
20	G3HS	127	31	—	247	50	6/6 Slot
21	EI6AS	125	11	—	425	200	14-el Parabeam
22	G3OZT	96	17	HE	—	90	—
23	G3HBW	49	18	BS	221	0·7	5-el Yagi
24	G8BCG	18	8	LE	—	20	8-el Yagi
25	G3VNQ	16	3	LE	257	50	8-el Yagi
26	G8CJV	1	1	WR	10	0·002	8-el Yagi

Check log received from A4659

VHF CONTESTS

Owing to the sudden resignation of Roger Whitbread, G8AYN, from his position as secretary to the VHF Contests Committee, all correspondence, including entries for the June 70MHz Portable Contest, should be sent to the new secretary, Ian F. White, G3SEK, 89 Arthur Road, Wimbledon Park, London SW19; or to the chairman, Cliff Sharpe, G2HIF, 20 Harcourt Road, Wantage, Berks.

Entries for VHF NFD in September should now be addressed to the VHF Contests Committee, c/o C. Sharpe, G2HIF, 20 Harcourt Road, Wantage, Berks.

Cray Valley RS 2nd SWL Contest results

The overall winner, Len Randall, amassed a total of 3,110 points using a Hammarlund SP600 receiver and a 267ft end-fed long wire with 120ft counterpoise. In second place was Ian Forse who, with a B40/A and a long wire, scored 2,955 points.

Conditions on 80m were very good and much dx was heard during the early hours of Sunday morning. Some of the dx countries heard were W, VE, KP4, 8R1, VP2A, VP2V, 4X4, PZ1, CR4, FM7, 6Y5, 8P6, YV, CT2, OA, HC and ZL. The appearance of EA6BR and PZ1CU boosted most entrants' scores.

The standard of logging was, on the whole, very good but some contestants failed to comprehend the scoring system, and some totals have therefore had to be reduced. Once again contestants appeared to have enjoyed the contest and we are looking forward to another bumper entry in the next Cray Valley Radio Society SWL Contest to take place on 25-26 September.

Posn	Entrant	QTH	Points 40m	80m	160m	Total
1	L. Randall, BRS32618	Erith, Kent	930	1,810	370	3,110
2	I. Forse,	Saltash, Cornwall	660	2,115	180	2,955
3	S. Ireland, G3ZZD	Southborough, Kent	430	1,635	300	2,365
	G. Allis, G11760	West Ewell, Surrey	230	2,075	60	2,365
5	J. Harvey, BRS 19682	Bromsgrove, Worcs	830	1,275	140	2,245
6	T. George, A7437	Penzance, Cornwall	950	1,280	–	2,230
7	N. Huntley,	Saltash, Cornwall	315	1,710	120	2,145
8	R. Treacher, BRS32525	Eltham, SE9	120	1,580	310	2,010
9	I. Ray, A6700	Aylesford, Kent	550	1,270	–	1,820
10	F. Gipson,	Brentwood, Essex	–	1,810	–	1,810
11	D. Johnson, A7511	Clitheroe, Lancs	–	1,535	–	1,535
12	P. Smith,	Chesterfield, Derbys	–	1,485	–	1,485
13	A. Whittaker, G13352	Abbey Wood, SE2	–	1,355	75	1,430
14	J. Tanner,	Bexleyheath, Kent	45	975	310	1,330
15	S. Rawlings, A7199	Reading, Berks	230	920	125	1,275
16	R. Philpot, A7623	Shenfield, Essex	–	845	–	845
17	M. Brett, A7131	Sidcup, Kent	–	470	215	685
18	V. Maddex, A6753	Reading, Berks	–	670	–	670
19	S. Mason,	Sidcup, Kent	85	510	55	650
20	N. Hydes, A6403	Darwen, Lancs	205	435	–	640
21	P. Hill,	Sidcup, Kent	205	335	75	615
22	R. Graves, A7159	Blackheath, SE3	–	465	100	565
23	R. Impey,	Brentwood, Essex	–	490	–	490

G2AAN Top Band Contest results

	AM	CW	SSB	Total claimed
G3ZDY	–	55	68	123
G3YMH	–	56	57	113
G3WTA	35	56	56	112
G3HZL/A	–	51	49	100
GW3RTR/A	–	49	32	81
G3IGW	–	36	33	69
G3VLX	20	32	34	66
G3UXP	–	38	21	59
G3YUV	–	52	–	52
G3BWQ	–	–	37	37

Contest winner, G3ZDY; runner-up, G3YMH; joint cw winners, G3YMH and G3WTA; ssb winner, G3ZDY.
Check logs received from: G2BTO, GW3SRG, G3XUD/A.

Looking ahead

26 October—RSGB Lecture at the IEE.

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**

Will members please note that from 9 July Mr B. O'Brien's address will be 8 Anthony's Way, Heswall, Wirral, Cheshire.

Merseyside Luncheon Club—First Monday in each month, 12.30 for 12.45pm on HMS *Landfall*. Please advise G3VQT or G2AMV if you wish to attend.

Ainsdale (ARC)—7, 21 July, 4 August, 8pm, The Morris Dancers, Scarisbrick.

Allerton (Liverpool) Scout ARS—North-west Region. Thursdays, 8pm, 1st Allerton Group Headquarters, 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 G4JP.

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

Bolton (B & DARS)—Third Wednesday in each month, with a discussion night on the first Wednesday. The Clarence Hotel, 176 Bradshawgate, Bolton. Secretary, G3ZQS.

Bury (B & RRS)—13 July (Film show—the projector will have had a good overhaul and a new amplifier fitted. As a reserve, however, G3RSM (guitar) and G3IVG (clogs) will give an impression of the Bacup Coconutters), 10 August (TVI and the Post Office), 8pm, George Hotel, Market Street. The Society has purchased a diesel generator which will have had a good trial on NFD and Region 1 VHF Contest. Secretary, G3VVQ, 411 Holcombe Road, Greenmount, Bury.

Carlisle (C & DARS)—5 July (Practical night), 12 July ("CW operating", by V. Riley, G3XET), 19 July (Practical night), 26 July ("VHF operating", by C. Goddard, G8DVD, and J. Borrowdale, G8CVU). The club reports two RAE passes in December and there were seven entrants for the May exam. 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.

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 callsign is GD3ZCM. Secretary, J. Parnell, Cronkbane, Quines Hill, Port Soderick, IOM.

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

Leyland Hundred Amateur Radio Group—Net nights: Thursdays, 2000gmt, 1,915kHz; Saturdays, 1900gmt, 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)—2, 16, 30 July, 8pm, Labour Party HQ, 13 Crosby Road South, Liverpool 22. Secretary, M. Graham, G3XMG, 14 Albert Road, Waterloo, Liverpool 22.

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

Manchester (SMRC)—Fridays, 2 July ("CW operating procedure" by M. Barnsley, G3HZM), 9 July ("Digital clock using ICs", by T. Winter, G8DLD), 16 July (phone contest operating procedure), 23 July (Special event station at Manchester Flower Show, Platt Fields, Manchester), 30 July ("2m /P tx", by J. Fletcher, G8DMJ), 8pm, Sale Moor Community Centre, Norris Road, Sale. The vhf section meets on Mondays, 8pm, the club shack, "Greeba", Shady Lane, Manchester 23. Secretary, G3WFT, QTHR.

Manchester University (ARS)—Please contact G3ZNP or G8BVF for details of activities. The shack is on the third floor in the union building.

Preston (PARS)—8, 22 July, 5 August, 7.30pm, Windsor Castle (private room), St Paul's Square. Secretary, G. Windsor, 26 St Gregory's Road, Preston.

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

Stockport (SRS)—Second Wednesday in each month is a discussion night; fourth Wednesday is a lecture night. Club meets at 8pm, Blossoms Hotel, Buxton Road, Stockport. Secretary, G8BCG.

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

Warrington (Culcheth) (CARC)—Fridays, 7.30pm, Chat Moss Hotel, Glazebury. All visitors are welcome. 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. New chairman is G3UEC; 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 Scouts HQ, Harding House, Park Road West, Claughton, Birkenhead. Secretary, G3WSD, 34 Glenmore Road, Oxton, Birkenhead.

Wirral (Wirral DX Association)—Last Thursday in each month at members' homes. June: host, G3VZM: G8AZT will talk on rope work for ham rigging. July: at the New Quay Parkgate—visitors are welcome. August: meet on putting green at Arrowe Park Golf Club. More details next month. Secretary, G3OKA, 219 Prenton Dell Road, Prenton, Birkenhead.

REGION 2 **RR K. Sketheway, BRS20185**

Bradford (BRS)—20 July (Natter night), 7.30pm, 10 Southbrook Terrace, Great Horton Road, Bradford 7.

Durham (DCARS)—11 July (AGM), 7pm, Room 146, Durham University's Elvet Riverside Block, New Elvet, Durham City.

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

Hartlepool (HARC)—Meetings every Monday, 7.30pm, Middlegate Room, Borough Buildings, Northgate, Hartlepool. At a recent meeting members were given a very interesting lecture and demonstration on amateur tv by the club secretary, J. W. Thompson, G3NWU, G6ACI/T. Visitors are always welcome. *BRS7323*.

Hull (H & DARS)—2 July ("Aerials and ATUs", by G3RDM), 9 July (Construction night), 16 July ("2m mosfet", by G3AGX), 23 July ("Coil winding", by G3PQY), 30 July (Short wave listeners), 7.45pm, 592 Hessle Road, Hull. *M. E. Longson.*
North Riding (NRARG)—Group meets on alternate Tuesdays and Thursdays fortnightly, in the back room of the Ship Inn, Falsgrave, Scarborough. Details from the secretary, Jeff Jones, G3VLM, Bingley Private Hotel, Albermarle Crescent, Scarborough. *G3VLM.*
Scarborough (SARS)—Thursdays, 7.30pm, c/o RAF Association, 3 Westover Road, Scarborough. Secretary, J. Cutter, G3VAN. *G8KU.*
South Shields (SS & DARC)—Meetings on Fridays, 8pm, Trinity House Social Centre, Laygate, South Shields.
Sunderland (SARS)—Meetings on the first and third Tuesdays in each month, 7pm, Sunderland Polytechnic. *G3XID.*
Tyneside (TARS)—5 July(Business meeting/slow morse practice) 12 July (Visit to Radio Newcastle), 19 July (Activities night), 26 July (Lecture on pulse code modulation), 7.30pm, in the lounge or own rooms, Community Centre, Vine Street, Wallsend. A bus trip to Scarborough was organized for 18 June. The callsign GB3TSE is being obtained for the period 3-7 August, to be used by the society at the Tyneside Summer Exhibition, Newcastle upon Tyne. *G. Lowdon.*

REGION 3 — RR R. W. Fisher, G3PWJ

Special regional events:
Upton Mobile Rally organized by Worcester & District ARC—11 July, Hill County Secondary School, Upton-upon-Severn, *G3WUI.* Bromsgrove ARC Mobile Picnic—22 August, Avoncroft Museum of Buildings, Stoke Prior, Bromsgrove.
Birmingham (MARS)—20 July (Lecture by Eddystone Radio), 8pm, Midland Institute, Margaret Street, Birmingham 3. *G8BHE.*
(South)—First Wednesday in each month, 8pm, Hampstead House, Fairfax Road, West Heath, Birmingham. 10 July (Exhibition station at the Queen Elizabeth Hospital. Callsign will be GB3QE. Special QSL cards).
Bromsgrove (B & DARC)—9 July (Informal), The Royal Oak, Barley Mow Lane, Catshill.
Cannock Chase (CCARS)—First Thursday in each month, 8pm, Bridgtown Social Club, Walsall Road.
Coventry (CARS)—2 July (Night on the air), 9 July (Radio car rally), 16, 23 July (Open night), 30 July (Night on the air) 8pm, City of Coventry HQ, Radford Road, Coventry.
Dudley (DARC)—6, 20 July, 8pm, Central Library, St James' Road. *G3PWJ.*
Lichfield (LARS)—First Monday and third Tuesday in each month, The Swan Hotel, Lichfield. *G3UUN* and *G3ZIF.*
Nuneaton (NARS)—First Friday in each month and the second Wednesday following, Caldecote Grange. *G8ERM.*
Rugby (R & DAR & EC)—Every Tuesday, 8pm, 10 Drury Lane, Rugby. *G3YQC.*
Solihull (SARS)—20 July ("The electronic control of gas turbine generators", by G3NXC), 3 August (Informal meeting, 9pm, Malt Shovel), 7.30pm, The Manor House, High Street, Solihull. *G3ZXO, G8BYM.*
Stourbridge (STARS)—First Tuesday in each month, Longlands School, Stourbridge. For details of meetings contact the secretary, D. Robins, 36 Wolverley Avenue, Wollaston.
Stratford (SoA & DARC)—10 July (Fete—the club has offered to assist G3YIK and G3ZHL in setting up a station at the King Edward VI School Fete. Visitors are most welcome).
Sutton Coldfield (SCRS)—12 July (RF generation), 26 (Natternite), 8pm, Clubhouse, Sutton Town, Football Club, Coles Lane. *G8CZM.*
Telford (WARS)—Every Wednesday evening, 8pm, Ketley Bank Youth Club, Main Road, Ketley Bank, Telford. *G3UKV.*
Worcester (W & DARC)—Third Saturday in each month, Crown Hotel, Broad Street. *G3WUI.*

REGION 4 — RR T. Darn, G3FGY

Derby (DADARS)—Wednesday. 5 July (Surplus sale), 14 July (Demonstration), 18 July (RSGB df qualifying round—details from G3ESB, QTHR), 21 July (DF practice night), 28 July (Technical quiz night), 7.30pm, 119 Green Lane, Derby. The Derby Mobile Rally will be held at Rykneld School, Bedford Street, Derby, on 15 August. A full turn-out of members is expected for this fourteenth annual event. Visitors and prospective members always welcome.
Derby (NHCCARC)—No programme received for July but meetings continue at the Nunsfield House Community Centre, Boulton Lane, Alvaston, Derby, on Friday evenings, 7.30pm.
Grimsby (GARS)—8 July (DF hunt), 22 July (Open evening), 5 August (DF hunt). *G8DEN.*
Lincoln (LSWC)—Club meetings every Tuesday evening at the club HQ, No 2 Guardroom, Sabraon Barracks, Breedon Drive, off Burton Road, Lincoln. Visitors are always welcome.
Mansfield (MARS)—Meetings on the first Friday in each month, 7.45pm, the New Inn, Westgate, Mansfield. Everyone welcome. *G8HX.*
Newark (NARC)—Club meets on the first Friday in each month, Newark Technical College. Informal club meetings are also held there every Tuesday, 7pm. *G3YCT.*
Nottingham (ARCON)—Club meets every Thursday at Wollaton Park. This club will again be operating GB3FON from the Festival of Nottingham from 10-25 July. Not quite so ambitious as last year, the station will operate on 160m a.m./cw, 80-10m ssb/cw and 2m a.m., during the evenings and for 24 hours at the weekends. Visitors to the site at Wollaton Park will be made very welcome. Further information from M. R. Harris, G3VUI, 20 Durham Crescent, Bulwell, Nottingham.
Worksop (NNARS)—The society meets every Friday evening, 7.30pm, Kilton Youth Club, Longfellow Drive, Worksop, Notts. 16 July (Visit to Mexborough club), 30 July ("Transistor techniques and applications", by Mr D. Rush. On alternate Fridays G3NHE will take classes for the RAE. This club has now been reformed and the following officers elected: Chairman, G8ON; secretary, G3OZN; treasurer, G3AUZ, organizer, G3NHE and committee member, G3BRJ. The club is in a very sound financial situation after three years of inactivity due to losing the old clubroom. It is felt that they are now in a good position to offer local amateurs and SWLs a club well worth a visit and possibly joining. Present membership is upward of 30. *G3OZN.*

REGION 5 — RR S. J. Granfield, G5QB

Bedford (B & DARC)—Thursdays. 1 July ("Aerial demonstration", by G3UQR), 8 July (Members' equipment—bring along a piece of homebrew or commercial kit for a 10-minute talk and demonstration), 10-11 July (High Power Field Day—Cranfield Aerodrome), 15 July ("Colour television" by G3SOA), 22 July ("Matching networks", by G3XKB), 29 July (Quiz), 8pm, Dolphin Inn, Broadway, Bedford.
Cambridge (C & DARC)—Fridays. 9 July (Informal), 16 July (VHF NFD planning), 23 July (Informal), 30 July (Equipment sale), 6 August (Informal, 7.30pm, Club HQ, Corporation Yard, Victoria Road, Cambridge.
March (M & DRAS)—Club meets on Thursday evenings, Old Police HQ, High Street, March, Isle of Ely.
Stevenage (S & DARS)—1 July (G2UJ will be coming from Ashford, Kent, to talk on developing a mixer-type vfo for a 2m tx, with demonstration. Please bring a friend or junior op to ensure a good attendance), 15 July (Open night). Club re-opens on 2 September. Further particulars of club activities from G3OVT, 8 Silam Road, Stevenage, Herts.

REGION 6 — RR L. W. Lewis, G8ML

Cheltenham (RSGB Group)—First Thursday in each month, 8pm, "Royal Crescent", Clarence Street, Cheltenham. *G2FWA.*
Oxford (O & DARS)—Second and fourth Wednesdays in each month, 7.30pm, Cherwell Hotel Clubroom, Watereaton Road, North Oxford. For further details contact the secretary, D. R. Ward, telephone Oxford 47771.
South Bucks VHF Club—3 August (Ragchew), Bassetsbury Manor, High Wycombe.

REGION 7 — RR P. A. Thorogood, G4KD

As many newsletters received do not arrive in time for inclusion here, it is better to give details of at least two months' programme. A six months' list of new members is available on request with stamps to G4KD.

Acton, Brentford & Chiswick (ABCRC)—20 July ("All band ground plane", by G3CCI), 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, 7.30pm, Congregational Church Hall, Chapel Road, Bexleyheath. At the recent AGM the following officers were elected: president, Price Wells, G3UFR; chairman, Colin Westwood, G3VFD; secretary, Len Randall, G4ACQ; treasurer, Cyril Phillips, G2FNT.
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 Tuesdays, 7.30pm, "Swan & Sugarloaf", South Croydon.
Crystal Palace (CP & DRC)—8pm, Emmanuel Church Hall, Barry Road, SE22.
Dorking (DR & SRD)—Second and fourth Tuesdays, "Wheatsheaf".
Ealing (E & DARS)—Tuesdays, 7.30pm, Northfields Community Centre, Northcroft Road, W13.
Edgware & Hendon (E & DRS)—Second and fourth Mondays, 8pm, St George's Hall, 51 Flower Lane, Mill Hill, NW7.
Farnham, Bucks (Burnham Beeches RC)—Fortnightly on Mondays, 7.30pm, Buffaloes Hall, Victoria Public House, Victoria Road, Farnham Common.
Gravesend (GRS)—Mondays, 8pm, Northfleet Recreation Centre, Springhead Road, Northfleet, Kent.
Greenford (GARS)—Second and fourth Fridays, Greenford Community Centre, Oldfield Lane.
Guildford (G & DRS)—Second and fourth Fridays. 9 July (Junk sale), 23 July (Discussion and members' lecturettes), 8pm, Guildford Engineering Society, Stoke Park. Miss Nell Corry, G2YL, has agreed to serve as president, the first radio society to be honoured by a lady president.
Hampton Court (TVARTS)—First Wednesday in each month, 8pm, "The Three Pigeons", Portsmouth Road, Long Ditton. The TVARTS welcomes it president, Les Cooper, G5LC, on his return from South Africa after an absence of two years and looks forward to his active participation at future meetings.
Harlow (DRS)—Tuesdays (General and cw practice); Fridays (Junior), 7.30pm, Mark Hall Barn, First Avenue. The annual mobile rally at Village Hall of Magdalen Laver (nr Harlow) will be on 26 September. Signs will be out between Harlow and Epping from the A11 to the site SE of Harlow, NE of Epping.
Harrow (RSH)—Every Friday, 8pm, Harrow County School for Boys, Sheepcote Road.
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.
Holloway (GRS)—Mondays (RAE), 7pm; Wednesdays (Morse), 7.30pm; Fridays (Club), 7.30pm, Whittington School, Archway School Annexe, Highgate Hill, N19.
Ilford—Every Thursday, 8pm, 50 Mortlake Road (off Ilford Lane), Ilford.
Kingston (K & DARS)—Second Wednesday in each month. 14 July (Quiz night), 11 August ("Counters and clocks", by R. Babbs, G3GVU, on digital counter techniques), 8pm, Penguin Lounge, 37 Brighton Road, Surbiton.
Loughton—Fortnightly on Fridays, Loughton Hall, Rectory Lane (nr Debden Station).
New Cross (CARS)—Second and fourth Fridays, 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, 7.45pm, "George and Dragon", Cromwell Road, Redhill.
Romford (R & DRS)—Tuesdays, 8.15pm, RAFTA House, 18 Carlton Road.
Scouts (ARS)—Third Thursdays in each month. 15 July ("Tape recorders", by Jeff Bottom, G3SDG), 7.30pm, Baden Powell House, Queensgate, South Kensington, SW7.
Sidcup (CVRS)—First and third Thursdays, 8pm, Congregational Church Hall, Court Road, Eltham, SE9.
Southgate (SRC)—Second Thursday in each month, 7.30pm, Civil Defence Hut, Bowes Road, N11.
St Albans (Verulam ARC)—21 July (George Eddowes, G3NOH, will talk about his vfo controlled 2m transmitter), 7.45pm, Town Hall, St Peter's Street, St Albans. 55 members and friends attended Arthur Milne's lecture on "Bermuda". The club has recently invested in a 46-element 70cm beam for VHF NFD.
Sutton & Cheam (SCRS)—Third Tuesday in each month, 8pm, The Harrow Inn, High Street, Cheam. The following officers were elected at the recent AGM: chairman, Roy Scott, G2CZH; vice-chairman, John Brodzky, G3HQX; hon secretary, Jack Korndorffer, G2DMR; hon treasurer, Ron McDonald, G3DCZ. Committee: Peter Miller, G4AWW; Andrew Maish, G4ADM; Arthur Mitchell, G8DF; Derek Poulter (awards manager), G3WHK; Ian Cooper; Brian Levett, G3TXH; Rowland Smithers (co-opted), PRO; Mike Pharoah (co-opted), G3LCH.
Welwyn (Mid-Herts ARS)—Second Thursday in each month. 9 July (Meeting), 12 August (VHF and NFD planning), 6 September (G3LTF on moonbounce), 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, Sports Club, St Augustin Avenue, North Wembley. (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)—22 July ("Electronic clock", by G3WAW), 19 August ("Phase lock oscillators", by G8AJC), 23 September (Design of transistors).
Crawley (CARC)—28 July ("An amateur radio subject", by members of the staff of Mullards). Trinity Congregational Church Hall, Ifield, Crawley.

Mr Fred Ward, G2CVV, President of RSGB, receiving a replica of the Crawley "Clubman" trophy from Ron Vaughan, G3FRV, at the recent Crawley Amateur Radio Club Dinner. The trophy is a "shillelagh", presented to Derby & D ARS, of which G2CVV is secretary, on the occasion of its Diamond Jubilee

Dover (SEKYMCAARS)—Meetings held every Thursday, 7.30pm, YMCA Leybourne Road, Dover.
Eastbourne (SARS)—Meetings held on the first Monday in each month, Victoria Hotel, Latimer Road, Eastbourne.
Maidstone (MYMCAARS)—Meetings held ever Friday, "Y" Sports Centre, Melrose Close, Loose, Maidstone. Details of meetings from G3WXL, QTHR.
Mid-Sussex (MSARS)—1 July ("Radio astronomy"—slides and talk on aspects of his work by D. T. Emmerson, BA (Oxon), G3SYS). All meetings at Marle Place, Leylands Road, Burgess Hill.
Worthing (WARC)—Meetings held every Tuesday, "Rose Wilmot" Youth Centre, Littlehampton Road, Worthing.

REGION 10 **RR D. M. Thomas, GW3RWX**

Blackwood (ARC)—Due to the long succession of unfortunate acts of vandalism which have beset the club, the decision was made to abandon any further attempt to run its own headquarters. Meetings are now held in the Oakdale Community Centre on Fridays, 7.30pm. Excellent facilities are available and all aspects of the hobby will be catered for. *GW3TUG.*

Barry College of Further Education (ARS)—Details of the summer programme and meetings available from GW3VKL.

Cardiff (RSGB Group)—12 July, 7.30pm. At present it is not clear whether the usual meeting place will be ready for use, an announcement will be made on GB2RS and through local sources. *GW3GHC.*

Glamorgan Raynet Group—Details of meetings and exercise periods available from GW3ZFG, telephone Cardiff 62411.

Haverfordwest (ARS)—Tuesdays, 7.30pm, Club HQ, Rosemary Lane, Haverfordwest, Pembs. Callsign of club, GW3XCT. *GW3YBB.*

Hoover (ARC)—Mondays, 7.30pm, Hoover Social Club, Hoover Works, Pentrebach, Nr Merthyr, Glam. Secretary, Mr F. E. Tribe.

Port Talbot (ARC)—Second Tuesday in each month, 7.30pm, Trefelin Club & Institute, Trefelin, Port Talbot, Glam. *GW5VX.*

Pontypool (ARC)—Details of meetings during school vacation period are available from GW3JBH.

Pembroke (ARC)—Last Friday in each month, 7.30pm, Defensible Barracks, Pembroke Dock, Pembs. *GW3LXI.*

Sully & District Shortwave Club—Tuesdays, 7pm, Annexe Sully Bowls & Social Club, 59 South Road, Sully, Glam. Secretary, Mr Glyn Maggs, 3 Thorley Close, Cyncoed, Cardiff.

Rhondda (ARS)—Meetings at Rhondda Transport Employees Club & Institute, Porth, Rhondda, Glam. *GW3PHH.*

Swansea Telephone Area (ARS)—Tuesdays. 6 July (TV servicing), 13 July (CW competition), 20 July (Talk—"Going mobile), 27 July (Transmitters), 7.30pm, Telephone Engineering Centre, Gors Road, Swansea. Secretary, Mr D. E. Connor, 7 Glanmon Road, Sketty, Swansea, Glam.

University College, Cardiff (ARS)—Activities suspended for summer vacation, but new students entering in October should notify the secretary of their interest in advance. Secretary, c/o Students Union, Dumfries Place, Cardiff.

University College, Swansea (ARS)—Activities suspended for summer vacation, but new students entering in October should notify the secretary of their interest in advance. Secretary, Students Union, University College, Singleton Park, Swansea, Glam.

REGION 11 **RR P. Hudson, GW3IEQ**

Bangor (B & DRC)—Meetings held on alternate Thursdays at the Drill Hall, Bangor. A net is active every Sunday on 3,700kHz at 1300, anyone interested is invited to contact B. V. Davies, GW8CGP, 15 Erw Faen, Tregarth, Bangor.

Conway Valley (CVARS)—Meetings held on the second Thursday in each month, Parade Hotel, Llandudno.

Rhyl (R & DARS)—The club will be staging a special event station at a charity garden party promoted by the National Society for Mentally Handicapped Children at Pengwern Hall, Rhuddlan, from about 2pm on Saturday 10 July. SSB will be used on 160 to 15m and it is also hoped to have a 2m station active. This is the first event of this kind ventured by the Rhyl Club since it assumed its present title. As the club callsign is not expected to be available by this date, the station hopes to be operating GW3YIH/P.

REGION 12 **RR G. M. Grant, GM3UKG**

Aberdeen (AARS)—Fridays, 7.45pm, 6 Blenheim Lane, Aberdeen. GM3GHA, telephone Aberdeen 33838.

Dundee (DARS)—Thursdays, 8pm, 3 Magdalen Place (off Roseangle), Dundee. *GM3KYI, QTHR.*

Inverness (IRS)—First and third Thursdays in each month, 7.30pm, 4 Falcon Square (nr railway station), Inverness. Miss Veitch, telephone Drumnidrochet 266.

Lerwick (LRC)—Tuesdays and Thursdays, 8pm, Annsbrae House, Lerwick. *GM3XPQ,* telephone Bixter 249.

Lhanbryde (MFARS)—Wednesdays, 7.45pm, St Andrews School, Nr Lhanbryde, Elgin, Morayshire. *GM3UKG,* telephone Clochan 225.

Thurso (CARS)—Second Tuesday in each month, 7.30pm, Thurso Technical College. *GM3JUD.*

REGION 14 **RR N. G. Cox, GM3MUY**

Ayrshire (AARG)—5 July, 7.30pm, YMCA Howard Street, Kilmarnock.

Ayrshire (Ardeer Recreation ARC)—1, 6, 8, 13, 15, 20, 22, 27, 29 July, 7.30pm, Ardeer Recreation Club, Amateur Radio Section, Stevenston. Details from J. F. McCreight, GM3DJS, 10 Auchenharvie Road, Stevenston, Ayrshire.

Falkirk & District RSGB Group—Closed for summer months. Next meeting 10 September, 7.30pm, Temperance Cafe, Lint Riggs. Full syllabus to be issued at this meeting.

Glasgow University (GURC)—Closed for summer vacation. Next meeting October, further details in September issue of club news.

Greenock & District (G & DARC)—2, 9, 16, 23, 30, July, 7.30pm, James Watt Library, Union Street, Greenock.

Mid-Lanark RSGB Group—16 July, 7.30pm, YMCA Brandon Street, Motherwell.

West Scotland (ARS)—2, 9, 16, 23, 30 July, 7.30pm, 81 Virginia Street, Glasgow C2.

REGION 15 **RR J. Thompson, GI3ILV**

City of Belfast YMCA Radio Club—Club meets on Wednesdays and Saturdays, 8pm, City YMCA (3rd floor), 12 Wellington Place, Belfast, BT1 7GE. Further information from YMCA General Office. GI3UFH would like to hear from anyone who has information on the Belfast Wireless Club which existed many years before the war and is believed to have held its first meeting in the Physics Lab at Queen's University in the early days of broadcasting. Contact him c/o the YMCA or QTHR.

REGION 16 **RR W. J. Green, G3FBA**

Chelmsford (CARS)—First Tuesday in each month, 7.30pm, Marconi College, Arbour Lane, Chelmsford. *G3VCF.*

Haverhill (HDRS)—Alternate Wednesdays, 7.30pm, Leiston Community Centre, Clements Estate, Haverhill. *G3WQF.*

Ipswich (IRC)—Last Wednesday in each month, Gippeswyk Hall, Gippeswyk Avenue, Ipswich. Morse practice 7.30pm. *G3YWM.*

Lowestoft (L & DARC)—16 July (Free evening), 30 July (Sale of members' surplus equipment), 8pm, YMCA Park Road, Lowestoft. *G3GNK.*

Norwich (NARC) 5 July (Business meeting. Visit to Gt Yarmouth Power Station by 30 members at 7.30pm), 19 July (Introduction to amateur radio—part 6 "Transmitters"), 26 July (Demonstration and talk about electronic organs). Meetings at the Brickmakers Arms, Sprowston Road, Norwich. *G3XLL.*

REGION 17 **RR C. Sharpe, G2HIF**

Basingstoke (BARC)—Club meets on the first Saturday in each month for morse practice and an informal gathering. 17 July ("Amateur tv", by Dave Pack, G3MPS), 7pm, Chineham House, Shakespeare Road, Popley, Basingstoke. *G3CBU.*

Chippenham (CDARC)—Club meets every Tuesday. 13 July (DF hunt starting at 7.15pm), Normal meetings 7.30pm, Boys' High School, Chippenham. *G3UTO.* Fareham (FDARC)—4 July (Picnic and treasure hunt at Winchester Hill, starting at 2pm), 11 July ("The 'el-bug' ", by G3HQT), 18 July (committee and winter programme planning meeting), 25 July ("Simple transistor theory", by G3YOM), 7pm, Porchester Community Centre, Porchester, Hants. Visitors are always welcome. *G3XIV.*

Newbury (NDARS)—First Monday in each month, 7.30pm, South Berkshire Technical College. There will be no meeting in August. *G3KJC.*

N Berks (AERE, Harwell, ARC)—Meetings on the third Tuesday in each month, also informal gatherings and junk sales every Friday lunchtime. 20 July, 7.30pm, Social Club, AERE Harwell, Didcot, Berks. *G3NNG.*

Portsmouth (RMARC)—The Royal Marines Amateur Radio Club has been reformed after a lapse of 11 years. The old callsign, G3KSB, has been re-issued and the club room is open from 7 to 10pm every Wednesday evening. All visitors are welcome, especially ex RM TXers/SWLS and members of the RNARS. The station equipment includes a KW2000B, a G5RV, and a TA33 jnr 3-el beam. Operators: G3KOJ, G3OKV, G3TZQ and G3XIV. No formal programme has yet been arranged. Further details from the secretary, C/Sgt(s) G. G. Bulleyment, Signal Training Wing, RM Barracks, Eastney, Portsmouth, Hants, or from the station manager, C/Sgt(s) F. A. Parsonage, G3OKV. *G3XIV.*

Reading (RDARC)—Meetings on alternate Tuesdays. 6 July ("Radio wave propagation, 10kHz to 10GHz", by V. Robinson.

Chairman's lecture), 20 July (The other side of tv. A club visit to the educational tv studio at Bulmershe College. Transport leaves the "Victory" at 2010 hours and returns at 2145. Talk-in by G3ULT on 144·24MHz), 25 July (Club vhf picnic near Inkpen Beacon. Bring the family. Raffle and competition. G3ULT on 144·24MHz and G3HBU on 70·26MHz and 70·365MHz). Clubroom, Victory Public House, Meadway Precinct, Tilehurst, Reading. *G3NBU.*

Southampton (RSGB Group)—9, 10 July (A demonstration of amateur radio at Southampton Show. Talk-in stations on 144MHz and 70·26MHz). Also monthly meetings at the Lanchester Buildings, Southampton University.

(SDRC)—Meetings every Wednesday evening at the clubroom in Kent Road. Further details of the above from Les Hawlyard, telephone Southampton 73378. *G3ZKR.*

Swindon (SDARC)—14 July (Informal meeting), 7.30pm, Penhill Junior School, Penhill, Swindon. *G3JAP.*

Wessex Bournemouth (WARG)—Meetings on the first Friday and third Monday in each month. 25 July (Mobile picnic at Stony Cross in the New Forest). The club is planning a special event station to mark the 70th anniversary of Marconi's first transatlantic transmission in December. *G8BBN.*

Contests calendar

10–11 July—HP FD (Rules in March issue)
18 July—432MHz Open (Rules in May issue)
18 July—432MHz Listeners Contest (Rules in June issue)
18 July—DF Qualifying Round—Derby (Rules in this issue)
7–8 August—WAE CW
8 August—DF Qualifying Round—Salisbury (Rules in June issue)
9 August—144MHz SSB
15 August—70MHz CW
28–29 August—All-Asian CW
2 September—DF Qualifying Round—Dartford Heath (Rules in June issue)
4–5 September—VHF NFD (Rules in March issue)
4–5 September—IARU Region 1 VHF/UHF
11–12 September—WAE phone
12 September—80m FD
19 September—DF Contest Final
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 Oct–30 Dec—70MHz Cumulative
9–10 October—21-28MHz Telephony (Rules in May issue)
9–10 October—VK/ZL Oceania CW
23–24 October—7MHz (cw)
30–31 October—432MHz Fixed
30–31 October—CQ WW DX phone
6–7 November—144/432MHz CW
6–7 November—7MHz (phone)
6–8 November—CHC/FHC (phone and cw)
7 November—OK Contest
13–14 November—2nd 1·8MHz
27–28 November—CQ WW DX CW
5 December—144MHz Fixed

SPECIAL EVENT STATIONS

Finchley Carnival
G3SFG/P will be operating from this event at Victoria Park, London N3, from 8 to 10 July. Main bands will be 160 and 80m, plus 2 and 4m. Details from G3MBL, 244 Ballards Lane, London N12.

Civil Service Show, GB3CSS
The Cheltenham area of the Civil Service Sports Association holds its annual show on 10 July from 1–6 pm. Talk-in on 2m and Top Band (1,875kHz), side-shows, sports and train rides for the family, admission 8p. There will be ample parking-space and the venue is the Civil Service Sports Ground, Tewkesbury Road, Cheltenham, junction of the A4019 and B4063.

Normanton Grammar School Fete
There will be special activity stations (G4AAQ/A, G3ZXZ/A, G8EGE/A, G6AAS/T/A), from the Normanton Grammar School ARS at the school fête on Wednesday 14 July from 1100 to 1600gmt. Talk-in on 2m for mobiles. Amateur tv demonstration among the attractions. Skeds will be welcome; 3·5–28MHz cw/ssb, 144MHz a.m. and amateur tv. Addresses for routes, skeds and direct QSLs: NGSARS, c/o D. J. Lockwood, Sharlston Common, Wakefield, Yorks. Tel: Crofton 458.

Newton Longville Fete
The North Bucks ARS will be operating a station on 160–10m and 2m at the Newton Longville Fete to be held at The Grange, Newton Longville, near Bletchley, Bucks. Callsigns G3LCS/A, G3WXO/A (Top Band) and G3THC/A (2m); mobiles on 2 and 160m particularly welcome.

Nottingham Festival '71
GB2FON will be operated by the members of Nottingham ARC from 10 to 25 July at Wollaston Park, Nottingham. There will be three stations operating and the bands and modes will be: 160m a.m./cw, 80–10m ssb/cw, 2m a.m. An swl corner will be in operation. A special card has been designed and the address for QSLs not through the bureau is via G3EKW, Sherwood Community Centre, Mansfield Road, Nottingham. If direct, please enclose IRCs to the value of return postage.

GB3LFS
This special callsign has been issued to the East and West Langdon (Nr Dover) Gardeners Society Show which will be held on 24 July. Bands: 80, 40, 20 and 15.

Esperanto Congress, 31 July—7 August
The 56th Universal Esperanto Congress will take place in London from 31 July to 7 August 1971. The International League of Esperantist Radio Amateurs (ILERA) will operate a special radio station, GB3ESP, on ssb and cw during that period on 80 to 10m, from 0800 to 2100gmt daily.

Anyone wishing to arrange a sked should write giving date/time/frequency/system to Walter Farrar, G3ESP, Wentwood View, Ackworth, Pontefract, Yorkshire, England.

Maldon, Essex, Octocentenary
The Maldon YCRG, assisted by local amateurs, are operating GB2MO from 5 to 7 August as part of the town's octocentenary celebrations. Operation will be from the recreation park on hf bands (plus 2m on the 7th). Other attractions include a carnival and funfair and there will be commemorative QSL cards. Further information from R. Wager, "Robbins", Manse Chase, Maldon, Essex.

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

New boxed 931A, ECC33, 6J5GT, R17, CV287, offers? Wanted: Heath SB200, unfinished project considered. G2DVA, QTHR. Tel Frodsham 3407.

Hammarlund super-pro rx, 150-400kHz, 2·6–20MHz, £18 ono. Codar CR45 allband trf rx, £5. 82 tx 1·8–16MHz with psu, 80m xtal, key, box, £5. Collins 455kHz mech filt with data, £5. Buyer coll or post extra. Harris, 7 Oxford Square, RAF Locking, Weston-super-Mare, Somerset.

HRO rx, unmod and comp with hndbk, orig psu, 9 coils + spkr, miniature valves, extra illuminated S-meter, exc cond, £18. G8CCI, QTHR. Tel Banbury 3139 (office hours).

Heathkit RA1 with calib, £20. R209 rx, 12V am/fm, £12. Pye base station vhf rx with case, £4. G3WMQ, QTHR. Tel 01-903 4363.

6ft diam parabolic dish fitted with mounting lugs, highest offer. Maynard 46 Redbridge Lane West, Wanstead E11. Tel 01-989 4588.

Heathkit HP13A /M psu, pos earth, almost new, £28. Buyer coll. G3MQT, QTHR.

Df rx type R81, 260–530kHz, 1·5–3·5MHz, df loop aerial, £20 ono. Q mult QRM16, £4·50 ono. Wavemeter type W1191A, mains stab psu, 100kHz-20MHz, £3 ono. Newstead, 16 St Georges Road, Forty Hill, Enfield. Tel 01-363-7929.

9R59D, immac, calib, stabilizer, ls, £32. Canonball 160m ssb tx with psu, £24. Leak TL12 mono amp, £10. Lionel bug, £2·50. Wanted: /M KW2000 psu, aerial system, swr bridge, ptt mic. G3DCS, QTHR.

Panda Cub tx in exc cond with 6146 in power amp stage, £20. Naylor, G3SHF, 19 Broadgate, Preston, Lancs.

Hammarlund SP-400-SX, 1·25–40MHz, hndbk, £25 ono. Bantex 160m B fibreglass helical whip, £7. 6HF5 c/w base, £1·25. Hi-gain LC80Q 80m B loading coil, £4. Hi-gain 12AVQ 10/20m traps, £2 ea, G3JMJ, QTHR. Tel Edenbridge 3467.

Constant voltage trnsfmr, 230V-50VA, £1. 4-way motor-driven coax switch, BNC connectors, 28V dc, £2·50. Coax relay 24V dc with matching plugs, £1. Magslip tx/rx, Mk 2 compass indicator, £2. G8BNJ, QTHR.

EA12, £150. 840C, £40. Solartron CD7115 lab scope, dc to 10MHz, double beam, £70. Heath VVM V-7AU with 309-CU rf probe, £15. All del free. Part exchanges or swops welcome. GW3UCJ, QTHR. Tel Briton Ferry 2376.

Ssb filts, PZT, 472kHz, b/w, 1·8kHz, few available, £4 with data. Elliott, "Oatlands", Southend Road, Howe Green, Chelmsford Essex. Tel Chelmsford 71604.

KW Viceroy Mk 3 tx, extra ½ lattice filt, 6146Bs, manual, exc cond, £75 ono. Will del 50 miles or buyer coll. G3IUZ, QTHR. Tel 058-27-3007.

Two Grampian mic trnsfmrs, 30: 600Ω, also one 30: 50KΩ, £2 ea. Batt charger/mains unit for uher professional /P recorders, exc cond, £7. Mic goosenecks with base, 75p. G3VWE, QTHR. Tel 0272-556759.

Heathkit RA-1 rx, Hartley 13A scope, Creed 85R typing reperforator FSY1·1 rtty tu, not wkg but with circ. Offers? Dry reed switches, no data, no coils, 4p ea. GM8BJJ, QTHR. Tel 047-553 478.

KW 201 rx with xtal calib, Q mult, as new, £85. KW 2-tone oscillator and wattmeter, £10. Swr meter, £5. 80-160m /M G whip and base mount, £8. Buyer coll. G3XTU, QTHR.

£200 6% debenture stock, Lambda Inv Co Ltd, years interest to June 1971 to purchaser. G3WGS, QTHR.

Steel screws, 2BA by 1¼in r/h, 100 for 25p, pp. Wanted: 2BA nuts. G3PTB, QTHR.

Dullmeyer F/19 tv lens, Vidicon deflection focus coils, £2 ea. BC348, wkg, £10. Electroniques ham-band coil pack, £10. RA-1 S-meter, 50p. Will del 25 miles. G8CCV, 52 Freeman Road, Didcot, Berks. Tel High Wycombe 26200, extn 348.

Marconi tv measuring scope, 5in tube TF177, differential amplifiers, variable period markers, variable marker delay, X50 expansion. about £50 or exch DB scope. Wanted: info on Solatron CD568. G3VXS, QTHR. Tel Endon 2158.

160-80m homebrew RSGB Noviset tx/psu, never used, £15. Buyer coll or carr extra. Wanted: aerial rotator, comp, in gd cond. G8ERF, 9 Highfield, Long Crendon, Aylesbury, Bucks.

No 38 Set 9–7·2MHz, untested as bought, 80p less post. Wells, 1 Midd Cotts, Hartley Bottom Road, Longfield Hill, Nr Dartford, Kent.

Heathkit Mohican, recent manufacturers overhaul, £18. Part exch EC10 with cash adjustment. G3PNI, 17 Durban Road, Margate, Kent.

80 brand new tv valves, £25. 14 brand new lop trnsfmrs, £12. Wanted: VF1U vfo. G4HU, QTHR.

Freq meter BC906D, standing wave meter 100MHz (slotted line), same vhf, £6 ea. Dawe If oscillator, cathode-ray monitoring, £10. BC457A, £2. 4X150 valve base, £2. C45, £15. TF388/8 variable attenuator, £3. G3XNH, QTHR. Tel East Horsley 3982.

HRO MX, gd cond, 10-160m with bandspread coils, psu, spkr and phones, orig paper capacitors have been replaced with modern equiv, £30 ono. Cowell, 35 Bare Avenue, Bare, Morecambe, Lancashire. Tel Morecambe 2831.

Two faulty Cossor 3339 double beam scopes with manual, £3·50 the pair. Heathkit DX40U tx with manual, needs slight attention, £10. VFO free. BC221 ac supply, spkr, manual charts, £10. Collect only. G2BUW, QTHR. Tel Romford 43122.

AR77E rx, £17·50, pse collect. Williams, 22 Willersley Avenue Orpington, Kent. Tel Farnborough 55430.

2m convtr FET, i.f. 28–30MHz, £7·50, post paid. G8BCA, QTHR.

Drake TR4 trnscvr, comp with psu and mic, mint cond, £290. BC640 2m tx (USA equiv of T1131), £12 with variac. G3MCS, QTHR. Tel Princes Risborough 4343.

LM14, charts and psu, £18. Grampian DP4 Hi Z mic, mint, £7. G3UFU, QTHR. Tel 01-994 6931.

Control cable 12 core 1amp, brand new, 20p per yd. Heavy duty 75Ω coax, unused, 15p per yd. Sae for samples. LM7 frequ meter (equiv BC221), uncalib, £5. Willcox-Gay vfo, £4, post extra. GD3TIU, QTHR. Tel 062-485 442.

Hartley 13A double beam scope, 2Hz–5·5MHz, c/w probe, manual, gd cond, £19. Orchard, G3TTC, Devonshire House, Gold Street, Stalbridge, Sturminster Newton, Dorset.

Steel tubular mast, 2in diam, socket brackets, guy ring, unused, £3. G3XNA, QTHR.

9H1CB/FT150 trnscvr c/w, 2 spare pa valves, 2 power transistors, QM501 mic, ldspkr, best offer around £150. GM3RFH, CPO Mess, RNAS Lossiemouth, Moray, Scotland.

30ft mast in 3 equal sections, comp with polypropalene stays and halyard, nylon pulley and insulator, easy erection instrns. Ideal for field day or home station. G2BIM, QTHR.

A Canadian S2 set, psu needed, 150V ht 12V lt, in wkg cond, £3. Buyer coll or pays rail fare, Hickman, 56 Oakmount Road, Chandlersford, Hants.

HW32 trnscvr, latest mods, compact psu and mic, £45 ono. G3UBL, 872 Kenton Lane, Harrow Weald, Middx.

R107 rx, convtr 14/21/28, mult, partly-built tx, Class D wavemeter, absorption wavemeter, G5RV with masts, atu, swr meter, phones, keys, morse oscillator, xtal mic, filts, books, mags. G3VDG, QTHR. Tel 0922 51377.

G4ZU beam, twin boom, 10-15-20m, with feeder and commercial atu, £10. Buyer coll. G3UJD, QTHR.

HA-600 rx, £30. Space-Mark 2m convtr, £7. Rx covering 145–146MHz, £5. HW-17A, sightly modified, £60. R220 rx, less front-end, £5. Two Command rxs, £1 ea. G8ATA, QTHR. Tel Poynton 4521.

Pye PTC 330 70MHz tx, 15W rf output, exc cond, recent makers service, £15. G3ADZ, QTHR. Tel Liss 3314.

JR310, hardly used, no conversions, £65 ono. Can del within London area. Fuller, 12 Alexandra Drive, Upper Norwood, London SE19 1AJ.

KW2000 comp with ac and dc psus, Shure mic and vehicle mountings, £140. Will del 100 miles otherwise carr extra. G3HBE, QTHR. Tel 021-373 3026.

Trio JR500SE rx, boxed and unused, £52. Wanted: Gd rx covering top band. Phillips, G3NJP, Shandon, Willesley Pound, Cranbrook, Kent.

Heathkit RA1 with mtchg Q mult and spkr, £36. G3TDM, QTHR. Tel 01-360 3056.

Creed 7B and silence cover plus loop supply, £13. National tuning capacitor, 150pF 6kV, £2. 9 2μF 5kV capacitors, £1 ea. Buyer coll or carr extra G3XUA, QTHR. Tel Nottm 285554.

CR100, nearly all new valves, new S-meter, resprayed, circ and notes, re-peaked on all bands, offered with sep preselector, £18. Pref buyer coll, can del short distances. Oughton, 48 Morley Hill, Enfield, Mddx.

KW 2000B, perfect, tested and alignment-checked by KW early June, orig packing, £199, not before 9 July. Wallis, 17 Meadowside Walton on Thames, Tel Walton on Thames 23228.

Three 38 MFD 2kV paper caps, 2200V eht trnsfmr. 4V+27V lt trnsfmr V17 valve. Offers. Marconi TF428B valve voltmeter, exc cond, £6. Radiomobile car radio, m/w + 8 shortwave bands, £8. G8DDM. QTHR. Tel Penn 4483.

Labgear cubical quad, 20, 15, 10m, comp, £5. Cdr rotor TR44 and control unit, new spur gear, £20. Pref buyer coll. G3FLS, QTHR. Tel Loughborough 4700.

NCX5 with NCXA psu, mind cond, £150. Wanted: Collins 75S3. G3KDA, 2 Crawford Close, Bidford-on-Avon, Alcester, Warks.

Ssb trnscvr, 10–160m, 100W pep, vox, calib, two vfos etc, with linear, pair 4CX250B, offers over £100. G3VAG, QTHR. Tel Wivenhoe 2243.

Tiger transistor /M 160–80m convtr, fault on 80m but fine on 160m, tunes on any radio, 600–800kHz, £5·50. GW8CGH, 2 Penprisk Road, Pencoed, Glam. Tel Pencoed 444.

Base for 813, 75p. Silicon coaxial diodes for microwave rxs, 32MHz wideband i.f. strip. Wanted: coax c/o switch. New 4CX250B. G3KH, 133 Station Road, Cropston, Leicester, LE7 7HH.

American Navy rx, 1·5–12MHz, psu and spkr, detailed service manual, £8. Pyatt, 23 Arundel Drive, Orpington, Kent. Tel Orpington 20281.

Mains trnsfmr, 2800V, 1A, £16. New 813, £2. 811As, £1·40 ea. Diodes 1000piv, 1·5A, 20p. Capacitors, 100+200μF, 275V, 25p. Chokes, 15H 250mA, 60p. Trnsfmrs, 4·5V 40A, £1·60. All items unused. Buyer coll. G3YMP, 42 Southwall Road, Deal, Kent.

Marconi xtal calib, ex 52 set, outputs at 1MHz, 100kHz, 10kHz-15MHz, psu 12V, 150V, £3. G3XSJ QTHR.

KW2000A with psu and mic, £160. G8IO, Grafton Manor, Bromsgrove, Worcs. Tel Bromsgrove 72151.

SB300+cw filt, £80. G2DAF Mk 2 tx+psu and cw paddle, £40. LM14 +psu, £20. Marconi TF1449, £15. G3RMC, QTHR. Tel Southend 88382.

Going QRT: Trio 9R59D 2m tx and convtr, 70cm tx and convtr, 23cm tripler and convtr, 70cm+2m aerial, psu, modulator, other odds and ends, £60. Callers, weekends only, G8DIQ, QTHR. Tel Shrewsbury 55870.

DX4OU am tx, can be converted to ssb, any reasonable offer. 27–37MHz trnscvr, batt operated type WSA42. Info wanted on teleprinter regenerator type RNIC, serial No BNO83/133059/3. G3WUT, QTHR. Tel Basingstoke 4590.

HRO bandspread 160–10m, octal valves, l/s trnsfmr, clean cond, £15. HRO 80m (3·5–3·8MHz), bs coil, £2·50. Darkin, 3 Adrian Close, Tagwell Road, Droitwich, Worcs. Tel Droitwich 4624.

Circ notes and diagrams for R1475, 75p and large sae. R1392, 100–150MHz, £5. Will del 50 miles. G3ZZY, 61 West Street, Tavistock, Devon. Tel Tavistock 2827.

M/A meters from 25p. Weston analyser needs attention, £1·50. Leland audio osc, 0/20kHz, £5. AVO sig gen 95kHz-80MHz, £6. Valve voltmeter 100mV–100V, £4, post extra. Many other items, sae list. Thorburn, 27 Banklands, Wcrkington.

Valve amps, 10W rms output into 400Ω with input of 0·2mV, £3. Also 3W valve amps spec, same as for 10W, £2. Pyatt, 23 Arundel Drive, Orpington, Kent. Tel Orpington 20281.

6ft rack with removable sides and rear door, free to anyone who cares to coll. G8AKA, QTHR. Tel Broadstone 5297 (w/ends only).

ASB8 modified, 70cm rx, £4. Regulated twin, 6-10V 1A supply, £5. Organ dividers 7 octave transistorized, wkg order, printed circ, £6. Reflex spkr, 2 units, WB make, nice cab, £6. Del reasonable distance. G8APS, QTHR. Tel 021-308 3044.

Skyrover rx, ideal swl, 550kHz–30MHz, £10. Class D wavemeter, mains, £5. Ten Tec PM3A tx/rx, 5W batt, 40-20m cw, £35. "*Radio servicing*", Patchett, Volls 2, 3, and 4. £1, G3LOL, QTHR.

Heathkit DX100U+SB1OU, £70 ono. CR100, £12. All in exc cond with manuals. Will del 100 miles. Also Pye Ranger 2207/6 converted to 4m with transistor psu and hndbk, £12. GM3YKE. QTHR.

Hammarlund HQ170, exc cond and performance, £80 ono. 2m fet convtr. 28-30 i.f., £7. Speech processor transistorized, £4. R1155, gd mech cond but audio fault, £2·25. Minimitter tx, aerial relay fitted, £17. Angell, 46 Upton Park, Slough, Bucks. SL1 2DE. Tel Slough 21086.

19in rack cab, approx 3ft high with back door, £2. Buyer coll. Wanted: 832A valves, must be gd ones. GW8CGH, 2 Penprisk Road, Pencoed, Glam. Tel Pencoed 444.

KW Vespa Mk 2, 6LQ6 alc, first class cond, £100. G3YBK, QTHR. Tel Exeter 78710.

BC221-B comp with stabilized psu, charts, phones, £15. R1475, £4·50. Psu, £2·50. ZC1 Mk 2, £7·50. 19 set, wkg, £1·50. Electronic equipments in 19in cabinets, £2. NEP UV recorder, type 1050, £10 comp. G3KWK, QTHR. Tel Redditch 63817.

Creed printer type 54, vgc, sound cover, 250V ac mains, offers. G3SUY, QTHR.

Lafayette HE30 rx, 500kHz–30MHz, £15. HRO 456kHz xtal filt unit, mint, £2. Xtals: 7·75278, 8·3444, 8·9219, 9·48333, 10·839268, 11·3625, 11·4125, 12·72214, 12·93333, 40p ea. Bargains for callers—trnsfmrs, capacitors, pots, chassis, etc. G3VUT, QTHR. Tel 01-550 9300.

Hammarlund HQ129X rx, 540kHz–31MHz on bandspread 160m, £28. Buyer coll. Algate, 18 Florence Road, Wimbledon, SW19 8TJ. Tel 01-542 3553.

R107 rx, in gd wkg order, plus manual and hdphns, £12. 38 Set, gd wkg order, £2. Buyer coll. Cape, 108 Old Church Lane, Stanmore, Middx. Tel 01-954 2967.

KW2000 ac psu, £120, after NFD. G3OBW, QTHR.

Homebrew scope, 2½in, £5. B2 tx only, £7. Cowl-gill motor and pp, £5. 2—PV-1·35 ATP35, £2 ea. Wanted: DX100, FL200, HRO, any cond. Field, 2 Hobbes Walk, Doverhouse Road, Roehampton, London SW15.

Eddystone 840C rx, £35 ono. Martin, 92 Old Bath Road, Twyford, Reading, Berks. Tel Loddon Vale 5371.

HRO MX, miniature valves with 9 gen cov coils, exc cond, £30. Wanted: Woden UM3 modulation trnsfmr base and chimney for 4CX25OB. GW8CMA, 6 Gwelfor, Killay, Swansea, Glam SA2 7NX. Tel 0792 27496.

Heathkit RA1 xtal calib, little used, exc cond, £26. Also Joystick de luxe aerial with 4H atu, £5·50. Johnson, 13 Meadow Close, Budleigh Salterton, Devon. EX9 6JN. Tel B/S 2300.

Moving QTH, must clear 15yrs accumulation: all types comps, valves, trnsfmrs, etc, also various txs, rxs, test equipment etc. Sae for detailed list, all at bargain prices. G3LMH, 77 Upwood Road, London SE12 8AL.

Praktica FX2, 2·8 Tessar lens case, £16 ono. Bevan, 7 Drayton Drive, Heald Green, Cheshire. SK8 3LE. Tel 061-437 9584.

CR100 mains trnsfmr, £1. Photostat manual, 60p. VC139A crt, £1 Partridge auto trnsfmr, 100V 200W out, £1·50. Telephone dial, 50p. Rotary convtr, 12-310V, 50p. Jackson SM dial, 50p. Hunt, 3 Elm Close, Laverstock, Salisbury.

Hudson high-band AM112, 25W, /M with mic, control box, spkr etc, £16. Buyer coll. Miniature xtal, 10·7MHz bandpass filt, new and boxed, £1·25. G3YLQ, QTHR. Tel Luton 25595.

HW100, £95. Wanted: aerial rotator and tv camera, sim to type EMI 8. G3SPX, 3 Cliff Drive, Crigglestone, Wakefield.

Trio JR500SE, top-band conversion done, Hamgear PM2, spkr, mint cond, £50. Rusby, 12 Park Meadow, Princes Risborough Bucks. Tel Princes Risborough 4930.

Pye Handi Cambridge, exc cond, comp with accumulator, wkg 2m, £40 ono. G8CSR, 46 Long Brandocks, Writtle, Chelmsford, Essex. CM1 3JP.

G&D 2m tx, 12V dc 240V ac, £28. RX, 420-480MHz, £9. VF1-U modified rtty, £8. Rtty demodulator, tones to dc pulses, requires psu, £8. Rotatory gen, 24V dc in 230V ac out, drives KW2000A ac/psu, £8. G3CTR, QTHR. Tel 01-237 4604.

Eddystone EC10 Mk 1, mint cond, hndbk, hdphns, mains psu, £45 ono. Also Eddystone 870A, gd cond, £20 ono. Cleaver, 86 Main Road, Dovercourt, Harwich, Essex. Tel Harwich 2195.

Trio 9R59DE, 20 mths, as new, boxed, manual, internal spkr, xtal calib, exc cond and wkg order, £40 carr paid. Can be heard by appntmnt, owner going /P and /M. Rosamond, 3 The Brow, Montagu Road, Huntingdon, PE18 6RA. Tel Huntingdon 2304.

Swan 350 with calib. TA33jr. Codar AR22. The lot, £175 for quick sale. All in mint cond. G3PWO, 135 Woolwich Road, Abbey Wood, London SE2. Tel Erith 36215.

Class D, Mod 2 wavemeter as new with charts and accessories, £10. G3PIX, 24 Forest Avenue, Foresthall. Tel Newcastle on Tyne 665334.

50ft Telomast with guys, gd cond, £12·50. Buyer coll. Wanted: 811A bases. G3YMP, 42 Southwall Road, Deal, Kent.

AR88D, vgc, with manual, £27·50. 14 ele 70cm J beam, unused, £4. BC221, orig charts, vgc, no psu, £15. Buyer coll pse. G2NH, QTHR. Tel 01-942 7246.

Johnson Viking Invader ssb tx, 10-80m, 160 p.e.p., comp with hndbk, auto-trnsfmr, in orig carton, £75 carr pd. G5JZ, QTHR. Tel Rushlake Green 211, std: 043 56.

KW Viceroy tx, Hallicrafters SX111 rx, both in exc cond. Also standing wave ration bridge, L coupler, mic etc. Station closing down. £160 ono. GW3LOD, Plas-y-Mynydd, Nantycaws, Carmarthen. Tel Carmarthen 5490.

Ekco mw/lw car radio, 12V, comp with plugs, spkr + fittings, £6 or exch for 2m convtr. AR88D comp with tools + manual, vgc, £35. Westwood, 114 Pettits Lane, Romford, Essex. Tel 47577.

70cm 8/8, £2. Buyer coll. Dual stab psu, 6-10V, 1A, £5. Set organ dividers, 12-7 octave silicon, £6. Old Altiflex 2¼ reflex camera, knockabout, £1·25. WB hi-fi reflex spkr, 10in + tweeter, £5. G8APS, QTHR. Tel 021-308 3044.

Pair long range high grade walkie-talkies, cost, £30, unused, sell for £25. BTH horn spkr, offers. Heavy duty tx, psu, £8. Bush 9in tv, ok for caravan, perf, offers. G3WIF, QTHR. Tel Bristol 293738.

Rather tatty BC221, perf wkg order, built-in stabilizer, psu, audio stage and ls, £10. G3CDR, 157 Dartford Road, Kent.

70cm tx with mod Pye base, manual inc, £20. Sae full det. G8BCA, QTHR.

HW100 trnscvr, mint with psu, mic 1pf, TA31 masts, also wood cabinet for installing rig in living quarters, comp stn, £120. G3WKR, QTHR. Tel Hitchin 730809.

Vhf wavemeter W1310, 150-220MHz. Two scope tubes 09J 5CP1, 50p ea. Two magslips. Receiver AP6549 Mk 2, RF24, 25, 26, 27. Valve /P rx, £1. Large paper capacitors. Flynn, 59 Weoley Park Road, Selly Oak, Birmingham. B29 6QZ. Tel 021 472 1087.

Pair Stentorian HF10112 ldspkrs in bass reflex type cabs, £10. Will del 50 miles. Birkett, 40 Blencathra Street, Keswick, Cumberland.

KW2000 inc ac psu, immac cond, just serviced by KW Electronics, £130. Tilt-over tower sim to Versatower, inc rotator and indicator, £60. Tri-band cubical quad, inc feeder lines, £15. Jones, G3RCU, Japonica, Abbey Road, Sandbach, Cheshire.

Pair new boxed 813s with bases, £5. Murphy tx, 1·5-16MHz, A1/2/3, 75W with mtchg psu, £20. Pref buyer coll and insp. G3YGM, 9 Albertus Gdns, Hayle, Cornwall.

CR300/1 Marconi rx with int psu + many mods, £13 ono. Wanted: HC6/U, 7·6-10·4MHz ± 1kHz xtals, state price. Fellows, 10 North Street, Burwell, Cambs. CB5 OBA.

Elizabethan tx, comp with modulator, psus, filt unit, frequ meter, topband rig box, 50 valves, 807, 6L6s, rectifiers etc, various comps, spares etc, £25 the lot. Buyer coll. G3KIA, 1 Springfield Road, Holcombe Brook, Ramsbottom. Tel Tottington 2297.

Heathkit RA1 rx with calib, osc + spkr, £30 ono. IO-12U oscilloscope + IG-82U sine/square gen, £35 the pair or will split. Billingham, Ovingdean Rectory, Brighton, BB2 7BA.

Panda Cub tx with ptt relays, 30W a.m., 60W cw, vgc, £23 ono. Wanted: Transistor rx suitable for ssb 1A use, 80,40,20m. G3YZW, QTHR. Tel 021-705 2572.

ICs: SL201/C, 22p, SL201/B, 25p, SL301/C, 28p, + sae. Transistors: 2N3708/9 similar 2N2926, 2½p ea, + sae. *SWM* 1970-1 vol, offers. Tuttlebee, 87 Wardo Avenue, London SW6 6RB. Tel 01-731 2984.

Eagle semi-auto bug key with relays and pp, comp, new boxed, £5. KW lp filt, £3·50. Buyer coll. Field, 2 Hobbes Walk, Roehampton, London SW15.

Reject computer boards, trimpots, relays, ICs, pot cores, all new and cheap. Sae for det. G3DLT. 17 Cadnam Close, Strood, Rochester, Kent. Tel Medway 77405.

Trio 9R59DE with voltage regulator and calib (no xtal), inc manual and in maker's box, only 1yr old, vgc, £30. Bishop, 33 Hopes Lane, Ramsgate, Kent. Tel Thanet 54812.

HRO with psu, b/s coils, 160-10m, £22·50. Panda Cub tx, 160-10m, £22. Both gd cond—will part exch for Codar mains psu for AT5. Buyer coll. G3ZEJ, "Gatherwynd Cottage", Blymhill Common, Nr Shifnal, Salop.

Scope telequipment D31R, two beams, bandwidth dc to 6MHz, time base 18 speeds, modern scope with miniature valves, vgc, £25. Cooper, 45 Nightingale Crescent, Harmans Water, Bracknell, Berks. RG12 3PY. Tel Bracknell 4168.

Filament trnsfmr for 813, 10V 10A tapped primary 220-250V ac, £1·50. Pair of Selsyns, £2. Eddystone 888A, exc cond with S meter, £60. G3RUN, QTHR. Tel Deal 4276.

Radio Communication, Jan-Dec 1968, £1. *Radio Communication*, Jan-Dec 1970, £1. Tops Club mag *QMF*, April 1965 to Aug 1961 + Nov 1963 to Dec 1967, £1 the lot. Pratt, 30 Lyndale Road, Bingley Yorks. Tel 097-66 3699.

Admiralty 50W amp, £6. Meter, without valves, £3. Admiralty P3 5XG232, 10XEL91, £4. SCR522, less 832s, switch, £2·50. PS 1000/125OV, 300mA metered, £6. HK257B, £2. HK54, £1·50 plus carr. Wanted: gd EC10. GW5VX, QTHR.

Tiger TR100, 100W am tx, 80-10m + 160m, self-contained psu and modulator, £25. G3XSO, QTHR. Tel Slough 24760.

DX100U, £40. TR1196B mains trnsfmrs 3kV at 16mA, 1kV at 25mA, crt 1CP1. Technical Press *Basic Electronics*, Vols 1-5. Mullard valve voltmeter. Moving coil meters. New WW and carbon resistors. Offers. Pettitt, 82 Downhills Way, London N17. Tel 01-888 8696.

NC188 National rx with central electronics sideband slicer + adapter, exc cond, both with instruction books, best reasonable offer for both. GW5AHU, Camelot, Reynoldston, Swansea. Tel Reynoldston 266 (thru Swansea).

BC342 with 100kHz calib noise limiter, ½ lattice filt, voltage regulated etc, £10. Will del 50 miles, small charge beyond. G5XB, Little Orchard, Gallows Tree Common, Reading. Tel 073-525 2195.

Telomast 50ft comp with all guys etc, £15. Buyer coll phasing harness + ironmongery to mount 4 70cm beams, only used for 24hrs, £9. Wanted: Eddystone 898 dial. G3VZV, QTHR. Tel Toddington (05255) 2470.

Furzehill valve voltmeter, £5. Minimitter tx a.m., 120W cw 150W, Mullard 5-10 amp + two valve preamp. RF26B, as new. AF32B. 2m convtr, built-in RF26 unit case. Offers. G3KAG, QTHR. Tel Ellastone 393.

AVO mod 8 Mk 1, mint cond, £17 ono. Command rx, 3-6MHz, £2·50. Will exch rx for PR30 preselector, Also BSR TD2 tape deck, £5 ono. Johnson, 29 Chatburn Road, Clitheroe, Lancs.

FRDX500 rx, 160-2m, with calib, vgc in orig carton, £115 ono. 4μF 2000V capacitors, 50p ea. 25ft steel tower, offers. Allen, "Rosswan", Dimmocks Lane, Sarratt, Rickmansworth, Herts. Tel Kings Langley 62438 (after 6pm).

36ft mast, 3ft by 12ft by 2in, aluminium with joiners. Also 40ft mast, 22ft steel, 18ft aluminium, 2in diam, each with baseplate, six guys, galvanized wire, thimbles, glass insulators, rotproof rope+stakes, £8 ea, £12 pair. Buyer coll. G3UVS, QTHR. Tel Yelverton 2986.

Vespa Mk 2 6LQ6 with psu and spare 6LQ6, £85. HQ170A with autotrnsfmr clock and manual, £80. Both immac, property of G3RRF. Also CT38, £12. G3XWP, QTHR. Tel 01-392 5552.

Creed 7B+AP100386 rx, freq shift, exch for 2m Pye Ranger. Why. G3JGC, QTHR.

RSGB *Radio Communications*, 1966-67/1968-69 clean in wrappers, offers for the lot, +post. G2JY, QTHR.

Trio 9R59DE rx, xtal calib, stabilizer fitted, covers 550kHz-30MHz bandspread 80-10m, exc cond, £30, comp with hndbk. G3VMD, QTHR. Tel 01-843 0235.

Leak stereo 30,+amp, SP25 Mk 3, both new and boxed. Will swap for TW144 communicator or R216 rx in gd cond. Also swop SP25·3 and AT66 cartridge for BC221. G8BEN, QTHR. Tel Whittlesey (Cambs) 2499 (evenings).

Heath OS-2 scope, £25. Eddystone 888A S meter, £4. Eddystone 888A spkr unit, metal cased, circular, £3. All mint. Wanted: Samson ETM-2 keyer, TW communicator, 144-146MHz, in first class cond. G3TYJ, QTHR.

Electroniques gen cov transistor tuner unit GC166T, brand new and unused, comp with all data, £12·50 ono. G8DFR, 1 High Street North, West Mersea, Colchester, Essex.

2N3375, £3. 2N3553, 75p ea. 2N3866, 75p ea. 23cm varactor tripler, 15W, (Oct 1967 *RADCOM*), needs aligning, £10. 2m trnsvtr, 14MHz i.f., W7LHL design, (Sept 1963 *QST*), needs 2W ssb sig, QQVO3-10 output, built in psu, £10. G8AVA, QTHR.

No 10 calib, £2. El keyer, £15. Panda tx, 150W cw, 120W fone, £20. S/A bug, £3. G3YBL, 14 Box Lane, Boxmoor, Hemel Hempstead. Tel Hemel Hempstead 56286.

Deceased member's property: TF2414 freq counter, SB301, SB401, BC221, EICO, 753 trnscvr with courier psu, 5T HRO rx, Ezee match, GEC mini scope, xtal calib, 5A variac test instruments, Valiant tx. Offers. G3LRM, QTHR. Tel Paulerspury 651.

Heathkit HW-17A, factory aligned, £45. Ballance, 31 Polstead Road Oxford.

Collins KWM2 trnscvr, 12V dc psu, noise blanker, Collins /M mount, matching homebrew 240V ac psu with spkr. Best offers, comp or separate units. Letters only pse. G3DKJ, QTHR.

Ssb pa dynamic psu. 700V 225mA "C" core, trnsfmr 5R4GYs, £3 +carr. New service manual for Class D wavemeter, 50p. G6RF, Farm Cottage, Collestick, Truro, Cornwall. Tel Perranporth 2047.

Eddystone 840C with Codar pre-amp, £40. AVO 8 Mk 2, £10. All immac cond. 6ft cables, 50 core, multi-coloured with 50 way plug and sockets either end. Newman, 264 Collier Row Lane, Romford, Essex. Tel 70 63970.

Hustler 4BTV, inc 80m resonator and radials £24, or exch TA33jr. 8kW trap dipole fitted balun, £4·50. 30ft sectional steel mast comp double guys, £4·50. Cossor ID35 Mk 3 scope with instrctns, £12·50. G3AFC, QTHR. Tel Longfield 2691.

12V inverter, 280V 200mA, £2. Transistor modulator, suit QQVO3/10, £3. Henry's fm tuner, needs alignment, £3. Electroniques Mk 1 i.f. module in chassis, £2. Part-built wavemeter, 50μA movement, £1. Transistor tester, homebrew, 60p. G8AWV, QTHR. Tel 01-794 9934.

KW2000A+psu, mint cond, little used, comp with Shure ptt mic, £170 ono. Carr paid. G3LCZ, QTHR. Tel Stockton 66248.

HROCW G2DAF type XCC, 20, 15+10m (5-5·5MHz i.f. with special coil), +2m convtr and 4-6MHz coil, £20. G2DAF linear+sep psu, needs PR QY3-125s, £30. Bush radio, rf stage, walnut cab, 10W audio. G3LCS, QTHR. Tel Wolverton 3379.

Base station for 2m Redifon GR386 mains fm. AR88E, matching spkr, S meter. Vanguard tx, 160-10m, fb cond, £56·50 or why. Hallicrafter rx, 60-120MHz, mains, comp with 122 xtals, £22·50. Donohue, 41 Garway, Woolton, Liverpool. L25 5LP. Tel 051-428 6851.

HW100 c/with pp, £120. Drake 2B c/with Q Mult etc, £90. OS2, £15 Wanted: 16mm projector, 28MHz handie-talkie. G3COI, QTHR.

CR100, vgc, manual, £15. Erskine miniscope/sweep gen, £8. Buyer coll. Wanted: GR78. Cook, Old Lodge, Seven Hills Road, Cobham, Surrey. Tel 266 3117.

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KW2000A, vgc, with mains /M psus, £150 ono. Two Kokusai 455kHz mech filts with xtals, all new, £6·50 ea. Eddometer transistorized Eddystone gdo, S902 Mk 2, £18. G3UHE, 35 Beaufort Avenue, Leamington Spa, Warks. Tel Leamington Spa 23097.

Heath HW100 trnscvr, prof built, 3 mths old, with ac psu, spkr, £130. G3OLB, QTHR. Tel Oldbury 4559.

Heathkit HP-13A /M psu+Halson whip, 80 and 15m coils, £27. Sorbie, 15 Earn Gardens, Larkhall, Lanarks. Tel Garrion 4858.

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Collins mech filt, 3·1kHz bandwidth for 500kHz, £6. Japanese keying paddle, unused, £2·25. Hallicrafters SX111 and spkr, exc cond, £50 or exch for 2m gear. G3AUU, QTHR.

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Electroniques valved Qoilpax modulator unit, general cov, mint, cond. BFO unit HS085, Choke DLM14. Electroniques IFTS. Padmore, 219 High Cross Road, Poulton-le-Fylde, Blackpool. Tel Poulton 3193.

Electroniques transistor coil pack GC166T, also RSGB morse tapes+S640 rx, any cond. GW3DSV, QTHR.

Cannonball 160m ssb tx, state cond, type, price pse. G3ZJK, 32 Park Road, Thornbury, Bristol. Tel Thornbury 2185.

Hallicrafters CRX102 or sim rx covering 144-174 am/fm. G8DRS, 146 Elms Vale Road, Dover.

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BSWL Review Jan 1937, any Sept 1939 to Nov 1941, March 1942, any pre-war *WFSRA News*. WFSRA *Skywire*, after Aug 1953, WFSRA *Bee-Kay* Vol 1, No 5 (1955), + Vol 1, No 9 onwards. G3IDG, 96 George Street, Basingstoke, Hants.

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Radio Communication Jan 1971. Vella, "Mayfair", off Ursuline Street, Guardamangia, Malta.

Hallicrafters CRX102 or similar. G8DRS, 146 Elms Vale Road Dover, Kent. Tel Dover 3000.

Canadian 52 Set for local swl, must be vry cheap and in wkg order, state cond and price. Beord, 81 Connaught Road, Fleet, Hampshire.

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HRO 20m b/s coil unit also HW17A with or without /M psu, or 2m Cambridge. G8DPW, 44 Marlborough Crescent, Sevenoaks, Kent. Tel Sevenoaks 57099.

Buy or borrow tech manual with circ details for any electronic desk calculator, or details of any published articles. Bird, G3KOV 103 West End, Street, Somerset.

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One Mullard DH3-91 CRT. Hingley, 949 Woodbury Road, Halesowen, Worcs.

2 Pye Cambridge hi-band trnscvrs requ, suitable for conversion to 2m or already convtd conds. Draper, 115 Chesford Road Stopsley, Luton. LU2 8DP. Tel Luton 31560.

Loan or buy dets of VK2AZN's "Deltahet" rx. *Radio Television & Hobbies* Sept/Oct 1964 (Australian mag). Also *official* manual for RACAL RA-17, circ of Standard SR250 tape recorder. Shepherd, 72 Westerland Avenue, Canvey Island, Essex. SS8 8JS.

Cathode ray tube, type VCR139A, gd cond. Haynes, 347 Shenley Lane, Birmingham B29 4JJ. Tel 021-475 4841.

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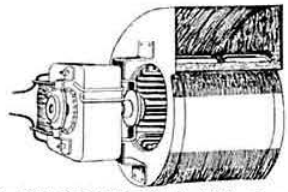

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The number of words in each advertisement must not exceed 32 not including name and address or callsign and QTHR or telephone number. Four pages of each issue are allocated to Members' Ads at present, and in order to include as many advertisements 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.

I, 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 to 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* _____

RSGB PUBLICATIONS

RSGB

Amateur Radio Circuits Book	70p
Amateur Radio Techniques	£1·13
Guide to Amateur Radio	47p
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RSGB Amateur Radio Call Book, 1971	52p
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postage	*35p extra*
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SSB Equipment	19p
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VHF Manual	£1·38

CQ

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Antenna Roundup Vol. 1	£1·46
Antenna Roundup Vol. 2	£1.84
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RTTY Handbook	£1·64
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MEMBERS ONLY

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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
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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

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